CLIMATE CHANGE AND SHIPPING ECSA POSITION PAPER[1]

Introduction

In the climate change debate shipping should be regarded as the best available solution to the global need for transportation. Shipping is the most energy efficient mode of transport and the backbone of global trade. Seen in light of the enormous volume of goods carried by ships, the CO_2 emissions from shipping are small. The reason for this is that for many decades shipping - even without specific regulation on this issue - has had a strong market driven incentive to focus on reduction of fuel consumption.

However ECSA fully acknowledges the need for further reduction of air emissions from shipping in terms of emissions per unit of transport work, in particular in view of the projected growth in world trade and thus seaborne transportation, and is of the opinion that the way to achieve environmental protection must be found in a holistic manner. To be successful, such an approach should take into consideration the availability of technology to reduce emissions, the need to encourage innovation and the economics of world trade. Reducing pollutants such as SOx and NOx may have a negative effect on CO_2 emissions. A holistic approach to air emissions is therefore necessary to ensure an overall environmental improvement in the long term.

It should also be kept in mind that European shipping plays a key role in global maritime trade with a controlled fleet of almost 41% in gross tonnage of the world merchant fleet.

An Excellent CO_2 Performance

Global warming is, by definition, a global problem and shipping is the most global of all industries. The demand for sea transportation determines the volume of shipping and is therefore the key factor that influences the overall Green House Gas (GHG) emissions from shipping. Many independent studies have been carried out to assess the total CO_2 emissions from shipping.

IEA[2] estimates that the share of CO_2 emission from international marine bunkers will remain approximately 2% at least until 2030.

The Stern Report[3] estimates that all modes of transport in 2000 accounted for 14% of global greenhouse gas emissions, a share which is expected to remain constant at least until 2050. The majority, or 76% of the emissions, is from road transport, 12% is from aviation, and 10% from shipping.

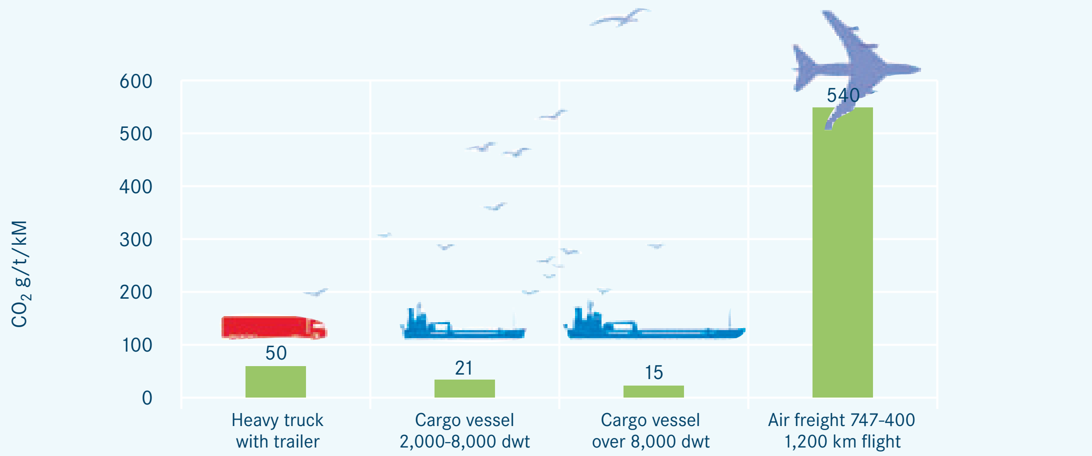
1 This paper has been produced in cooperation with and support of the International Chamber of Shipping (ICS).
2 International Energy Agency, World Energy Outlook 2006
3 Stern Review on the Economics of Climate Change, October 2006

In other studies, the results range from below 2% (IMO study from 2000) and up to nearly 4% and IMO has recently decided to carry out a new study to obtain an authoritative update. To obtain an exact figure on global emissions is difficult, but the emission share is relatively limited seen in the light that shipping is the backbone of globalisation carrying some 90% of world trade. Shipping delivers fundamentals such as heating and food and provides huge economic and social benefits to developed and developing economies, lower consumer prices, wider variety of products and larger market potential. Furthermore, when comparing GHG emissions from shipping with other transport modes the transport work performed must also be considered.

In general, shipping produces less greenhouse gases per tonne kilometre than any other form of transportation, and technological advances and the use of larger ships are constantly improving that efficiency. This is illustrated by the following examples:

Comparison of CO_2 emissions by different transport modes

Example 1



Source: Swedish Network for Transport and the Environment

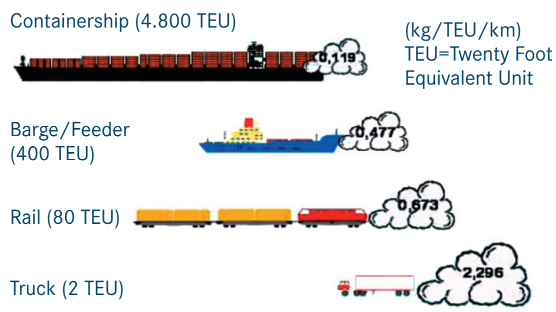
Example 2

Ship type	Loading capacity	Service speed	CO_2 emission
Panamax Bulk Carrier	80000 tdw	15 knots	3 g per t-km
Container Ship	6600 TEU	25 knots	8 g per t-km
Cargo vessel	3000 tdw	13 knots	20 g per t-km

Source: Danish Shipowners Association

Example 3

CO_2 emissions



Source: Institut für Energie und Umwelt (IFEU), Heidelberg 2002

Example 4

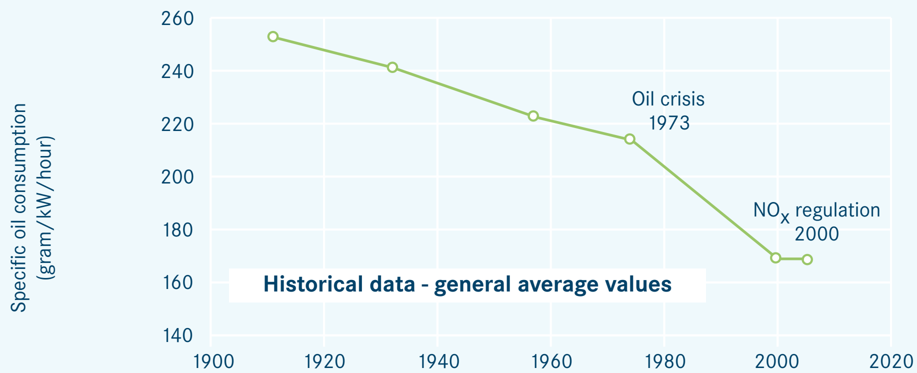
Mode of transport		CO_2 (g/t-km)	Year	Source
ROAD	Road light Duty Vehicle	410	2004	Infras_IWW
	Road Heavy Duty Vehicle	91	2004	Infras_IWW
RAIL				
	Freight Train (diesel)	38	2004	Infras_IWW
	Freight Train (electric)	19	2004	Infras_IWW
INLAND WATERWAY	Barge	31	2004	Infras_IWW
AVIATION	Cargo Aircraft	673	2004	Infras_IWW
MARITIME	Tanker (Oil, Chemicals, LG, Others)	11	2007	TRT
	Bulk Carrier	10	2007	TRT
	General and specialized cargo	42	2007	TRT
	Container and Reefer	18	2007	TRT

Source: TRT - Trasporti e Territorio Consulting, Italy/ IWW- University of Karlsruhe, Infras consulting group

Against this background, further use of waterborne transport would reduce the CO_2 emissions associated with transport and should be encouraged. This is a policy which goes hand in hand with the EU policy to address the issue of excessively congested roads. It must be remembered that regulation with the aim to achieve marginal greenhouse gas savings from shipping at considerable cost may well lead to a modal shift to other less environmentally credible forms of transport. The result would be an overall environmental loss. Furthermore – and more fundamentally - additional burdens for shipping in the EU could have a negative effect on economic growth and reduce the EU's role in a globalised world.

Historical developments of energy efficiency in shipping

Reduction of CO_2 emissions is directly linked to saving fuel, because CO_2 is one of the products of combustion being proportional to the fuel consumption. Fuel is a significant part of the total cost of operating a ship. Shipowners have therefore focused on fuel economy long before the greenhouse effect was an issue and the climate debate began. Shipbuilding is a mature technology, and engines have been optimized for fuel economy using best available technology ever since the introduction of engines. The figure below illustrates the continued development of engine efficiency for large two-stroke engines. Since the oil crisis in the early seventies, the efficiency of ship diesel engines has improved by 20%, but the efficiency penalty as a result of NOx regulation has resulted in a stagnation in the improvements achieved.



Source: MAN Diesel

ECSA has compared two container ships which were both among the largest of their time. The fuel consumed to move a standard container one kilometre is less than 1/5th of the fuel consumed 30 years ago. Some of this significant reduction is due to the development of more efficient engines, hull forms and propulsion systems, but the fact that the container capacity of the new ship is ten times larger than that of the old ship is the primary reason for this improvement. It is notable that this reduction in CO_2 emissions has been achieved without any kind of regulation and with market forces as the only driver. Statistics from the ports of Rotterdam, Hamburg and Antwerp show that the number of ship visits has decreased while there has been a significant growth in trade.

Given the growth in world trade, shipping should be seen as making a positive contribution both in environmental and economic terms. Shipping is part of the solution rather than the problem.

Principles for Any Future Climate Regulation of Shipping

International shipping must work for **international solutions via IMO** applicable to all ships regardless of flag. This is necessary in order to establish a level playing field; otherwise, ships with the highest and most costly standard will lose out to ships operating in registers with a lower standard, which again will result in higher global emissions.

We are therefore pleased to note that the EU's Transport and Energy Ministers at their Council meeting in June 2007 confirmed that the IMO should be the focal point for finding CO_2 solutions, as is requested by article 2.2 of the Kyoto agreement.

The future regulatory regime must furthermore be so designed that international shipping as such is not capped and thus causes severe disruption to global trade and development. It is also important to have a **holistic view** on the regulation of the transport mode in order not to stimulate a modal shift in Europe from waterborne transport to a less environmentally credible mode of transport such as road, air or rail transport.

The future regulatory regime must also be goal based in the sense that it will **encourage innovation** and the development of new and more CO_2 efficient technical and operational solutions, thus ensuring implementation of the most cost-effective solutions.

Furthermore, reasonable transitional arrangements should be adopted that **do not penalize shipping** companies which at an early stage and on a voluntary basis have implemented energy-efficiency measures.

Realistic objectives: The world merchant fleet has grown by 32% in tonnage terms since 1997. An annual growth of 3% in international transport demand is expected in future. If the size of the world merchant fleet expressed in gross tonnage (GT) is estimated to increase by 3% per annum in the coming 20 years and if shipping as a whole in 20 years' time is not allowed to emit more CO_2 than it did in 2005, then the energy consumption and the CO_2 emissions per GT would need to be reduced by approximately half. Seen in this light, an objective of an absolute reduction of CO_2 emission on a global basis with known technical/operational solutions, whilst possible for the specific ship per GT or per transported unit, will not be possible for the sector as a whole. Regulation must therefore focus on relative reductions with a view to continuously improving the efficiency of the individual ship and realise that absolute reduction objectives are not within reach given the growth in world trade and immaturity of alternative power for shipping.

Against this background, ECSA advocates that the following fundamental principles be applied in relation to any future climate regulation on shipping:

- Regulation must be **flag neutral** to ensure a level playing field for EU shipping and agreed internationally to ensure consistency.

- Regulation must focus on **relative reduction** with a view to continuously improving efficiency of the individual ship and realize that absolute reduction objectives are not within reach given the growth in world trade.

- Regulation must ensure the free choice of method via **goal based standards** to promote innovation and cost effective solutions.

The need for improvement - Options for the shipping industry

Although there are practical difficulties involved in reducing CO_2 emissions from shipping, the need to improve on performance remains. The 2000 IMO study on Greenhouse Emissions from Ships, to be updated by 2010, has identified a variety of options to achieve this and there is a need to further examine the pros and cons of the following ones in particular. An essential criterion for any measure is that it is so designed that it will not distort competition between ships of different flags.

Technical and Operational Options

These options have a direct impact on the emissions per unit of transport work.

> **Increased efficiency of the power plant** - Over the last decades there has been continuous development in producing more efficient engines. There are several existing options not fully utilized due to their high cost and/or complexity as well as novel ideas not fully explored.

> **Optimisation of hull and propeller design** - Also in these areas, extensive R&D has resulted in ever more efficient hull and propeller systems. It is therefore believed that the remaining potential is diminishing, but there remains room for improvement.

> **Energy optimal fleet operation** - Significant reductions in fuel consumption, and thus CO_2 emissions, in relation to the transport work produced can in theory be achieved by maximising the utilization of the cargo carrying capacity on all voyages and by improving logistics. However, there has always been a focus by shipping companies on this aspect in order to obtain maximum exploitation of the tonnage, and the scope for further improvement is therefore probably limited.

> While **reduction of ship speeds** will reduce the CO_2 emissions per unit of transport work, the feasibility of the option will largely depend on the type of shipping involved; for the bulk sector, for example, the option has considerable potential which should be explored further, while for the container trades in particular it presents significant difficulties. In the latter regard, it would require the consent of major customers as they would in general have to wait longer to receive their goods; there would also be a requirement to hold larger inventories in some cases. Shippers seek to maintain supply continuity and time of delivery is often an essential competitive parameter. In relation to ferries, travelling time for passengers and goods is a key issue in the extensive competition with other transport modes; in addition, they should be considered as a bridge between areas forming essential and reliable infrastructure. It should also be noted that reducing ship speed will reduce the transport capacity, and in order to maintain the same transport capacity more crews will have to be recruited – which is already problematic today - and more ships may have to be built which will require additional use of energy in the production process and thus more CO_2 emissions. Further analysis will therefore be needed on the pros and cons of this option.

> **Better waste heat utilization** – The exhaust gas and cooling water from ships contains substantial energy and by better utilizing this energy the overall thermal efficiency of the engine system can be improved, in many cases by 5-10%, thus reducing the overall fuel consumption.

> **Alternative fuels and means of energy** - There are several possibilities for replacement by energy sources which reduce the dependence on fossil fuel:

- **Bio fuel** seems doubtful because of the limited capacity and ethical problems, but is an environmentally sound solution when looked at from the point of view of an individual ship. Bio fuel in the form of bio diesel works well in ship engines and reduces the emission of CO_2 considerably. If bio diesel is used 100% then the CO_2 emissions would no doubt be reduced significantly. Bio diesel can be blended with the normal fuel and, for example, 5% bio diesel in the fuel can result in a CO_2 reduction of about 4%. An additional positive factor is that bio diesel does not contain sulphur. A clear disadvantage is the very high price as well as the risk that it will not be available in usable amounts due to the likely high demand by land transport, notably cars.

- **Nuclear power**, whilst having a proven track in military vessels, requires a large critical mass and involves significant political problems as well as complex legal issues e.g. the relation to the International Atomic Energy Agency. Crew competency is also likely to be a significant barrier to the commercial application of nuclear power, with the controversial issue of disposal of nuclear waste being a further complicating factor.

- **Gas (LNG)** will in the short term be able to reduce the CO_2 emission, for example, of auxiliary engines, and also of the main engine for shorter distances. While this type of fuel takes up a lot of space on board and is less relevant for ocean going ships, it could be of benefit to short sea shipping, e.g. ferries. There are large reserves of gas, making it one of the fuels for the future.

- **Fuel cells** are a possibility in the long term but currently they are not energy efficient.

- **Wind and Solar energy** could become a supplementary source on selected routes but are not considered realistic options for the foreseeable future.

Legislative Options

Taking into account the aforementioned historical developments in energy efficiency in shipping and the principles for any future climate regulation of shipping, the industry is prepared to enter into discussions on the different legislative options that can be both practical and attainable. The industry understands that the following options are currently under consideration by policy makers, although it is emphasized that the industry has not yet reached firm conclusions about their respective viability or net environmental benefit:

> **Requirements to meet a unitary CO_2 index limit value** - For the purpose of identifying and developing mechanisms needed to achieve reduction of GHG emissions from international shipping, IMO is in the process of evaluating the organisation's CO_2 emission indexing expressing the amount of CO_2 emissions per tonne/km of actual net transport work carried out. Other types of CO_2 index may also be envisaged, for example a theoretical index based on design parameters only. Setting a limit for such an index could have an impact on the specification and performance of newbuilds.

> **Inclusion of maritime transport in a Global Emission Trading Scheme**.
It will be a challenge to introduce an Emission Trading Scheme (ETS) as it will be necessary to address the difficult questions on how to allocate initial emission allowances (free or auction/sell), how to avoid distortion of competition, how to avoid a barrier for new companies and how to stimulate the operation of more CO_2 efficient ships.

If the establishment of ETS is contemplated, a truly global scheme under IMO would be much more effective in reducing CO_2 emission from shipping than any regional scheme or any scheme excluding developing countries or countries which choose not to participate. A trading scheme has to be flag neutral and clearly defined and monitored.

A global Emission Trading System represents a method by which international shipping is subject to the same framework as all other activities covered by the same ETS; this leaves it to the market mechanisms for supply and demand of emission allowances to regulate the market price and where the limited supply of emission allowances will be utilised. This should not define any arbitrary cap on the supply of world seaborne transportation capacity in itself, but rather influence the demand through the cost of sea transportation, which will inevitably increase.

> **Allocation of emissions from maritime transport to States** – By allocating CO_2 emissions from international shipping in national emissions, these could be included within the framework of the next round of the Kyoto agreement.

> **Mandatory differentiation of harbour dues** – This option is already used in Sweden on NOx and SOx. One of the challenges is to establish a reasonably simple and fair criterion for differentiation in the form of a CO_2 index of some sort. As there may be a risk for distorting competition between ports, the same system should apply to all ports within a region. Furthermore, this involves a redistribution

of the charges when ships with different levels of energy efficiency call at ports, which will be a problem for private ports and commercially run ports in general. Today, the port charges are actually a matter of negotiation, especially for large customers, which is why this option is problematic. Moreover, experiences from Sweden would indicate that this approach has not had any noticeable environmental effect, because the advantages have been insufficient.

IMO is now in the process of compiling and evaluating technical, operational and market based systems to address the CO_2 emissions from international shipping and, to expedite progress, established a Correspondence Group at MEPC 56 in July 2007 to carry this forward to MEPC 57 in March/April 2008.

The shipping industry encourages all stakeholders to come forward with relevant technical, operational and market based options and to further analyse their pros and cons for application to international shipping, as a basis for selecting the best mechanisms meeting the before mentioned criteria.

January 2008

The **European Community Shipowners' Associations (ECSA)**, formed in 1965, comprises the national shipowner associations of the EU and Norway. ECSA works through a permanent secretariat in Brussels and a Board of Directors, as well as a number of specialised committees. Its aim is to promote the interests of European shipping so that the industry can best serve European and international trade and commerce in a competitive free enterprise environment to the benefit of shippers and consumers.

The **International Chamber of Shipping (ICS)** is the principal international trade association for merchant ship operators. ICS represents the collective views of the international industry from different nations, sectors and trades. ICS membership comprises national shipowners' associations representing about 80 % of the world's merchant fleet. A major focus of ICS activity is the International Maritime Organization (IMO), the United Nations agency with responsibility for the safety of life at sea and the protection of the marine environment. Most ECSA members are also members of ICS.

For more information, please contact **Tim Marking** or **Sonia Karassavidou**, ECSA, Rue Ducale 67, 1000 Brussels, Tel +32 2 511 39 40, Email: marking@ecsa.eu or karassavidou@ecsa.eu and/or **Peter Hinchliffe**, ICS, 12 Carthusian Street, London EC1M 6EZ, Tel +44 20 7417 8844, Email: peter.hinchliffe@marisec.org
Further data on the shipping industry can be found on: www.shippingfacts.com