Impacts of proposed MBIs on the competitiveness of the Dutch maritime sector

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Author(s):
Marc Davidson
Jasper Faber
Gijs Verbraak

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Further information on this study can be obtained from the contact person Marc Davidson.

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Preface

This research has been commissioned by the Dutch Ministry of Transport, Public Works and Water management.

A draft of this report has been reviewed by a panel comprising of:
The Dutch Ministry of Housing, Spatial Planning and the Environment (VROM): Wieger Dijkstra;
The Dutch National Ports Council (NHR): Tiedo Vellinga en Joost Dijkhuizen;
The Royal Dutch Shipowners Association (KVNR): Ronaldo Valadares Fonseca

The authors greatly appreciate the valuable comments from the reviewers. The authors, however, are solely responsible for the content of the report and for any errors and omissions.

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Summary

In 2003, the International Maritime Organization's assembly adopted Resolution A.963(23) on "IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships". Among others, this resolution "urges the Marine Environment Protection Committee to identify and develop the mechanism or mechanisms needed to achieve the limitation or reduction of GHG emissions from international shipping". In doing so, the MEPC is urged to give priority to among others the evaluation of market-based solutions (MBIs). Currently, two main proposals to reduce greenhouse gas emissions from ships have been submitted to the MEPC:

- An International Fund for Greenhouse Gas Emissions from Ships, submitted by Denmark (MEPC 59/4/5).
- A Global Emission Trading Scheme for International Shipping, submitted by France, Germany and Norway (MEPC 59/4/25).

In preparation to MEPC 59, the Dutch Ministry of Transport, Public Works and Water management, has asked CE Delft to analyze and compare the two proposals, and to assess and compare the impacts of these MBIs on the competitiveness of the Dutch maritime sector, i.e. the Dutch ship owners, ports and fuel suppliers. The following conclusions have been drawn:

The proposals by Denmark and France, Germany and Norway are not yet sufficiently well elaborated to draw firm conclusions. In particular, the question remains how revenues of both MBIs are used, which target will be set in the Danish proposal and how high the level of auctioning will be in the French, German and Norwegian proposal.

The system proposed by Denmark deviates from what is normally understood by an MBI. The Danish proposal intends to reach the target primarily by spending the revenues of a levy instead of giving an efficient incentive to reduce emissions. The proposal by France, Germany and Norway is a typical MBI.

The ETS as proposed by France, Germany and Norway, is perfectly environmentally effective, since a fixed cap is put on the CO_2 emissions by the maritime sector. The system of GHG contributions as proposed by Denmark is environmentally effective as long as every four years, the political decisions are made to maintain the target and set the levy at the appropriate level.

In the proposal by France, Germany and Norway more emission reduction is achieved within the maritime sector than in the Danish proposal. The reason is that the CO_2 price is expected to be higher under the ETS, giving a stronger incentive.

Probably, the levy in the Danish proposal (the GHG contribution) is set below the marginal costs of emission reduction outside the maritime sector. This would result in a low cost effectiveness from a social point of view: under the Danish proposal, in all probability, many cost-effective measures to reduce emissions are left unused. The proposal by France, Germany and Norway is fully cost-effective.

It *seems*, furthermore, that the returns of an auction of allowances under the proposal by France, Germany and Norway are spent *outside* the maritime sector, while in the Danish proposal the maritime sector is only charged to finance emission reduction. This would result in lower costs for the maritime sector. The Danish proposal would thus be more cost effective from a *sectoral* point of view.

The main differences between the two proposals *do not* result from the one using a levy and the other emission trading. They result from the level of the GHG contributions and differences in the use of the revenues of both systems. Consequently, both proposals can be adapted so to have the same cost-effectiveness.

There are no indications that the proposals lead to significant competitive advantages or disadvantages for the Dutch maritime sector compared to foreign maritime sectors.

1 Introduction

1.1 Background

In 2003, the International Maritime Organization's assembly adopted Resolution A.963(23) on "IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships". Among others, this resolution "urges the Marine Environment Protection Committee to identify and develop the mechanism or mechanisms needed to achieve the limitation or reduction of GHG emissions from international shipping". In doing so, the MEPC is urged to give priority to the evaluation of market-based solutions.

As follow-up to resolution A.963(23), MEPC 55 (October 2006) approved a "Work plan to identify and develop the mechanisms needed to achieve the limitation or reduction of CO_2 emissions from international shipping". The work plan culminates at MEPC 59 (13 to 17 July 2009) where an in-depth discussion on market based instruments (MBIs) is scheduled.

Currently, two main proposals to reduce greenhouse gas emissions from ships have been submitted to the MEPC:

- An International Fund for Greenhouse Gas Emissions from Ships, submitted by Denmark (MEPC 59/4/5).
- A Global Emission Trading Scheme for International Shipping, submitted by France, Germany and Norway (MEPC 59/4/25).

1.2 Aim of this research and set up

In preparation to MEPC 59, the Dutch Ministry of Transport, Public Works and Water management, wants insight in the merits of both MBIs. It has asked CE Delft to assess and compare the impacts of these MBIs on the competitiveness of the Dutch maritime sector, i.e. the Dutch ship owners, ports and fuel suppliers. The objectives of this study are therefore:

- Analysis of and comparison between the proposal by Denmark and the proposal by France, Germany and Norway.
- Analysis of the impacts of both MBIs on the competitiveness of the Dutch maritime sector.

To this end, in chapter 2 we shall first explain the general working of MBIs. In chapter 3, the relevant IMO submissions on MBIs are analyzed. Chapter 4 discusses the impacts of both MBIs on the competitiveness of the Dutch maritime sector. In chapter 5, conclusions are given.

2 Introduction to MBIs

2.1 Introduction

In chapter 3, a comparison will be made between the two main proposals to reduce greenhouse gas emissions from ships submitted to the MEPC: the International Fund for Greenhouse Gas Emissions from Ships, submitted by Denmark (MEPC 59/4/5), and the Global Emission Trading Scheme for International Shipping, submitted by France, Germany and Norway (MEPC 59/4/25). To facilitate this comparison, we first explain the general working of market-based instruments (MBIs). In particular we dedicate a separate chapter to the theoretical working of MBIs because the Danish proposal for GHG contributions rather deviates from what is normally understood by an MBI.

2.2 Why market-based instruments and how do they work?

Generally, climate policy has two main objectives: to reduce GHG emissions and to reduce them cost effectively, i.e. against lowest costs. In theory, emissions could be reduced cost effectively by *command and control*, i.e. direct regulation. Authorities could investigate which measures are required to reach the target and subsequently prescribe these. In practice, however, a central authority simply lacks the time, manpower and detailed knowledge to determine the set of cost-effective measures as well as to enforce their implementation.

MBIs solve this problem by using the knowledge of all emitting parties involved in their own opportunities for emission reduction and accompanied costs to achieve emissions reduction against lowest costs. The main idea behind MBIs is that if there is a price attached to emissions, companies will determine for themselves whether it is cheaper to reduce emissions or to pay the price of these emissions. In this manner, all measures are implemented with costs below the emission price and measures which are more expensive (i.e. inefficient) will be refrained from.[1]

A second important advantage of market-based instruments over command and control is that the price mechanism offers an efficient incentive for all available measures to reduce emissions: not only technical and operational measures, but *volume* or *demand* measures as well. After all, in some cases, it may be cheaper to refrain from a certain economic activity (a specific cargo transport) than to reduce the accompanying emissions by technological options. This might be the case when a certain activity has only a very low (marginal) added value. Command and control is generally not well equipped to address such volume or demand measures. However, if demand measures

[1] Please note that in many cases, market-based instruments can be effectively supplemented by different instrument types. This is especially the case when the private benefits of market based instruments are not clear, or when market failures are present (OECD, 2007: Instrument mixes for environmental policy, Paris; CE Delft, 2008). In the case of shipping, the transparency of the charter market could potentially be enhanced by requiring ships to have an Energy Efficiency Operational Indicator (EEOI) and inform the charterer about its value. Moreover, the EEOI could be used as a labeling instrument to inform the shipper or the consignee about the carbon footprint of the ship it has engaged. Similarly, a limit value for the Energy Efficiency Design Index (EEDI) for new ships could potentially increases the incentive for ship builders to invest in fuel-efficient ship designs'.

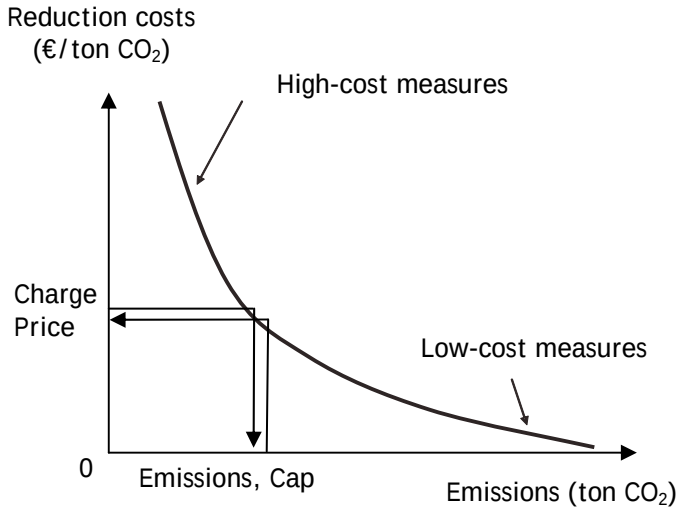
are not included in the set of measures, which is implemented to achieve the emission target, more expensive technical or operational measures have to be implemented, thereby increasing the overall costs of emission reduction.

There are two main MBIs, which attach a price to emissions: charges (taxes/levies) and cap-and-trade (tradable emissions rights/ allowances/ permits). In the case of charges, an authority directly determines the price of emissions. Consequently, each economic actor decides whether it is cheaper to reduce emissions or to pay the charge. In the case of cap-and-trade, a central authority sets a cap on the amount of greenhouse gases that can be emitted. Emitters are allocated emission permits and are required to hold an equivalent number of allowances which represent the right to emit a specific amount. If the amount of allocated permits (the cap) is less than the participants to the system would have emitted in the absence of the cap, there is scarcity and the rights obtain an economic value. Consequently, each economic actor decides whether it is cheaper to reduce emissions or to buy emission allowances.

In Figure 1, the general working of MBIs is illustrated. The figure shows the marginal costs of additional emissions reduction as a function of emissions, i.e. the additional costs of additional emission reduction. At the beginning, at business-as-usual emissions (the right side of the figure), emissions can be reduced against very low costs. However, the more emissions are reduced the higher the costs of additional emission reduction measures become.

If a charge is set, emissions are reduced up to a certain amount. If a cap is set, this results in a certain emission price. Consequently, there is no fundamental difference between the two instruments, apart from the following fact due to ex-ante uncertainty about the marginal cost curve: in the case of a charge, the economic burden can be predicted with certainty, but the environmental effect cannot; in the case of cap-and-trade, the environmental effect can be predicted with certainty, but the economic impact cannot.

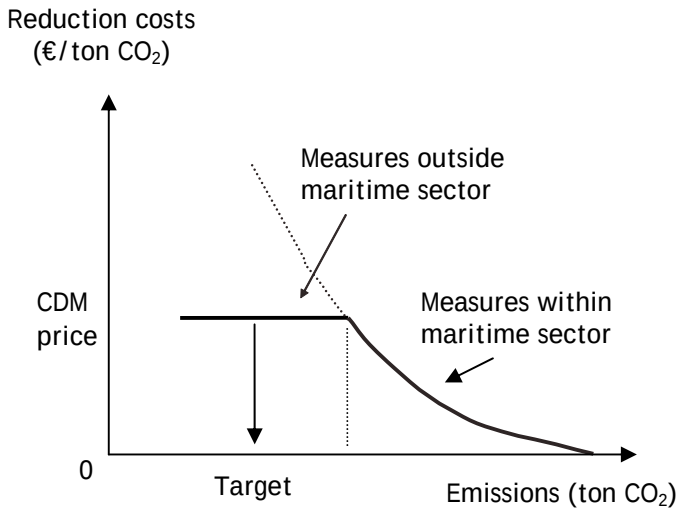
Figure 1 **Marginal costs of additional emissions reduction as a function of emissions**



2.3 Cost-effectiveness in an open system

If different sectors are required to make the same contribution to emission reduction in terms of percentage, these sectors may face different marginal reduction costs. It could be the case, for example, that emission reduction by the maritime sector is relatively expensive.[2] If that were to be the case, the most cost-effective option for the maritime sector to reach its target is to reduce emissions *within* the maritime sector up to the point where the marginal reduction costs become equal to the price of emission reduction outside the maritime sector, such as the price of CDM credits. Further emission reduction is then achieved by buying emission reduction outside the maritime sector. See Figure 2.

Figure 2 Marginal costs of additional emissions reduction in an open trading system



This cost-effective situation is automatically achieved under an emission trading scheme if allowances or credits can be bought from outside the maritime sector as well. In the case of an emission charge, the charge level has to be set equal to the price of emission reduction outside the maritime sector. Subsequently, part of the revenues of the charge has to be used to buy emission reduction outside the maritime sector up to the target.

2.4 Use of revenues, distributional effects and cost effectiveness

There is no fundamental difference between charges and cap-and-trade systems with regards to distributional effects. The potential revenues are the same in both systems and both systems face the same choice: whether to recycle the revenues to the sector or to use the revenues for purposes outside the sector, such as adaptation. In the case of cap-and-trade the choice is between auctioning and free allocation. In the case of free allocation the difficult question arises which distributional key to use. In the case of charges, revenues are created. These can be recycled to the sector according to exactly the same distributional key as which otherwise would be used for the free allocation of emission rights. In other words, any distributional objective can

[2] See also the expectations expressed in the ICS contribution MEPC 59/INF.9, page 3. The possibility also exists, however, as proposed by Norway (MEPC 59/4/24), to set the target for the maritime sector in such a manner that *equal* marginal reduction costs exist.

be obtained with charges as well as a cap-and-trade system and the same distributional questions are faced.

It should be noted though that the recycling of revenues to the sector generally is at the expense of cost effectiveness, since it introduces a market-distorting subsidy. As mentioned in section 2.2, the cost-effective set of emission reduction measures includes volume measures as well. Recycling of revenues to the sector diminishes the incentive to consider such measures and therefore increases the costs of technical and operational measures.

Dedicated recycling of revenues for technological innovation may subsidize these options more than is cost effective, i.e. may stimulate the application of technological measures with costs (high) above the costs of alternative emission reduction options, such as the Clean Development Mechanism (CDM).

3 Comparison of proposed MBIs

3.1 Introduction

In this chapter, we compare the two main proposals for market based instruments to reduce GHG emissions from ships submitted to the MEPC: the International Fund for Greenhouse Gas Emissions from Ships, submitted by Denmark (MEPC 59/4/5), and the Global Emission Trading Scheme for International Shipping, submitted by France, Germany and Norway (MEPC 59/4/25).

Our analysis in this chapter shows that although the proposals are very different, the main differences in working and impact *do not* result from the fact that the one proposal centers around contributions (a levy), while the other proposal centers around a trading system.

3.2 Description of the two systems

3.2.1 Main system

France, Germany and Norway have proposed a global Emission Trading Scheme (MEPC 59/4/25 and 26). In this system, ships need to surrender emission allowances for the CO_2 they emit. Ships would receive a number of allowances up to the cap for the sector. In addition, they would be able to buy additional allowances from other systems and/or use CDM or similar credits. The proposal has many similarities with emissions trading schemes as described in chapter 2.

Denmark has proposed a system in which fuel suppliers pay GHG contributions (MEPC 59/4/5). Japan supports this system (MEPC 59/4/34). Although the proposal still leaves room for interpretation, the system is better described as a *dedicated levy* rather than as an MBI. In the case of a dedicated levy, it is the *spending* of the revenues which offers the intended effect. In the case of an MBI, it is the levy itself, which offers the intended effect.

The idea that the GHG contributions are *primarily* intended as a dedicated levy most clearly shows from sections 10 and 13 of the proposal (our italics):

Section 10: "The International GHG Fund, as proposed and explained in this submission, provides a simple mechanism that will result in significant reductions in global GHG emissions *primarily by funding mitigation* and adaptation activities, while also stimulating improved fuel efficiency across the world's fleet through financing specific R&D efforts, but also by providing an incentive to shipowners/operators to invest in more fuel efficient solutions."[3]

Section 13: "GHG contributions are not to be conceived as a general tax on the international shipping sector *as GHG contributions would by nature cater for offsetting some of the negative effects of international shipping on the*

[3] The GHG contributions in fact do offer an incentive to invest in more fuel efficient solutions, but not necessarily an *efficient* (i.e. sufficiently strong) incentive. As will be explained later, the GHG contributions are expected to be much lower than the marginal costs of emission reduction.

climate by allocating revenues to specific international purposes with a view to addressing climate change. In this case, this implies offsetting some of the impacts from international shipping on climate change by financing primarily adaptation and mitigation activities."

Finally, the idea that the system proposed by Denmark implies a dedicated levy rather than an MBI is strengthened by the fact that the level of the GHG contributions is not primarily determined by the required impact of the system on maritime emissions, but by the revenues required to offset maritime emissions through mitigation outside the maritime sector (sections 56, 57 and 58).

3.2.2 Geographical scope

Both the International Fund and the Emissions Trading Scheme are intended to be global. The International Fund would be fed by a levy on bunker fuel sales that would be raised regardless of the location where the fuel is sold. This means that fuel suppliers in non-Annex I countries would be under the same obligations to pay the levy as fuel suppliers in Annex I countries. The Emissions Trading Scheme would require ships of all flags to participate, regardless of where they sail or by whom they are owned.

The reason for the global scope of both systems is that shipping is a global industry and excluding ships flying a certain flag would incentivize flagging out, just as excluding fuel suppliers in certain countries would create an incentive to change bunkering patterns. Both actions would undermine the environmental effectiveness of the instruments.

3.2.3 Allocation of revenues

France, Germany and Norway suggest auctioning of the allowances thus creating revenues. Their proposal offers no suggestions for the allocation of these revenues. The proposal mentions a 'phase-in period', however, which economically works the same as the gradual transition from a levy to a cap-and-trade scheme:

"In order to allow the shipping industry time to adapt to the new situation a phase-in period is suggested and should be part of the legal instrument in which the share of emissions for which allowances have to be surrendered is gradually increased. Also other phase-in schemes could be established such as starting with specific types of ships or sizes."

Denmark has proposed to allocate the revenues of the GHG contributions to finance (section 8):

1. Mitigation and adaptation activities in developing countries and in particular in the most vulnerable developing countries being the Least Developed Countries (LDCs), the Land Locked Developing Countries (LLDCs) and the Small Island Developing States (SIDSs).
2. R&D projects on more energy efficient ship designs and propulsion systems in order to accelerate continuing improvements in this field.
3. Technical cooperation within the existing IMO framework. And
4. Administrative expenses for operation of the International GHG Fund.

Japan has added to Denmark's proposal the option to refund a part of the revenues to those ships ranked "excellent" based on those ships' performance in terms of energy efficiency in a certain evaluation period.

However, in the rest of Denmark's proposal the emphasis of the allocation of revenues is on offsetting emissions in the maritime sector via the CDM or similar offset mechanisms. How these two objectives relate is not clear. For example, it is unclear whether CDM-credits can easily be obtained from financing mitigation activities in developing countries and in particular in the most vulnerable developing countries. Furthermore, if an international agreement is reached in which the developing countries accept binding targets as well (however loose), the possibility to offset emissions in those countries may be severely limited.

3.2.4 CO_2 price

In the proposal by France, Germany and Norway, the CO_2 price is determined by the international market for emission allowances, since it is proposed to couple the maritime ETS to other trading schemes.

In the proposal by Denmark, the CO_2 price is unknown, but expected to be much lower than the marginal costs of emission reduction outside the maritime sector. If the revenues of the GHG Fund are entirely used to offset emissions (as suggested in Annex 3 of the proposal), then the CO_2 price will only be a fraction of the global marginal costs of mitigation, i.e. the international market price for emission allowances. Annex 3 of the Danish proposal gives the following example: "if the GHG contributions are set at USD 45 and the price of CDM credits is USD 45, total emissions from international shipping will be offset by around 1/3." It should noted, though, that in the Danish proposal GHG contributions are expressed per ton bunker fuel, which means that the GHG contributions in the example are about USD 15 per ton CO_2, a *third* of the CDM price.

However, the proposal does not exclude the possibility that the level of the GHG contributions is set equal to the marginal price of emission reduction outside the maritime sector.

3.2.5 Target

The proposal by Denmark indicates that the shipping sector will have an emissions target. It does not elaborate on what the target for maritime emissions will be or how it will be set.

The proposal by France, Germany and Norway states the following general remarks:

"An emission cap and target period will have to be established in the legal IMO instrument in order to guarantee the environmental goals of the scheme. For that purpose the ability of the shipping sector needs to be taken into account, as well as the outcome of the deliberation of the UNFCCC, which may conclude in emission reduction targets for the international transport modes. However, if a target will be established by UNFCCC, it has to be reflected by the cap and target period which will have to be set in the legal IMO instrument to ensure consistency. Usually, an emissions cap is set using a historic level of emissions from the sector and a reduction path. The cap should reflect the necessities of climate protection as well as the respective share and capabilities of the shipping industry and its anticipated development."

Norway has proposed to establish an emission cap in an ETS for international shipping on the basis of equal marginal reduction costs across the global sectors (MEPC 59/4/24). Establishing an emission cap in such a manner implies that no allowances are withdrawn from or added to other international trading schemes. Norway proposed such a cap to "ensure that shipping is not unfairly

burdened compared to other industries" (section 2). It could be argued, however, that a fair burden is not achieved by the determination of the cap. If all emission allowances are auctioned to the maritime sector and the revenues of such an auction are not recycled to the sector, the cap has only consequences for global emissions, but no financial consequences for the maritime sector. Instead, the (financial) burden for the maritime sector is determined by the amount of emission allowances which are allocated for free to the maritime sector. Whether such an amount is fair depends upon the amount of emission allowances which are allocated for free to other sectors. However, in the largest emissions trading scheme operating today, the EU ETS, different sectors are already treated differently, which makes a comparison problematic.

3.3 Analysis

3.3.1 Effectiveness with regard to CO_2 reduction

The ETS as proposed by France, Germany and Norway, is perfectly environmentally effective, since a fixed cap is put on the CO_2 emissions by the maritime sector. Although the scheme allows the maritime sector to buy emission rights from outside the sector, and thus allows the maritime sector to emit more than its target, additional emissions by the maritime sector are perfectly compensated. It should be noted, however, that the assumption is made that emission reductions credits bought outside the sector reflect real emission reductions. It has sometimes been argued that CDM projects are not additional. If this is true and the projects would also have been done in the absence of CDM, the credits would not reflect real emission reductions and the environmental effectiveness would be undermined.

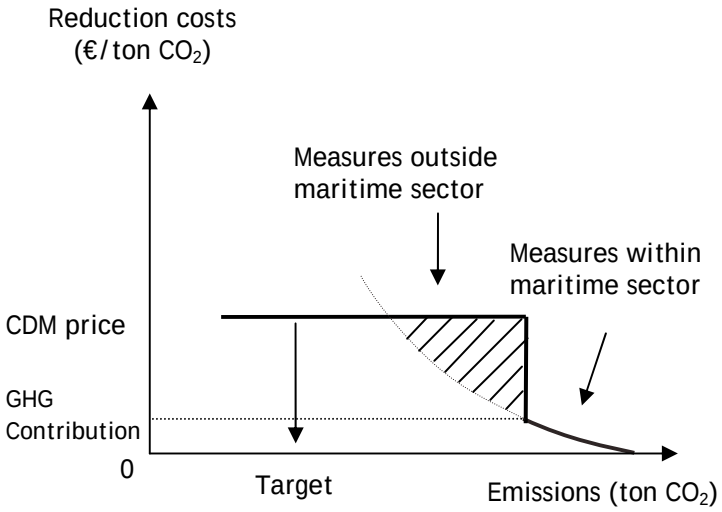
The system of GHG contributions as proposed by Denmark is environmentally effective, since the target can be achieved by financing emission reduction outside the maritime sector. Since its environmental effect depends almost completely on buying offsets, the quality of the offsets is even more important that in the case of the ETS. Moreover, there may be a time lag between the moment the target should be achieved and the moment of emission reduction. After all, if there is a mismatch between the target and actual emissions, additional emission reduction has to be bought and the level of GHG contributions may have to be adapted. Furthermore, it should be noted that achieving the target via GHG contributions and offsetting is more vulnerable to political pressure than a cap under a trading scheme. After all, more political decisions need to be taken in the Danish proposal than in the ETS: the target has to be established as well as the level of the GHG contribution and the distribution of the revenues. If these decisions are not perfectly aligned, the environmental effectiveness could be undermined.

3.3.2 Cost effectiveness

Cost effectiveness can be defined from a social (global) perspective and from a sectoral perspective. From a social (global) perspective, an MBI is perfectly cost effective if the emission target for the maritime sector is achieved with the cheapest set of emission reduction measures available. From this perspective, *distributional* effects are irrelevant. For example, whether emission allowances are auctioned or allocated for free to the sector, is a matter of *distribution* and *equity*, but not of *cost effectiveness* (at least not in first order). From a sectoral perspective, however, the overall costs to the sector may be included in the definition of cost effectiveness: a system which achieves the same goal against lower costs for the sector is then considered more cost effective.

From a social (global) perspective, the proposal by France, Germany and Norway is more cost effective than the Danish proposal. To be more precise: the proposal by France, Germany and Norway is perfectly cost effective, while the Danish proposal could turn out to be quite inefficient. In the proposal by France, Germany and Norway all emission reduction options within the maritime sector are used which have marginal costs below the costs of additional emission reduction outside the maritime sector (see Figure 2 in the previous chapter). Figure 3 shows the emission reduction, which results from the proposal by Denmark. Since the GHG contributions are (much) lower than the marginal costs of additional emission reduction outside the maritime sector (see section 3.2.4), many opportunities within the maritime sector are left unused and more expenses are made on emission reduction than necessary.[4]

Figure 3 Marginal costs of additional emissions reduction in the proposal by Denmark



From a sectoral perspective, the cost-effectiveness depends on two variables that have not been parameterized in the proposals: the target in the Danish proposal and the level of auctioning in the ETS proposal. The more ambitious the target, the higher the costs to the sector. And the higher the level of auctioning, the higher the costs to the sector. Thus, an ETS with free allocation can have lower costs to the sector than a GHG Fund with a very ambitious target. Conversely, an ETS with full auctioning would be more expensive to the sector than a GHG Fund with a unimposing target (assuming that the auction revenues would not be ploughed back into the sector).

In the numerical examples given in the Danish proposal, the costs to the sector appear to be lower than in the proposal by France, Germany and Norway. It should be noted, however, that a system can be designed which fares better than the Danish proposal against both definitions of cost effectiveness. If the GHG contributions are set equal to the marginal costs of emission reduction outside the sector and the revenues of the system are partly returned to the

[4] It should be noted that in the proposal by Denmark part of the revenues are used to fund R&D projects on more energy efficient ship designs and propulsion systems. Japan has suggested the option to refund a part of the revenues to those ships ranked "excellent" based on those ships' performance in terms of energy efficiency in a certain evaluation period. It is difficult to assess beforehand the additional emission reduction, which will be achieved by these options.

sector, then lower costs for the sector are achieved *and* a better cost effectiveness.

In conclusion, both the social and the sectoral cost-effectiveness of both proposals can be made the same, but in its current form the social cost-effectiveness of the Danish proposal is inferior to the ETS.

3.3.3 Administrative burden

In both systems, a number of administrative tasks have to be fulfilled. Table 1 presents an overview.

Table 1 **Administrative tasks in proposals by Denmark, and France, Germany and Norway**

Actor	METS	GHG Fund
Fuel supplier	Provide bunker fuel delivery note*	Provide bunker fuel delivery note* Provide levy receipt Report amount of fuel sold to administrative body Pay levy to administrative body
Ship / ship owner	Keep bunker fuel delivery notes* Report on amount of fuel used Acquire allowances Surrender allowances to administrative body	Keep bunker fuel delivery note* Keep levy receipt Pay levy if fuel is bought from a non-registered fuel supplier
Flag state	Monitor and enforce compliance for ships flying the flag	Register fuel suppliers Monitor and enforce compliance for ships flying the flag
Port state	Monitor and enforce compliance for ships in ports	Monitor and enforce compliance for ships in ports
International organization	Manage allowance registries Receive emissions allowances Distribute funds	Maintain register of payments Distribute funds

Note: Tasks marked with an * are required in Marpol Annex VI.

From Table 1 it can be concluded that the main administrative difference between the METS and the GHG Fund is that in the former the ship (in fact its owner or operator) submits a monitoring report and surrenders the allowances, while in the latter the similar tasks of reporting fuel sales and paying the levy will be on the fuel supplier.

One administrative tasks that is not mentioned in Denmark's proposal is a registry of fuel sales that ensures that a levy is paid on all fuel that is sold. This requires at least that fuel suppliers to submit a verified document of fuel sales. It may also require that either refineries or ships keep records of fuel sales or purchases that allow the data from fuel suppliers to be verified.

Which system has higher administrative costs overall is hard to conclude from Table 1. While the number of tasks is comparable, the costs per task could be higher in one system than in the other. This cannot be estimated without a much more detailed design of the systems.

3.3.4 Predictability of economic impact

In a closed system (no interaction with other sectors), there is a clear distinction in the working of charges and cap-and-trade with regards to the economic predictability. Since the charge level is known, so is the economic impact. In the case of cap-and-trade, the price of allowances, and thus the economic impact, has to be awaited.

In an open system, where part of the emission reduction can be achieved outside the sector, the situation is less clear. First of all, in an open system the price of emission allowances is determined by the global market. Since this market is much bigger than the maritime market alone and already runs before the maritime sector introduces MBIs, the price of emission allowances is much better predictable.

Secondly, in the case of charges (or GHG contributions) the level of the charge has to be adapted to the intended effect. Since the environmental effect is not well known, but the maritime sector is given a clear target, it is also not known in advance how the charge level has to be adapted in the future either to sufficiently reduce emissions or to produce the fund from which to pay emission reduction outside the sector.

However, since in its present setup the Danish proposal costs less than the other proposal, a buffer could be introduced in the Danish system, which reduces economic volatility. After all, the Danish proposal aims at funding mitigation as well as adaptation outside the maritime sector. If the costs of mitigation, which helps the maritime sector to achieve its target, are higher than expected, the expenditure for adaptation can be reduced so to keep the level GHG contributions unaltered.

3.3.5 Distribution of costs over relevant actors

There are three distributional issues: within the maritime sector, between the maritime sector and other sectors, and between maritime sector and government.

Distribution of costs within the maritime sector

The objective of MBIs is to give CO_2 emissions a price. Consequently, under an MBI those who emit more pay more, and those who perform most efficiently pay least. Since the expenditure on CO_2 emissions is closely related to the expenditure on fuel, the distributional impact of the introduction of an MBI is about the same as an increase in fuel prices: it benefits those who operate most efficiently. As a result, operators with a less efficient fleet bear more costs.

The distribution of costs can be influenced, however, by the recycling of the revenues of the MBIs. The Danish proposal (section 71), for example, states the following:

"Part of the revenues should be allocated for technical cooperation activities already existing within the IMO framework. The aim of the existing framework is to help developing countries improve their ability to comply with international rules and standards relating to maritime safety and to prevent and control maritime pollution. Priority is given to technical assistance programmes that focus on human resources, development, and institutional capacity-building in developing countries."

Japan, on the other hand, has suggested a mechanism which could have the opposite effect: to refund a part of the revenues to those ships ranked "excellent" based on those ships' performance in terms of energy efficiency in a certain evaluation period.

The proposal by France, Germany and Norway does not elaborate on the use of the revenues, which would arise from auctioning of the allowances. Therefore, the distributional effects are unknown.

Distribution of costs between the maritime sector and other sectors
Between sectors the same mechanism works as within the maritime sector: MBIs attach a price to emissions, which means that those who emit more have to pay more. Between sectors this implies that sectors, which are less energy intensive, have to pay less than sectors which are more energy intensive.

Specific distributional effects may arise if revenues of MBIs are recycled to the one sector, but not to the other. In this respect, the Danish proposal may give distributional advantages over other sectors, if these have to pay a higher price for all emissions. If, for example, the aviation sector has a system of cap-and-trade and the revenues of auctioned allowances are used outside the aviation sector, then the Danish system has a distributional advantage.

Presently, however, there is not enough known about the distribution of costs over the other sectors to make a detailed assessment. Furthermore, the elaboration of the proposal by France, Germany and Norway is still unknown.

3.4 Conclusions

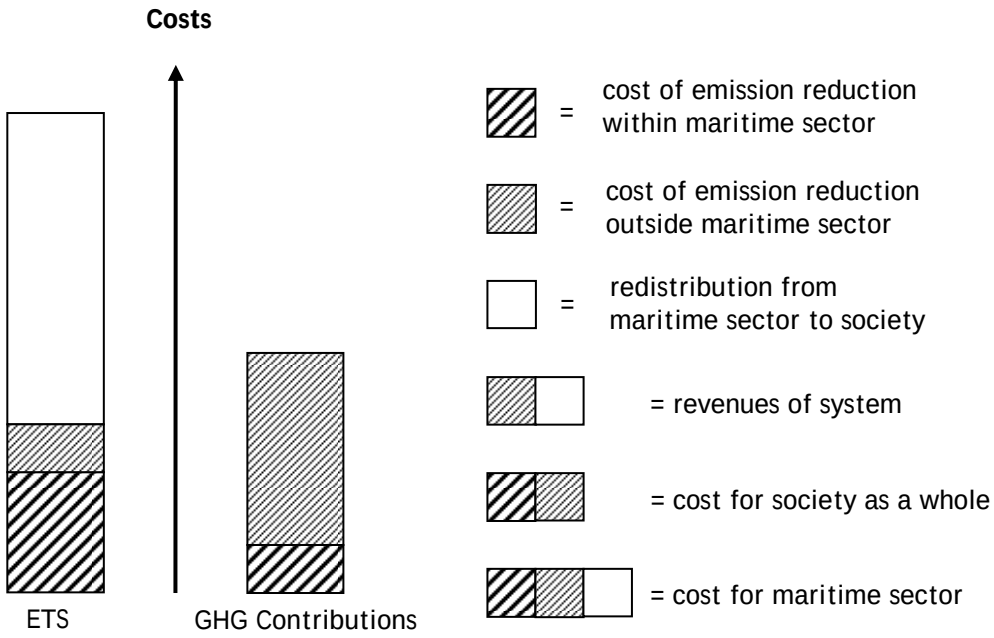
Since the use of the revenues is in neither of the proposals well defined, the comparison given in this chapter is preliminary. However, some conclusions can be drawn from the spirit of the proposals' text.

The most striking difference is that where the proposal by France, Germany and Norway is a typical MBI, the Danish proposal seems rather to be a dedicated levy. In the Danish proposal, the target seems not to be achieved by giving a price to maritime emissions, but primarily by raising the funds to finance emission reduction outside the sector.

A second difference between the two proposals is that in the proposal by France, Germany and Norway, allowances are auctioned and the returns seem to be used outside the sector. In the case of the Danish proposal, less money is withdrawn from the sector, since the level of the GHG contributions is expected to be much lower than the price of emission allowances.

The main differences between the two proposals are illustrated below in Figure 4 under the assumptions that in the case of the ETS all allowances are auctioned and the revenues are spent outside the maritime sector, and that in the case of GHG contributions all revenues are used to buy emission reduction outside the maritime sector. Once more, it should stressed that these assumption follow from the spirit of the proposals' text, but that choices can be made differently.

Figure 4 **Graphical illustration of costs and redistribution in the proposals for an ETS for the maritime sector and a system of GHG contributions**



In the figure, the following conclusions are illustrated:

1. In the proposal by France, Germany and Norway more emission reduction is achieved within the maritime sector than in the Danish proposal. The reason is that the CO_2 price is expected to be higher under the ETS (see section 3.2.4), giving a stronger incentive.
2. The social costs of emission reduction (costs within and outside maritime sector) are expected to be higher in the Danish proposal than in the proposal by France, Germany and Norway. The reason is that in the Danish proposal emissions are reduced outside the sector, while cheaper options are still available within the sector. These options are not used because of the low carbon price.
3. In the proposal by France, Germany and Norway the cost for the maritime sector are higher than in the Danish proposal. The reason is that allowances are auctioned and revenues are assumed to be spent outside the sector.
4. In the proposal by France, Germany and Norway the revenues of the system are higher than in the Danish proposal. The reason is that the price of allowances is expected to be higher than the GHG contributions.

It should be stressed that the differences between the two proposals *do not* result from the fact that the one proposal centers around contributions (a levy), while the other proposal centers around a trading system. A system of GHG contributions can be designed, which gives the results of the ETS as discussed above, and vice versa.

4 Impacts on competitiveness

4.1 Introduction

The central conclusion of chapter 3 has been that the Danish proposal appears to be less cost effective from a social point of view than the proposal by France, Germany and Norway: under the Danish proposal, in all probability, many cost-effective measures to reduce emissions in the shipping sector are left unused. However, the price of CO_2 emissions, and thus energy use, appears to rise more in the proposal by France, Germany and Norway than in the Danish proposal.

A further difference is that the proposal by France, Germany and Norway may lead to somewhat higher administrative costs for shipping companies, whereas the Danish proposals puts a higher administrative burden on the fuel suppliers.

If the Dutch maritime sector differs from foreign sectors with regards to relevant characteristics, then the differences in cost increases may have different impacts on the competitiveness of the Dutch maritime sector. In this chapter, we investigate whether there is reason to assume such differences. Please note that we only investigate the impacts on the competitiveness compared to the foreign maritime sectors and not compared to other modalities, such as road, rail or aviation.

In all cases it is expected that if there is an impact on the Dutch maritime sector, it is stronger under the proposal by France, Germany and Norway than under the proposal by Denmark. The reason – as mentioned – is that the price of CO_2 emissions, and thus energy use, appears to rise more in the proposal by France, Germany and Norway than in the Danish proposal.

4.2 Impacts on Dutch ports and fuel suppliers

With respect to the introduction of MBIs, the most relevant difference between Dutch ports and fuel suppliers and their foreign competitors is their geographical location. Although the distance from the port of Shanghai, for example, to the port of Rotterdam is roughly the same as the distance from Shanghai to the port of Antwerp, the distance to Le Havre is about two hundred nautical miles shorter, while Hamburg is two hundred fifty nautical miles further away. This means that under MBIs the costs for ship owners to reach the Dutch ports increase relative to French ports, while they decrease relative to German ports. Whether the overall effect is positive or negative is difficult to assess.

Table 2 **Container transshipment (total throughput) in the Le Havre Hamburg range in 2007**[5]

Port	Distance to Shanghai relative to Rotterdam (in nautical miles)	Mln. tons
Le Havre	- 200	78,9
Duinkerken	- 100	57,1
Zeebrugge	- 50	42,1
Antwerpen	0	182,9
Rotterdam	0	406,8
Amsterdam	100	87,8
Bremen	250	69,2
Hamburg	250	140,4

Currently, Rotterdam has a large bunker market. One of the reasons is that fuel is cheaper in Rotterdam than in other ports in Europe (although the causality is hard to establish). The Danish proposal would increase the price of fuel as fuel suppliers would have to pay the GHG contribution. Past experience has shown that bunker fuel markets are very vulnerable to price increases. An 8% sales tax introduced in the ports of Los Angeles and Long Beach led to the collapse of the bunker fuel market there. Many ships decided to bunker in Panama instead (Michaelis 1997).[6] However, in this case the bunker fuel prices in Panama were not affected. In the Danish proposal, all bunker fuel sales worldwide would be subject to paying a GHG contribution and this would not change the relative prices in Rotterdam. Therefore, it is not expected that the position of the Rotterdam bunker fuel market would be impacted.

4.3 Impacts on Dutch ship owners

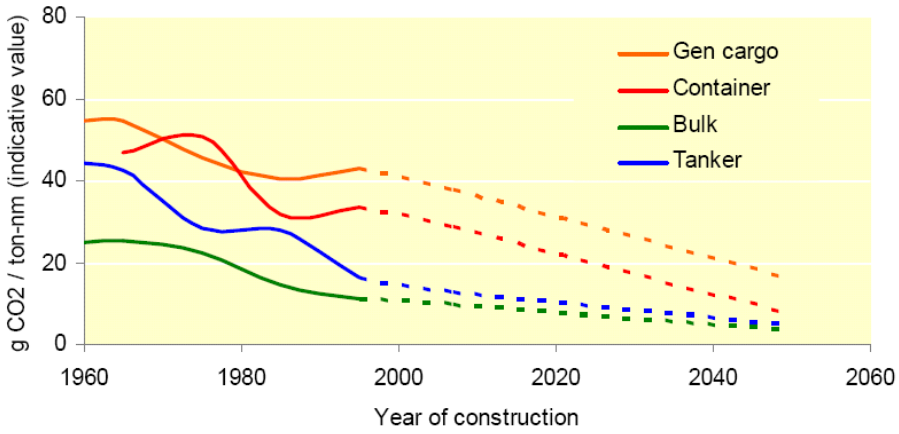
The additional costs for emitting greenhouse gases could give rise to differences in costs if other competitors can offer the same service with less emissions (or can do so more easily), i.e. in the same market. Whether Dutch operators face higher costs depends upon their fuel efficiency per ton-mile. This efficiency depends upon both *technology* and *ship size*. Generally, the larger and more recently built, the more fuel efficient the ship per ton-mile.

Figure 5 shows the historical and expected future development in fuel efficiency for the period 1960-2060. From this figure it shows that newer ships are generally more fuel efficient than older ships.

[5] Source: Havenbedrijf Rotterdam N.V. (2008).

[6] Michaelis, L., 1997: SPECIAL ISSUES IN CARBON/ENERGY TAXATION: MARINE BUNKER FUEL CHARGES, Annex I Expert Group on the United Nations Framework Convention on Climate Change, Working Paper No. 11, OCDE/GD(97)77, Paris: OECD.

Figure 5 Historical improvement in fuel efficiency



The Dutch fleet is relatively young and modern with an average age of 10 years (V&W, 2008).[7] As can be seen from Table 3, this is the same as the average age of the fleet of the developed countries. The fact that the fleet is relatively young gives the Netherlands a slight competitive advantage compared to the major open-registry countries and more advantage compared to the developing countries and economies in transition. The average age of the Chinese fleet, for example, is 18 years (UN, 2007: 127).[8]

[7] V&W, 2008, Dutch Ministry of Transport, Public Works and Water management, Beleidsbrief Zeevaart 2008, The Hague.

[8] UNCTAD (2007) Review of Maritime Transport 2007, United Nations, New York and Geneva.

Table 3 Age distribution of the world merchant fleet

Age distribution of the world merchant fleet, by type of vessel, [a] as of 1 January 2007

(Percentage of total dwt)

Country grouping	Type of vessel	0–4 years	5–9 years	10–14 years	15–19 years	20 years and over	Average age (years) 2007 [b]	Average age (years) 2006 [b]
World total	All ships	25.1	21.0	16.7	10.9	26.2	12.0	12.2
	Tankers	30.3	25.0	16.4	14.6	13.6	10.0	10.0
	Bulk carriers	21.6	19.0	19.1	9.0	31.3	12.9	13.1
	General cargo	10.1	12.6	10.9	9.6	56.8	17.4	17.5
	Containerships	34.7	25.7	18.6	8.0	13.0	9.1	9.4
	All others	19.6	14.4	10.7	9.1	46.3	15.1	15.3
Seven major open-registry countries [c]	All ships	27.6	21.3	16.7	10.5	24.0	11.5	
	Tankers	31.1	24.9	16.6	15.7	11.8	9.8	
	Bulk carriers	24.7	19.7	18.4	7.8	29.5	12.3	
	General cargo	11.5	14.3	13.2	9.6	51.3	16.5	
	Containerships	39.0	23.5	16.0	7.9	13.5	8.9	
	All others	22.4	15.0	9.8	5.9	46.9	14.7	
Developed countries	All ships	28.4	29.9	17.6	7.8	16.3	9.9	
	Tankers	36.5	35.4	14.3	6.7	7.1	7.7	
	Bulk carriers	19.6	25.5	23.9	6.1	24.9	11.9	
	General cargo	14.9	23.9	15.8	12.8	32.6	13.7	
	Containerships	30.6	31.6	19.1	8.8	9.9	8.9	
	All others	22.4	19.9	15.0	10.7	31.9	13.0	
Economies in transition	All ships	20.1	6.2	11.5	10.3	51.8	16.2	
	Tankers	34.4	7.4	15.5	7.1	35.5	12.6	
	Bulk carriers	9.1	7.2	10.9	13.1	59.7	18.2	
	General cargo	6.7	4.3	5.0	10.1	73.8	20.1	
	Containerships	47.0	3.3	16.1	8.2	25.4	10.5	
	All others	32.0	7.0	14.8	10.0	36.3	13.1	
Developing countries	All ships	24.6	18.9	17.1	11.8	27.7	12.4	
	Tankers	28.0	21.0	17.7	17.5	15.8	10.8	
	Bulk carriers	23.1	18.3	18.6	9.6	30.5	12.8	
	General cargo	9.6	10.9	10.7	8.5	60.4	17.9	
	Containerships	35.9	24.4	19.3	7.2	13.1	9.1	
	All others	17.6	12.9	10.5	7.8	51.2	15.9	

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

[a] Vessels of 100 GT and above.

[b] To estimate the average age, it has been assumed that the ages of vessels are distributed evenly between the lower and upper limits of each age group. For the 20-years-and-over age group, the midpoint has been assumed to be 23.5 years.

[c] The open registries in this group are the Bahamas, Bermuda, Cyprus, Liberia, Malta, Panama and Vanuatu.

Source: UN, 2007.

Apart from the age of the ship the size matters for fuel efficiency: larger ships are generally more fuel efficient per ton mile than smaller ships. The Dutch fleet consists of relatively small ships with an average deadweight tonnage of 4,633 in 2007 (UNCTAD, 2007: 36). The world average is about 11,000 ton and the average for Belgium is about 30,000 ton, for example. However, it is difficult to draw conclusions from these differences. After all, operators with smaller ships will only experience a competitive disadvantage if larger ships compete in the *same market* and on the *same route*. Since we assume that the ship size of the Dutch fleet has been adapted to the specific markets in which they operate, we do not have reason to expect competitive disadvantages.

4.4 Conclusions

Assuming the proposed MBIs are introduced globally and thus lead to a level playing field, we do not see reason to expect significant changes in the competitiveness of the Dutch maritime sector compared to the foreign maritime sectors. If they are not introduced globally or if enforcement would be weaker in some parts of the world, the competitiveness of the Dutch maritime sector could be affected. Please note that we have not investigated any changes in the competitiveness of the Dutch maritime sector compared to other transport modes.

5 Conclusions

The proposals by Denmark and France, Germany and Norway are not yet sufficiently well elaborated to draw firm conclusions. In particular, the question remains how revenues of both MBIs are used, which target will be set in the Danish proposal and how high the level of auctioning will be in the French, German and Norwegian proposal.

The system proposed by Denmark deviates from what is normally understood by an MBI. The Danish proposal intends to reach the target primarily by spending the revenues of a levy instead of giving an efficient incentive to reduce emissions. The proposal by France, Germany and Norway is a typical MBI.

The ETS as proposed by France, Germany and Norway, is perfectly environmentally effective, since a fixed cap is put on the CO_2 emissions by the maritime sector. The system of GHG contributions as proposed by Denmark is environmentally effective as long as every four years, the political decisions are made to maintain the target and set the levy at the appropriate level.

In the proposal by France, Germany and Norway more emission reduction is achieved within the maritime sector than in the Danish proposal. The reason is that the CO_2 price is expected to be higher under the ETS, giving a stronger incentive.

Probably, the levy in the Danish proposal (the GHG contribution) is set below the marginal costs of emission reduction outside the maritime sector. This would result in a low cost effectiveness from a social point of view: under the Danish proposal, in all probability, many cost-effective measures to reduce emissions are left unused. The proposal by France, Germany and Norway is fully cost-effective.

It *seems*, furthermore, that the returns of an auction of allowances under the proposal by France, Germany and Norway are spent *outside* the maritime sector, while in the Danish proposal the maritime sector is only charged to finance emission reduction. This would result in lower costs for the maritime sector. The Danish proposal would thus be more cost effective from a *sectoral* point of view.

The main differences between the two proposals *do not* result from the one using a levy and the other emission trading. They result from the level of the GHG contributions and differences in the use of the revenues of both systems. Consequently, both proposals can be adapted so to have the same cost-effectiveness.

There are no indications that the proposals lead to significant competitive advantages or disadvantages for the Dutch maritime sector compared to foreign maritime sectors.