

Economic incentives for maritime shipping relating to climate protection

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Abstract This paper aims to analyze the various policy options for addressing greenhouse gas emissions from international maritime shipping, with an emphasis on the use of economic instruments. The economic incentives provided for the industry are categorized and examined with regard to their effectiveness for climate protection purposes. An analysis of the potential use of market-based mechanisms for the shipping sector follows alongside with the review and evaluation of the various proposals for a Maritime Emissions Trading Scheme that are submitted to the Marine Environment Protection Committee of the International Maritime Organization and are currently under consideration. The importance of the adoption of a maritime global cap-and-trade scheme for climate change mitigation is particularly emphasized. Within this context, it is also considered whether the possible introduction of economic incentive measures on a broader (regional or global) level may cause problems of implementation and how these obstacles can be overcome.

Keywords Economic incentives · Market-based mechanisms · GHG emissions · Maritime shipping · Climate protection

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1 International maritime transport: environmental credit and discredit

A global attempt towards a more sustainable and less emissions-intensive industrial growth for all nations was introduced in 1992 by the United Nations Framework Convention on Climate Change (UNFCCC)¹ as well as by the subsequent agreement on the Kyoto Protocol (KP),² which entered into force in February 2005. A target on greenhouse gas (GHG) emissions reduction was set, as a practical attempt to attain the objectives of the Convention. Consequently, activities of an international character, such as international shipping and aviation, resumed a future global responsibility with regard to climate protection.

By discerning the increasing demand for environmental compatibility, international transport has sought to cope with the challenging task of securing a balance between cost efficiency and energy efficiency, independent of any developments (sectoral, environmental, regulatory) that have prevailed on the way (Klein 2007). At the same time, various international, supranational, regional, and national policy frameworks are either being developed or are currently implemented with a view to attaining the desirable GHG mitigation goal.

More specifically with regard to maritime shipping, despite being the most energy efficient mode of mass transport and carrying 90 % of world trade, it has recently found itself the subject of global discredit for failing to be climate friendly. In the second study of GHG emissions from shipping released by the International Maritime Organization (IMO) (Buhaug et al. 2009), it was estimated that 2.7 % of the global emissions of carbon dioxide (CO₂) were emitted by international shipping in 2007 and that in the absence of regulations and due to the expected growth of international trade, by the year 2050, ship emissions could grow by 200–300 % in comparison to the 2007 figures. In addition, the exclusion of international bunker fuel emissions from any commitment in the KP and the failure of the UNFCCC Conference in Copenhagen in December 2009³ to bring about clear directions on how to proceed with these emissions seem to have contributed to the worldwide growing concern (Heitmann and Khalilian 2010). The UN climate talks in the Durban conference in December 2011 equally did not result in the acceptance of any of the proposals for shipping emission reductions.⁴

The purpose of this paper is to provide for an evaluation of the past, current, and under consideration economic incentive measures which are applicable to the maritime sector with regard to climate protection. Starting from a basic categorization of the policy instruments available to policy makers for climate change mitigation, the use of economic incentives is set forth as an attractive approach to address shipping

¹ The United Nations Framework Convention for Climate Change opened for signature 9 May 1992 and entered into force 21 March 1994. Available at: <http://unfccc.int/resource/docs/convkp/conveng.pdf>

² Kyoto Protocol to the United Nations Framework Convention on Climate Change opened for signature 11 December 1997 and entered into force 16 February 2005. Available at: <http://unfccc.int/resource/docs/convkp/kpeng.pdf>

³ About the UN Climate Change Conference 2009-COP 15 and the Copenhagen Accord, see: http://www.denmark.dk/NR/rdonlyres/C41B62AB-4688-4ACE-BB7B-F6D2C8AAEC20/0/copenhagen_accord.pdf.

⁴ The briefing document prepared for the Durban conference by the ICS confirmed the commitment of the shipping industry to cut its emissions by 20 % by 2020.

emissions. The analysis of these economic incentive measures in the following chapters is made while respecting the “fundamental division” between charging and trading policy options. There is, however, a special mention to subsidization as a distinct form of economic incentive, which can either be applied as such or in parallel with charging or trading policies. The ultimate purpose of this study is to analyze the various economic incentive options as the preferable climate protection policy alternative for maritime shipping, to examine the present obstacles and alternative solutions for their global, regional, or national implementation and, lastly, to conclude by pointing out the future trends on this issue.

2 Policy instruments and climate change mitigation

The rising share of emissions from maritime shipping has led to policy design and diverse initiatives at many levels. Several options have been analyzed in theory as to identify the best approach to achieve the desirable reduction levels.

According to the traditional division of policy instruments for achieving climate protection objectives (Hahn and Stavins 1991), the first broad category of policy instruments includes “command and control” instruments, which set uniform targets to the industry on how much it should emit and further dictate the processes to be used, by providing little or no incentive or reward to meet the reduction target. The second category includes “economic incentives” or “market-based mechanisms”⁵ (hereinafter to be referred to as MBM), which grant to the industry greater autonomy in deciding how to meet the set of targets and provide it with incentives to search for cost-effective ways to meet them.

The “command and control” or regulatory instruments are very effective and easy to enforce as they are by nature compulsory. However, they have been criticized as being excessively rigid to encourage innovation or to provide continuous incentives to reduce pollution.⁶ Furthermore, the process of establishing technology-based regulation is often inordinately complex and time consuming as opposed to the application of economic incentive programs which overcome these problems with their apparent flexibility. The creation of ongoing incentives for the industry to design and invest in new and improved abatement technologies ensures that pollution control becomes cheaper and the information burden on regulators is reduced (Austin 1999).

Fees, levies, rebates, and subsidies are all economic mechanisms set by policy-makers to increase the costs of undesired actions and, at the same time, to reward desired actions (Corbett and Winebrake 2010). Each of these mechanisms is present in the international policy dialogue over maritime shipping and climate protection. However, it remains yet to be seen which is the best applicable strategy and the most suitable approach.

⁵ In their 2010 study on “The role of international policy in mitigating global shipping emissions,” Corbett J. and Winebrake J. refer to economic incentives as “guiding-hand” policies, as opposed to the “firm-hand” policies, representing the traditional command and control instruments.

⁶ However, according to Kuronen and Tapaninen (2010) in their *Evaluation of Maritime Safety Policy Instruments* “...many times the implementation of regulatory instruments adds to the costs and economic incentives may result from that.”

The challenge in this case is that for each circumstance, the choice of the preferred policy instruments is dictated by a variety of issues that pertain from the geographical area to be regulated, technological constraints, private interests, and political considerations (Kuronen and Tapaninen 2010). In turn, this means that policy reality is much more complex and nuanced than presumed under traditional theory (Driesen 1998).

At an IMO and UNFCCC level, a multiple approach to climate change mitigation is under consideration ranging from new design and operation metrics to carbon levies and emission trading markets (Corbett and Winebrake 2010). At the European Union (EU) level, a market-based approach is under consideration by adding the maritime industry to the EU emission trading system or by including ships in emission-related harbor dues and binding CO₂ index limits (Corbett and Winebrake 2010), whereas in California, the Global Warming Act of 2006 was recently enacted,⁷ which requires a reduction of GHG emissions from all sectors including ships in port and thus represents a more conventional “command and control” measure to its climate change mitigation approach.

Due to the fact that no applicable policy instrument can ever be viewed as a homogeneous product and each exists in a multitude of forms and variations, the term “economic incentives” can be as broad as to cover all incentives that either result in money savings for the maritime industry or result in getting financial support. Thus, market-based instruments are also included in this term as they offer to the industry the choice between increased operational costs and reduced CO₂ emissions from higher energy efficiency. For the purposes of this paper, the term “economic incentives” will follow the broader approach, so as to include both direct and indirect economic “rewards” for the maritime industry.

3 Economic incentives for the maritime industry

3.1 Addressing shipping emissions

According to a recent assessment of the Intergovernmental Panel on Climate Change “there are currently only a few cases of countries or ports introducing economic instruments to create incentives to reduce shipping emissions” (Ribeiro-Kahn et al. 2007).

However, as analyzed above,⁸ economic instruments are promoting climate-friendly performance by providing incentives for the maritime industry to go beyond regulatory requirements towards the use of the best available technology (European Commission 2002). They can serve as a complement to existing or planned obligatory measures to reduce shipping emissions. Thus, an increasing number of economic incentives have been introduced over recent years (mainly the last decade) in ports around the world in order to encourage the maritime industry to address its negative environmental impact.

⁷ About the landmark California Global Warming Solutions Act of 2006, see the California Climate Change Portal: <http://www.climatechange.ca.gov/>.

⁸ See: Section 2, Policy instruments and climate change mitigation.

However, few of these types of economic incentives are based on GHG emissions. They generally relate to the sulfur content of marine fuels, engine emissions of nitrogen oxide (NO_x) ship safety features, and quality management. In particular, NO_x emissions from ships have until now been one of the dominant policy drivers in both domestic and international policy action.

Even though NO_x is a greenhouse gas, it is commonly understood that effective climate protection measures should address the most potent greenhouse gas from international shipping, CO₂, and policy decisions should therefore shift their focus towards CO₂ emissions reduction (Buhaug et al. 2009).

The analysis of economic incentives in this study will focus on mechanisms, currently under consideration or already implemented, that either target GHG emissions directly (principally CO₂), or can be considered for future possible application for climate protection purposes.

3.2 Taxonomy of economic incentives

Due to the fact that many market-based approaches are very similar in nature (especially when dealing with “trading” and “charge” mechanisms), a taxonomy can only take into account their most basic form and characteristics, while at the same time recognizing that their numerous variations make alternative categorizations possible.

Market-based approaches are typically divided in two fundamental categories:

1. The *charging alternatives*, where the participants respond to a charge or price linked in some way to emissions (Harrison et al. 2004). This category includes (a) *environmental taxes, fees, or charges* (i.e., taxes on fuel or taxes on emissions), (b) *charges “en route,”* and (c) *environmentally differentiated port or fairway dues*.
2. The *trading alternatives*, where the participants trade “quantities” which represent either emissions or the right to emit. The emissions trading policy options that fall under this broad category are: the (a) *credit programs*, the (b) *benchmarking programs*, and (c) the *cap-and-trade programs*.

In the following chapters, these approaches will be analyzed on the basis of their general applicability to shipping emissions but also with regard to their potential implementation for climate protection (reduction of GHG emissions).

4 Charging alternatives

4.1 Environmental taxes, fees, or charges

The environmental taxes, fees, or charges represent prices for the discharge of pollutants into the environment, based on the quantity and/or quality of the pollutant(s) (Austin 1999). These fees are essentially different than most existing taxes, because they are not designed to raise revenue but to reduce emissions. Therefore, a redistribution of any receipts from the charges back to the operators is necessary, to ensure the environmental objective of the charge. In the shipping sector and with

regard to CO₂ emissions reduction, fuel and emission taxes appear to be the most relevant.

A tax on the purchase of fuel “at the point of sale” could be one potential method for reducing emissions from shipping, or, under an emissions tax, a charge for every ton of emissions could be imposed, at a rate specified by the regulator (Harrison et al. 2004). The rationale behind such an incentive method is that it aims to reduce the demand for fuel, which is typically responsible for marine-related air emissions, including CO₂, by imposing a tax on the fuel and increasing its price. The redistribution of revenues would reward operators who consume or emit less. For maximum effectiveness of an emissions tax, the charge would ideally be levied directly on the quantity of pollution emitted, although this can sometimes be difficult to measure or monitor. Therefore, a charge on a proxy for the emissions may be necessary (Austin 1999).

The main deficiency of this instrument is that a fuel tax is vulnerable to evasion. The operator of the ship can avoid the tax by taking fuel on board outside the taxed area. A similar approach to the “offshore bunker supply,” which is used as a current common practice for evading port fees or the loading limits imposed in some ports, could be adopted by the operators (Ribeiro-Kahn et al. 2007) and thus render the fee futile. A solution to this problem could be provided by an alternative tax calculated on the basis of the fuel usage of every vessel (Harrison et al. 2004).

The State of Washington (USA) is currently imposing an environmental fuel tax on marine fuels in order to promote the restoration of the state's waterways but is simultaneously applying a refund scheme⁹ for the use of non-dyed fuel. The disincentive for the purchase of dyed marine fuel is not restricted to only one state as several more states are currently applying similar refund schemes (American Boating Association 2012).¹⁰

4.2 Charges “en route”

Charges “en route” is a concept borrowed from the aviation sector,¹¹ where it has been applied for many years. It has been evaluated (Harrison et al. 2004) as being potentially applicable to maritime shipping and can be considered a subcategory of the environmental charges described above.

“En route” emission charges are calculated on the basis of the distance traveled by the vessel. The relevant authorities collect the charges and arrange for some sort of redistribution to the operators who adjust their activity in order to meet lower emission rates. The main difference with this scheme as compared to the environmental charges is that the charge is traditionally based on emission rates rather than measured emissions.

A CO₂-based “en route” charge could overcome the problem of charge evasion in shipping, provided that there is proper monitoring and that it is calculated according

⁹ For the Washington State's marine fuel tax refund, see: <http://www.dol.wa.gov/vehicleregistration/docs/BoatFuelTaxRefund.pdf>.

¹⁰ Namely: Alaska, California, Connecticut, Delaware, Massachusetts, Missouri, Nebraska, North Carolina, Texas, Virginia, Wyoming. Further information available at the American Boating Association website: <http://www.americanboating.org/>.

¹¹ For more info on the Eurocontrol “en route” charges cost-efficient recovery system, see: <http://www.eurocontrol.int/content/route-charges>.

to the carbon content of the actual fuel consumed on a single journey (Ribeiro-Kahn et al. 2007).

4.3 Environmentally differentiated port or fairway dues

According to this incentive program, differentiated dues obligations are applied to vessels on the basis of the quantity of their emissions. Port dues are set by individual ports and are applied to the visiting ships in exchange for port services, whereas fairway dues are usually set at a national or regional level, also in exchange for services (i.e., fairway maintenance) but applied to all ships navigating in affected national or regional waters (Harrison et al. 2004). The operators are incentivized to reduce the quantity of the relevant emissions that each system targets (usually SO₂ or NO_x), since the dues are structured to be charged in proportion to the emission level.

The difference between environmental fairway dues and the charges “en route” approach lies in the fact that the fairway dues apply only at the waters of a specified region, whereas the en route charges are calculated with regard to journey length and can target emissions from wider geographical areas.

Any differentiated dues system could also be applied for the reduction of CO₂ emissions from ships. However, this would require development of a standard system for CO₂ emissions indexing, which would award index points to different levels of emissions. Alternatively, the dues could be linked to a specific charging structure (Harrison et al. 2004).

Such economic instruments are key elements of the Nordic countries' environmental policy. Therefore, it comes as no surprise that Sweden was the first to introduce a system of environmentally differentiated shipping dues in January 1998 (European Commission 2001).

This scheme comprised a common target to reduce sulfur dioxide (SO₂) and NO_x ship emissions by 75 %. The maritime administrative authorities offered reduced fairway dues to those ships that qualified in accordance with the applicable certification and registration regime (Swahn 2002). The results from the application of this scheme were particularly encouraging as, after its first 18 months of application, nearly one third of ships calling annually at Swedish ports were registered in the program for continuous low-sulfur operation.

Another example of differentiated harbor dues applied by an individual port is the EcoAction program introduced by the Port of Vancouver, which promotes attainable emissions reduction goals for ocean-going vessels. Vessels may qualify for one of three levels of harbor due rates based on implementing one of the emission reduction options within a given category. The reduced rates are designed to provide a wide variety of technology and fuel options to vessels in order to promote and build awareness around a number of alternative emission reduction practices.¹²

Although presenting a number of advantages by providing an adequate level of incentive to the shipping industry and by reconciling differentiation with specially negotiated charges (Ribeiro-Kahn et al. 2007), the differentiated dues incentives may

¹² For more information on the so-called EcoAction Plan introduced by the port of Vancouver, see: <http://www.portmetrovancover.com/en/environment/initiatives/Air/EcoAction.aspx>.

also present a significant shortcoming for climate protection purposes, due to their geographically limited nature of application.

4.4 Similar differentiated dues programs

The implementation of similar differentiated dues programs is known in many ports.

4.4.1 *The Green Award*

A premium incentive based on port dues was introduced in 1994 by the Green Award Foundation, a neutral, non-profit, independent establishment following the cooperative efforts of the Rotterdam Municipal Port Management and the Dutch Ministry of Transport.¹³ Based on a series of strict environmental requirements, the Green Award grants certification¹⁴ to “extra clean, extra safe seagoing vessels, which are more than welcome in any seaport.”¹⁵ Hence, it induces financial profit for the ship owners involved, by creating market preference for quality and environmentally friendly tonnage. Additionally, the ports participating in its scheme offer a considerable reduction on port dues (10 % discount on average) to the certified visiting vessels. Other participating incentive providers such as government institutions, banks, and marine service providers grant savings to vessels with a Green Award certificate.

Many ports in Europe (Belgium, Latvia, Lithuania, the Netherlands, Portugal), America (Canada), South Africa, and New Zealand have up to now joined the Green Award scheme. The increasing number of participating ports as well as the numerous private companies of the Green Award incentive scheme has to a great extent contributed to rendering above-standard ship operation more attractive from an economic viewpoint.¹⁶

Even though the Green Award's certification requirements address a variety of environmental and safety awareness criteria including crew and operational and managerial elements, a specific effort has been made to focus on stricter requirements on air pollution issues. Therefore, the most recent update of the Green Award requirements covers the MARPOL NO_x emission limits¹⁷ as well as the monitoring of ship exhaust emissions¹⁸ (and use of these data to set targets for improvement). Within the latter requirements' revision, a CO₂ emissions monitoring system is

¹³ Since 1 January 2000, the Foundation has been completely independent from the Port of Rotterdam.

¹⁴ This certificate is subject to annual verification and is valid for 3 years. The certification scheme is open to oil tankers and dry bulk carriers from 20,000 deadweight tonnage and upwards, liquefied natural gas carriers, and inland navigation vessels.

¹⁵ More information on the Green Award certification scheme and its requirements can be found in: www.greenaward.org.

¹⁶ The Green Award Foundation started in the year 2011 with a balance of 240 certified vessels.

¹⁷ The “International Convention on the Prevention of Pollution from Ships” or else MARPOL 73/78 was amended in September 1997 with the “1997 Protocol,” including Annex VI (which entered into force in May 2005). Limits to NO_x and SO₂ emissions from ship exhausts were set within this Annex, including caps on sulfur content of fuel oil, NO_x emission limits for diesel engines with either global applicability or only in NO_x Emission Controlled Areas. The clause of the Annex on NO_x abatement was aiming to ensure that engine design for low NO_x can achieve the standards. By 2008, Annex VI was ratified by 53 countries representing 81.88 % of tonnage.

¹⁸ Emissions measuring systems which provide for continuous confirmation of compliance with the regulations from ship operators and manufacturers

introduced as a mandatory requirement for certification and therefore provides an economic incentive for ship operators in relation to climate protection.

According to the new air emission requirements, effective as of 1 September 2011, ship owners are encouraged to establish the current emission level of the ship (the “baseline” level) and then reduce their emissions below this level, or generally reduce the overall fuel consumption of the vessel.¹⁹ For the reduction assessment, the Green Award promoted methods relating to a ship's energy efficiency and deemed the introduction of a specific Ship Energy Efficiency Management Plan to be necessary. The participation to the Environmental Ship Index (ESI)²⁰ from the World Ports Climate Initiative is now compulsory for all the Green Award certified vessels, and the use of the IMO guidelines on energy efficiency measures²¹ is particularly encouraged. Notably, ships that score higher than the ESI index gain additional incentives (further discounts and reduced prices for marine services) at all ESI participating ports.²²

4.4.2 *The Green Shipping bonus and the port of Hamburg's environmental discount*

The Green Shipping bonus was introduced by the Port of Hamburg in 2001 and offered a rebate on port dues to ships depending on their environmental performance, including their emissions' level (SO₂) (European Commission 2002). This program was discontinued in 2003 after the claims of Hamburg's Senate that there was no more need for action regarding the environmental compatibility of shipping. Following recent calls requesting the port's return to an effective scheme contributing to a greener shipping industry, the Hamburg Port Authority (HPA) joined a scheme offering cheaper tonnage dues through discounts of up to 10 % to vessels, based on the ESI which bases its ratings on CO₂, NO_x, and SO₂ ship emissions.²³ The scheme entered into force on 1 July 2011.

4.4.3 *The example of Norway*

The Nordic states have taken the lead in terms of state application of economic instruments to shipping. For many years, Norway has had a differentiated charging scheme targeting the maritime industry and taking into account a wide range of environmental and safety-related considerations. More specifically, the Norwegian environmental differentiated tonnage tax²⁴ has been successful in its application so

¹⁹ Green Award Foundation (2011) *Green award air emission requirements (oil tanker version 11 & bulk carrier version 11)*. Available at: <http://www.greenaward.org/file.php?id=256&hash=ddf81879b0c56f1d7e3cd8c775d1dfca>

²⁰ The ESI is a combined effort of ports to promote the reduction of harmful air emissions (NO_x, SO_x, and PM) and greenhouse gases (CO₂). The Green Award is promoting and supporting this new concept by integrating it into the mandatory requirements for certification.

²¹ Adopted as mandatory for all parties to MARPOL Annex VI on 15 July 2011: <http://www.imo.org/MediaCentre/PressBriefings/Pages/42-mepc-ghg.aspx>

²² For further information on the ESI, see: <http://wpci-esi.org/Public/Home>.

²³ Further information on the Port of Hamburg's Environmental Discount can be found on the HPA's webpage: <http://www.hamburg-port-authority.de/en/press-contact/report/172-green-port-fees-hpa-to-introduce-environmental-discount-in-july.html>.

²⁴ For the guidelines of the NO_x tax of the Norwegian Maritime Directorate: <http://www.sjofartsdir.no/upload/Fart%C3%B8y%20og%20sj%C3%B8folk/Nox-avgiften/Guideline%20on%20NOx%20rev%2011.pdf>

far.²⁵ However, when it comes to climate protection, its main deficiency is that it addresses only NO_x emissions and the fact that it applies merely to Norwegian flagged vessels, including those on the Norwegian International Ship Register (European Commission 2002).

Whilst the Norwegian tonnage tax is aiming at NO_x mitigation, the Norwegian Green Tax Commission and the National Maritime Directorate have studied and proposed a number of environmental differentiated tax measures aiming at reducing discharges or emissions of significant pollutants, including CO₂ (European Commission 2002). Nonetheless, one of Norway's major contributions to GHG mitigation from maritime shipping came a few years ago, in the form of a proposal²⁶ submitted to the MEPC 56 in June 2007. The proposal put forward a Global Emission GHG Reduction Scheme, which is currently under consideration for adoption on an IMO level,²⁷ as a market-based mechanism (trading alternative).²⁸

4.4.4 International chamber of shipping and the environmental compensation fund proposal

Representing more than 80 % of the world's merchant fleet, the International Chamber of Shipping (ICS), while reflecting the views of the global shipping industry, recently expressed²⁹ the preference of the ship owners over a proposed environmental compensation fund administered by the IMO, instead of the adoption of a maritime emissions trading scheme if an MBM is ultimately decided to be implemented in shipping. According to the proposal, the fund would be financed by bunker levies and thus function as some form of tax system where the monies raised would be directed towards climate protection purposes as well as preparedness for the negative effects of climate change, especially in connection to developing countries' projects.³⁰

5 Trading alternatives

Trading policy options operate in markets for emissions reductions. The basic principle governing all the presented trading programs is that the value of the emissions reductions available to trade is determined by market forces and cost transparency (Shipping Emissions Abatement and Trading 2005). In contrast to standards, emissions' trading does not prescribe the way in which a sector should

²⁵ In force since January 2000: <http://www.cefor.no/news/Sjofartsdirektoratet/mdiff%28e%29.pdf>

²⁶ For the working details of Norway's Proposal, see: http://imers.org/files/docs/MEPC_56_4_9_country_prep.pdf.

²⁷ See below: Section 5.4.1, Proposal by Norway: global emission trading system for international shipping.

²⁸ The proposal's idea is that the IMO should set a cap on the total CO₂ emissions from international shipping and agree on the size of a charge on all such emissions. A fund under the IMO should be established and to which the charge should be paid. The revenue should be used for maritime industry GHG improvements, for CO₂ credits purchase in the emissions trading markets, and for climate change adaptation in developing countries.

²⁹ The proposal was made by the ICS Director of External Relations Mr. Simon Bennett, during the UNCTAD meeting in Geneva, held from 29 to 30 September 2011.

³⁰ Example: for adaptation purposes of ports to the effects of rising sea levels

respond to an incentive to lower emissions. Hence, the shipping sector can use a variety of means to reduce emissions.³¹ Within the market, the emitters are permitted and incentivized to pursue the most cost-effective emission reduction strategies.

5.1 Credit programs

Credit-based trading programs provide tradable “credits” to operators of industry operators that manage to reduce their emissions below their “business as usual” level (Harrison et al. 2004). These programs usually exist as an extension of a cap-and-trade program, allowing operators from other sectors not covered by regulation to join an existing trading program. Therefore, the participation to these programs is typically voluntary in nature.

The KP permits the establishment of a similar voluntary instrument designed to control GHG emissions in sectors and countries not covered by the Protocol. This scheme has been used by a number of industries in the USA (Shipping Emissions Abatement and Trading 2005).

GHG shipping emissions could be addressed by a credit-based program by allowing vessels to opt-in to an existing scheme by generating emissions reduction credits. An example of such a program could be provided by the DEMO project; however, it addresses only NO_x and SO₂ emissions reduction credits.³²

The European Commission has initiated this project via its DG Environment, based on requests to explore the possibilities of monitoring and verifying emissions at sea. The project is a proposal from the Swedish Shipowners' Association and refers to an EU-wide emission trading system of NO_x and SO₂, including shipping. According to the system, which is entirely voluntary, the ship owners have the possibility of refunds (environmental differentiated reimbursements on harbor and fairway dues) on emission reduction investments by selling credits to other emitters.

5.2 Benchmarking programs

Benchmark trading programs (or offsetting schemes) require that the average emission level from the covered activities should not exceed a certain level (the “benchmark” level) while setting a specific emissions rate applicable to these activities (Harrison et al. 2004). These programs usually set a legislative limit requirement, as opposed to the voluntary nature of most credit-based programs and are often implemented as precursors to a full trading scheme (Shipping Emissions Abatement and Trading 2005). The flexibility of these programs allows emitters who can reduce their emissions at lower costs to trade with emitters who would require expensive measures to reduce their emissions. Offsetting has been heavily promoted by the UK government, the EU,³³ and the UN as a painless way of reducing global emissions.

³¹ These means range from ship-based efficiency improvements, different logistics, a different geography of production, reduction of demand, and offsets from other sectors.

³² For information on the scope of the DEMO project: <http://www.pwc.com/se/sv/demoproject/challenges0223.jhtml>

³³ The global carbon offset market is dominated by the European Union, where companies that emit GHG are required to cut their emissions or buy pollution allowances or carbon credits (cap-and-trade mandatory system) from the market, under the European Emission Trading Scheme (EU ETS).

However, it remains highly likely that emitters may continue on a high-carbon path, by choosing to buy cheap permits rather than invest in low-carbon infrastructure (Despines et al. 2009).

A possible application of a benchmarking program for the purposes of GHG emissions reduction from maritime shipping could require that each vessel either reduces its average emissions and reaches the benchmark rate or purchases rights from other ship owners whose vessels have achieved emissions rates below the benchmark level (Harrison et al. 2004).

A carbon offset option as an individual project action was introduced in June 2011 on the initiative of the International Maritime Services, a ship delivery company based in Western Australia, in collaboration with the Yacht Carbon Offset.³⁴ Under this program, the GHG from the fuel burned by participating vessels will be counter-balanced by equivalent emissions reductions from verified green energy projects.

5.3 Cap-and-trade programs

A cap-and-trade program creates a total number of emissions allowances and thus sets an aggregate cap on emissions. Each allowance is allocated to the emitters once the cap is established by regulators. The allowance offers to its owner the right to emit a unit³⁵ of emissions, and every emitter covered by the program must hold allowances to cover their actual emissions. Within the cap, every emitter is free to trade (either buy or sell) allowances and thus allow their own emissions level to be covered (Shipping Emissions Abatement and Trading 2005). As expected, for some emitters, it appears to be more cost-effective to invest in emission reduction technologies than to purchase allowances. Conversely, if it appears more cost effective to purchase units than to reduce emissions, the emitter will offset emissions rather than reduce them. However, this emissions trading scheme (ETS) will eventually provide an economic incentive for the emitters towards lower emissions targets.

Cap-and-trade programs are the most common GHG reduction MBM in operation. The EU-ETS³⁶ probably represents the most prominent example for the use of MBM. Under this EU-wide scheme, in an attempt to meet with the KP obligations, the EU Member States are permitted to trade CO₂ emission credits between themselves.

Cap-and-trade programs could equally be applied to the maritime shipping context. A global, regional, or national cap could be set for overall CO₂ emissions from shipping; ships would be required to hold allowances in order to cover their total

³⁴ For more details on this initiative, see: <http://www.inationalmaritime.com/news.php> and <http://www.yachtcarbonoffset.com/index.html>.

³⁵ For trading purposes, one allowance or certified emissions reduction is equivalent to 1 metric tonne of CO₂ emissions.

³⁶ “Born” in January 2005, the EU-ETS aims at GHG emission reductions from six sectors of heavy industry: production of steel, electricity, cement, pulp, paper, and glass. According to the EU-ETS, large emitters of CO₂ within the EU must monitor and annually report their emissions as they cannot exceed a certain quota of CO₂ per year. They are also obliged to return an amount of the emission allowances allocated to them through a national (not centralized) allocation system. Apart from the initial allocation, the emitters are allowed to trade EU or other international emission credits. Selling emission credits is possible provided that they successfully reached reduced carbon emission levels during their operations. The EU-ETS is designed in a way that ensures the operators’ participation in the market without excessive or unnecessary government intervention.

emissions, and the ship owners would be free to trade allowances (Harrison et al. 2004).

One of the great advantages of the cap-and-trade scheme is that unlike credit-based and benchmark programs, it addresses total emissions and not only emission rates. However, the effectiveness of this type of ETS for generating tangible reductions in GHG emissions has been criticized, especially if such a scheme is applied only at national or regional level (Moffat 2010). The importance of a global cap-and-trade scheme is therefore particularly critical for climate change mitigation.

Likewise, the problem is apparent in the maritime sector. Under the cap-and-trade system, the IMO has designed an initial proposal for a Maritime Emissions Trading Scheme (METS), (Buhaug et al. 2009) which would have global implementation. Several alternative submissions were proposed to the IMO's Marine Environment (MEPC) at its 60th session for METS alternatives which were subsequently evaluated by the Expert Group on Feasibility Study and Impact Assessment of possible MBM (the Expert Group), as to the extent to which these MBMs could assist in reducing GHG emissions from international shipping (International Maritime Organization 2011). After this evaluation, the IMO called for further development of these proposals along with the inclusion of an evaluation of policy considerations such as international harmonization in implementation, carbon leakage, fraud, and traffic of vessels between non-party states (International Maritime Organization 2010). During the following MEPC meetings (MEPC 61, 62, and 63), further elements were added to the initial proposals submitted, and further impact assessments were decided to be conducted with regard to the introduction of an MBM for international shipping and its impact on developing countries.

An analysis follows on the METS proposal by the IMO as well as the three cap-and-trade MBM alternative proposals submitted to MEPC 60 and MEPC 61, currently under consideration by the IMO (from Norway, the UK, and France). Following the review of these cap-and-trade proposals, a special mention will be made to the proposal submitted to MEPC 61 by the USA, which provides for an example of a combination of technical standards and the first two trading alternatives mentioned above (credit-based and benchmarking systems).

5.4 IMO maritime emissions trading scheme

The cap-and-trade scheme proposed by the IMO would have a global scope and include CO₂ emissions from all ships above a certain threshold. According to the scheme, a cap on global maritime emissions would be set, probably based on an absolute emissions reduction target. The trading of permits would be allowed not only for the ships within this scheme, but would be open for trading with other ETSs, in order to allow the trade of allowances from sectors with different business cycles. Thus, it would allow the shipping sector to benefit from an overall emissions reduction at a lower price.

Under this scheme, the monitoring, reporting of emissions, and acquiring and surrendering of allowances would be made by the "ship" as the responsible entity that would also be held liable in case of non-compliance (Buhaug et al. 2009). Ships would also have to monitor their fuel consumption in a way that is verifiable. An annual report and surrender of allowances would be made by the responsible entity

(in practice: the ship operator, the charterer, or the consignee) to the Flag State, whereas every Port State would be able to inspect whether the visiting ship has surrendered allowances. In order to provide all vessels with the possibility to participate in the scheme, it allows vessels registered in non-party states to surrender their allowances either to another entity or to a party state.

Permits could be auctioned, sold, or allocated freely according to the individual ship's benchmarks (Moffat 2010). If permits are to be auctioned, an administrative body should be set up to manage the fund generated by the auction. The proceeds of the auction could be used to finance the shipping sector's R&D or for the support of developing countries' adaptation (Buhaug et al. 2009).

The IMO METS has been evaluated as a cost-effective policy instrument with high-level environmental effectiveness (Buhaug et al. 2009). This is because it is designed for global implementation and, therefore, has the largest amount of emissions within its scope.³⁷ It also has the additional benefit that it promotes the offset of emissions in other sectors. Ultimately, it allows actors to find the optimal abatement level.

5.4.1 Proposal by Norway: Global Emission Trading System for international shipping

The submission of Norway to MEPC 60³⁸ proposed a Global Emission Trading System for international shipping that would set a sector-wide cap on net CO₂ emissions resulting from the use of fossil fuel by international trade ships above a certain size threshold (Norwegian Ministry of Environment 2011). Similarly to the IMO's METS described above,³⁹ survey and certification would rely on the Flag State and inspection of surrendered allowances to the Port State. A target year (commitment period) would also be part of the system within which the ships would have to acquire and surrender emission allowances. The amount of allowances will have to correspond to their CO₂ emissions. A number of allowances (ship emission units) would be released into the market each year, via a global auctioning process. Ships and ship operators would have access to other ETS credits in an open global system (International Maritime Organization 2011).

The proposal indicates the establishment of a fund by the auctioning of emission allowances which will be under the control of the parties to the scheme and which can be used for (a) maritime industry GHG improvements, (b) climate change adaptation in developing countries, and (c) technical cooperation activities under the IMO (Kågeson 2008).

The proposal also acknowledges the burden that such a scheme could impose on the developing countries and includes an exemption clause voyages to Small Island Developing States or for the Least Developed Countries. However, such exemptions should be adopted after a lot of consideration as not to lead to carbon leakage and/or distortion of competition (Moffat 2010).

³⁷ All ships can, in principle, be covered by the METS.

³⁸ Submission by Norway (MEPC 60/4/22)

³⁹ See above: Section 5.4, IMO maritime emissions trading scheme.

By responding to the need for precise CO₂ emission control from international shipping, the Global Emission Trading System proposed by Norway establishes a cap on total emissions from the sector and leaves to the ship industry the option to follow the most cost-effective emission reduction measures in order to meet the cap. In other words, an invested capital by the ship owners can correspond to gradually more emission reductions and, consequently, more cost savings.⁴⁰ Furthermore, the proposed global system is in accordance to the principles of the IMO and provides for a fund to assist developing countries in their needs with regard to addressing climate change (Norwegian Ministry of Environment 2011).

5.4.2 Proposal by the UK

In MEPC 60, the UK submitted a proposal⁴¹ for a global emissions trading scheme for international shipping. According to this scheme, a global cap for the sector would be agreed, and a fixed quantity of allowances would be created based on the cap and then auctioned to ship operators (International Maritime Organization 2010). This ETS would be linked to the global carbon market, so that allowances from other sectors could be bought into account for maritime shipping emissions.

The design of this system differs from the traditional cap-and-trade programs in that it introduces a “long-term declining emissions trajectory” (International Maritime Organization 2011). Its structure includes special trading time phases that would comprise shorter compliance periods. During these phases, the parties to the scheme would have the opportunity to reassess whether the initial cap has been set correctly and evaluate the progress made in GHG emissions reduction (International Maritime Organization 2010).

More specifically, in the first transitional phase, the ship operators⁴² would have the time to familiarize themselves with the various new regulations, gather the necessary data, and set clear and accurate emissions baselines. After this initial phase, the ship operators would have to monitor their emissions by keeping records of their fuel purchases throughout each compliance period, report these emissions, and surrender adequate allowances to account for these emissions. These would be necessary requirements for maintaining a valid “Greenhouse Gas Certificate” for each compliance period.

The main benefits of the UK's proposal are that it defines an overall global cap on net emissions from international shipping to be agreed through UNFCCC, IMO, or both, but at the same time includes exemptions for voyages involving “the most vulnerable countries.” It provides the shipping industry with an element of certainty due to the inclusion of a transitional phase and its long-term trajectory, allowing the reassessment of the cap initially set (International Maritime Organization 2010). At the same time, the proposal gives the scheme great flexibility by permitting a link

⁴⁰ International Maritime Organization (2009) *Control of greenhouse gas emissions from ships engaged in international trade*. Position note of the IMO on the Eighth Session of the United Nations Climate Change Conference (AWG-LCA 8), p. 35.

⁴¹ Submission by the UK (MEPC 60/4/41)

⁴² The ship operators are the legally responsible entity under this scheme. The point of obligation would be individual vessels, and they would be identified by their IMO number.

with other ETSs. Finally, it enables emissions reductions to take place with the lowest costs for the industry.

One of its main deficiencies is that it does not provide for the use of the proceeds generated from the auctioning of allowances for mitigation, adaptation, or R&D purposes for shipping. However, following relevant decisions of national governments, these proceeds could be made available for the above-mentioned purposes under Climate Action Funds.⁴³

5.4.3 Proposal by France

The submission of France to MEPC 60⁴⁴ developed a global ETS very similar to the one proposed by Norway. This sector-wide system would be applicable to all ships above a certain threshold, regardless of their flag. The cap would determine the number of allowance units to be auctioned, and this would equally be an open system allowing the ships to use units from other carbon markets.⁴⁵ In this system, the ship operators would monitor emissions based on bunkered fuel, and the legally responsible entity would be the shipping company as identified in SOLAS regulation (International Maritime Organization 2010). Real-time access to information⁴⁶ on a ship's account would facilitate the Port State's control.

Complementing the Norwegian proposal, the French submission elaborates on some elements regarding the auctioning of the allowances and how this could be performed more effectively by ensuring a uniform price for the shipping CO₂ units. More specifically, it proposes a single international auctioning platform with frequent auctions where the bid size allowed would be limited. Small-ship operators would be encouraged to participate in non-competitive “auction windows” where small lots of units would be traded at a fixed price.⁴⁷

France's proposal could provide several benefits including high auction efficiency, prevention of market manipulation due to the frequency of auctions and the limited bid size, and incentives for participation to small-ship operators through the non-competitive auction options. The liquidity of the market (and avoidance of speculation) is ensured due to strict market regulation and the restriction of participation in the system only to the actors deemed “appropriate” (International Maritime Organization 2010), a term that has yet to be determined.

However, enforcement problems could accrue from the system due to the fact that no inquiry or injunction powers are suggested for the system's administrator who would probably have to rely on national authorities for enforcement measures (Moffat 2010).

⁴³ The Climate Action Plans refer to a set of financing strategies (funds, grants) available from governments or non-governmental organizations regarding climate protection aiming to engage the stakeholders in GHG emissions reduction-related action.

⁴⁴ Submission by France (MEPC 60/4/41)

⁴⁵ In particular Clean Development Mechanism credits

⁴⁶ Referring to: CO₂ unit deposits, withdrawals corresponding to bunkering actions, balance

⁴⁷ This would be the price paid at the most recent competitive auction.

5.4.4 Proposal by the USA to the IMO: Ship Efficiency and Credit Trading

The US proposal⁴⁸ makes use of both technical standards and MBM by combining a benchmark (baseline) and a credit ETS, applicable only to international shipping (Samulski 2011). Under Ship Efficiency and Credit Trading (SECT), all ships (including the existing fleet) would be subject to mandatory energy efficiency standards, the level of which would be dependent on energy efficiency technology and methods available. Consequently, the standards would become more stringent in time by following state-of-the-art standards and introductions of new technologies to the sector (International Maritime Organization 2009). The assessment of the efficiency standards would be made in accordance with an established baseline.

By recognizing the fact that not all ships will be in a position to meet the efficiency standards, the proposal adds an efficiency credit trading program to the system in order to allow the shipping industry to achieve reductions at the lowest possible cost. Within a specified compliance period, the more efficient ships would earn tradable positive efficiency credits, unlike ships operating less efficiently, which would have the option to purchase efficiency credits to comply with the imposed standards. The supervision of the scheme would lie with the IMO, and it would be operated through an independent body. Flag and Port State controls would ensure the validation of reports, the certification of compliance with the efficiency credit requirements (Moffat 2010), and the enforcement of the ETS consistently with MARPOL Annex VI obligations (International Maritime Organization 2011).

The US MBM approach intended to maximize in-sector efficiency improvements and chose not to include an offsetting credits system from outside the maritime sector. A pragmatic and cost-effective solution is proposed by combining efficiency standards with efficiency trading. This solution would allow a gradual improvement of the energy efficiency of the participating ships (of various types and sizes) by using a model of clearly defined and mandatory efficiency benchmarks. These improvements are expected to result in cost savings due to lower fuel consumption, and they would be produced at a faster pace than normal fleet turnover rates (Samulski 2011). Apart from the fuel savings advantage, the ability to sell efficiency credits is very likely to subsequently increase the value of more efficient ships. Therefore, SECT provides ship owners, operators, and charterers with a clear incentive to increase the efficiency of their vessels beyond their “business as usual.” The reduction of GHG emissions would be achieved while saving money in reduced fuel costs and ensuring long-term sustainability of international shipping (Samulski 2011).

6 Subsidization

A special form of financial incentive with regard to ship emissions can also be provided by subsidies granted by governments or other authorities. A subsidy program can be used to reward the reduction of discharges, whereas the charges or taxes are mainly focused on penalties (Austin 1999). The subsidies can take the form

⁴⁸ Submission by the USA (60/4/12)

of grants or soft loans flowing from the government or maritime authorities to the industry, by aiming to meet all or part of the costs linked to GHG emissions reduction. They can either be applied as separate single measures or in parallel with charging or trading incentives (Harrison et al. 2004), such as through buying CO₂ credits (trading alternative) or as an additional incentive to applied differentiated CO₂ taxes or charges (charging alternative).

A current example of applied maritime subsidies in connection with GHG emissions reduction is provided by Transport Canada under its Freight Technology Incentives Program.⁴⁹ The goal is to reduce fuel consumption to lower GHG emissions and the main air pollutants resulting from container handling activities. The results showed a 43 % reduction in GHG and a significant reduction of other air pollutants.⁵⁰

Furthermore, the Swedish Maritime Authority has provided one more example of funding for NO_x abatement technology equipment. The subsidy incentive was offered to all ships calling at Swedish ports. Under this program, a restitution from paid fairway dues was granted to the shipping companies, regardless of the ship's nationality, in order to cover 40 % of the costs for the equipment installation (European Commission 2001). The investment subsidy took the form of a refund for both the year of installation and the four following years.⁵¹

Similarly to the Swedish Maritime Authority's system, the adoption of a refund-subsidy system for GHG reduction could incentivize the installation of carbon abatement technologies on ships enabling them to operate with substantially reduced CO₂ emissions.

7 Issues of global, regional, and national implementation

7.1 Global maritime shipping emissions

To date, the majority of global GHG shipping emissions are unregulated, due to the lack of a regulation scheme by either the IMO or by the UNFCCC. Furthermore, international bunker fuel emissions have been excluded by the KP commitments. Consequently, discussions about emissions regulation from the maritime shipping sector at an international level could continue without any formal guidance or deadline (Heitmann and Khalilian 2010).

The global nature of the maritime sector justifies the fact that a significant part of the emissions takes place on the high seas, outside of the jurisdiction of any country. Therefore, unless they are giving effect to international rules and standards, ships are not bound by national regulations concerning their design, construction, or equipment.⁵²

⁴⁹ For further information on the Freight Technology Incentives Program of Transport Canada, see: <http://www.tc.gc.ca/eng/programs/environment-ecofreight-about-programincentive-366.htm>.

⁵⁰ 43 % in GHG, 87 % reduction in hydrocarbons, 47 % in carbon monoxide, 64 % in nitrogen oxides (NO_x), 43 % in sulfur dioxide (SO₂), and 80 % in suspended particulate emissions

⁵¹ The program was applied until January 2002.

⁵² Evidently referring to states other than the Flag State

Moreover, the multinational character of transporting ships causes additional problems for the introduction of GHG reduction regulation on a broader level. Limiting “free riders” who could, in one way or another, succeed in evading regional emissions regulation is essential and can only be achieved with a global approach to maritime shipping emissions regulation (Heitmann and Khalilian 2010).

7.1.1 *The role of IMO*

The IMO, as the highest supervisory body for international shipping, is the authority best placed to set standards for the environmental performance of ships. In 1999, the MEPC of the IMO commissioned the first study for the mitigation of GHG emissions from ships, in order to examine the best feasible means to address the issue, either by way of current technologies, technical and operational alternatives, or MBM approaches. In a highly competitive market, and given the established cooperation of Annex I and non-Annex I countries of the UNFCCC, the IMO should be the primary instigator for effective GHG reduction commitments. Furthermore, real economic incentives for the ship owners to invest in low-polluting ships or in environmentally friendly equipment could only be achieved if the IMO would introduce relevant rules and would secure their homogenous implementation (Michaelowa and Krause 2000).

Regarding the eventual adoption of an IMO METS, one of the main obstacles so far for the adoption of the scheme was the lack of its wide acceptance by all the negotiating delegations during the MEPC meetings. Many countries⁵³ sought concessions before signing up to any proposed measures, especially in the view of the scheme's aim to be binding and equally applicable to all Flag States. The principle of “common but differentiated responsibilities” of the KP and its requested (by some states) application to the shipping sector has led to political polarization and, unfortunately, to the negotiations' stagnation. During the latest MEPC meeting⁵⁴ (64th session), it was decided to postpone any detailed discussion over an eventual MBM adoption under the auspices of the IMO, and with the next MEPC meeting not scheduled until July 2013, it remains unclear when or whether an IMO METS will ultimately be agreed upon. However, one of the positive developments of MEPC 64 on this issue was the inclusion in the next MEPC meeting's agenda of a detailed discussion on the methodology and criteria to be used in a comprehensive impact assessment that is planned to evaluate the impacts on consumers and industry in the developing countries from the possible introduction of an MBM for international shipping.

Moreover, questions as to how fast, how far, and how wide to go with regard to CO₂ emissions have caused further tensions within the IMO, thus hindering even more the progress of the negotiations. Several countries and country groupings have suggested unilateral action, and the EU explicitly warned against a unilateral inclusion of maritime CO₂ emissions from vessels calling at its ports within the EU-ETS (Crist 2009; Corbett and Winebrake 2010) if the progress of the IMO discussion is unsatisfactory.

⁵³ Among others: China, Brazil, Saudi Arabia, South Africa

⁵⁴ The MEPC 64th session took place from 1 to 5 October 2012.

7.1.2 Side effects to a global cap-and-trade system and alternative scenarios

Multiple difficulties are present with regard to the inclusion of maritime emissions within a global cap-and-trade system. *Carbon leakage* is a critical issue to be addressed in case of global application of one of the proposed MBMs under the IMO.⁵⁵ Carbon leakage is defined as the increase in emissions outside a region as a direct result of the policy to cap emissions in this region. Carbon leakage means that the domestic climate mitigation policy is less effective and more costly in containing emission levels, a legitimate concern for policy makers (Reinaud 2008).

Consequently, if an MBM for shipping is introduced internationally, the sector would become more costly, and trade may move to other modes of transport (rail, road, inland waters) (Miola et al. 2011). The increased shipping costs would gradually be passed onto the consumers, and globally, the overall GHG emissions would not only be reduced but increased due to their transfer to other carbon-intensive modes of transport. In fact, carbon leakage works against the objectives of the UNFCCC and the KP. The problem could be resolved if international trade transportation would be viewed and regulated jointly as one sector (Moffat 2010).

As international trade also falls under the jurisdiction of the World Trade Organization (WTO), global emission reduction measures or the implementation of a global METS could hinder market access or provoke an issue of discrimination against foreign products (products emanating from countries non-parties to the convention) (Heitmann and Khalilian 2010). However, this appears to be unlikely, as no violation of the WTO rules from the application of any of the past IMO environmental and safety conventions has been evidenced to date.

Lastly, with regard to a cap-and-trade system with global coverage, this cannot be realized without the full support from the developing countries (non-Annex I, UNFCCC). In the hypothetical scenario of absence of support for a global system, three possible stages of development for the gradual implementation of such a scheme have been envisaged (Kågeson 2008):

- Stage 1. The scheme would be open to voluntary participation by states and ports.
- Stage 2. The scheme would cover the traffic of all ports of Annex I states where other states would also be invited to participate.^{56,57}
- Stage 3. The global scheme would cover traffic in all ports.

Throughout all the stages, the scheme would have to be developed and implemented by the IMO.

7.2 Regional actions

Despite being regarded as far from optimal solutions and even though they have not yet been discussed within the IMO, regional actions to address GHG emission

⁵⁵ See above Section 5.4 (proposals 1, 2, 3, and 4).

⁵⁶ The scheme in this case should be designed as flexible as to facilitate the entry of new participants and the adjustment of the cap accordingly.

⁵⁷ The ports of the non-Annex I countries would not have to participate and would not be affected by the scheme, as the port state control would only take place in Annex I countries.

reductions have been regarded as possible future options (Crist 2009). Some of the suggested options include: (1) the precedent of the regional action over low-sulfur emission areas operating under the IMO framework, which could similarly impose a low CO₂ emission-designated area under an analogous IMO framework; (2) the possibility for regional CO₂-differentiated harbor dues⁵⁸; (3) some form of regional CO₂-based emission charge; or (4) a regional cap-and-trade scheme, where the ships calling at participating ports of the world would be made liable for their emissions based on their real fuel consumption. This would allow additional coverage of emissions from voyages outside of the participating country or region and thus enlarge the geographical scope of the scheme (Kågeson 2008).

7.3 National ports

National ports have an important role with regard to environmental policies. They are in the best position to differentiate environmental port dues. Conversely, they can also promote incentives for low-energy-efficient ships and attract traffic, especially if other neighboring ports have introduced similar differentiated fees (Michaelowa and Krause 2000). However, there are many examples of ports and countries that promote quality shipping while following international market trends.⁵⁹ Nevertheless, the same examples proved that measures with a limited geographical scope (port-wide or nation-wide) do not provide for sufficient incentives for the introduction of climate-friendly technologies to maritime shipping. Only an international network of similar programs could result in satisfactory GHG emissions reduction figures.

8 Conclusion

As a purely global sector, maritime shipping plays a substantial role in the debates of policy makers over climate protection and energy efficiency. Due to the international GHG reduction commitments, a number of relevant changes and pertinent adjustments are expected to be introduced for the industry over the coming years.

With a view to the ultimate objective of the UNFCCC, to achieve “stabilization of GHG concentrations at a level that prevents dangerous interference in the global climate system,” the IMO has been looking for an applicable and comprehensive international regime able to deliver real emission reductions from international shipping. A working plan, including technical and regulatory action, is culminating. The first mandatory measures will come into effect in January 2013,⁶⁰ but it is still hard to say when an MBM will follow and what structure and form it will take.⁶¹

⁵⁸ See above Section 4.3, Environmental differentiated port and fairway dues.

⁵⁹ The Netherlands, Sweden, Norway, Finland, to name a few

⁶⁰ The new regulations involving technical and operational measures will require the use of an Energy Efficiency Design Index for new ships, stipulating a specific level of energy efficiency to be attained, and a Ship Energy Efficiency Management Plan for all ships.

⁶¹ According to the Second IMO GHG Study 2009 (Buhaug et al. 2009), it was recognized that, in view of the growth projections of human population and world trade, MBM were needed to be considered, as technical and operational measures alone would be insufficient for the regulation of GHG emissions.

The maritime industry is advocating international standards, preferably uniform ones, under the auspices of IMO and the UNFCCC, and government bodies and national authorities continue to pursue nation-wide mandatory measures, in order to draw a veil over the current absence of international regulation and address the urgent climate protection issue unilaterally. These approaches have proven to be insufficient for the global shipping sector, where a multilateral consensus for effective regulation is necessary. To achieve this, international organizations and national stakeholders are taking one step at a time by constantly evaluating and gradually introducing economic incentive measures. Experience from existing measures targeting non-GHG emissions, or from other industries that have already implemented efficient CO₂ abatement mechanisms in a cost-effective manner, could eventually be applied in the shipping sector following the necessary adjustments.

Ongoing research and political processes will determine the form of policy action to be agreed upon for global emissions targets, and a positive transformation of international shipping into sustainable shipping is expected in the coming years. However, whichever instruments are selected, they should ensure that the requirements for ships can be met while allowing further growth in global maritime trade.

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