INTERNATIONAL MARITIME ORGANIZATION

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MARINE ENVIRONMENT PROTECTION COMMITTEE
60th session
Agenda item 4

MEPC 60/4/40
15 January 2010
Original: ENGLISH

PREVENTION OF AIR POLLUTION FROM SHIPS

Achieving reduction in greenhouse gas emissions from ships through Port State arrangements utilizing the ship traffic, energy and environment model, STEEM

Submitted by Jamaica

SUMMARY

Executive summary:	This document proposes that via a global agreement under IMO, all countries would be authorized to allow their ports to levy a globally uniform emissions charge on all vessels calling at their ports. The charge would be staggered higher for heavier and dirtier fuels and lower for cleaner fuels such as natural gas and structured in such a way to achieve the global reduction targets for greenhouse gases.
Strategic direction:	7.3
High-level action:	7.3.1
Planned output:	7.3.1.3
Action to be taken:	Paragraph 21
Related documents:	MEPC 59/24 and MEPC 59/INF.10

1 The Second IMO GHG Study on greenhouse gas emissions from ships, 2009 (MEPC 59/INF.10), estimated that ships engaged in international commerce in 2007 contributed about 2.7 per cent of the world's anthropogenic CO_2 emissions and states that emission reductions are feasible through technical and operational measures as well as through the introduction of market-based incentives. The fact that this seemingly insignificant contribution to the global inventory of greenhouse gases emanates from the quintessential example of a globalized industry, the global agreement solution mechanism posited below can serve as an important reference point in the overall climate change debate.

2 In designing a pollution reduction solution involving public policy, considerations were given to economic factors, issues of equity, administrative simplicity and concentration of costs and benefits. The use of market-based instruments in a shipping context offered some clear advantages. Carbon taxes and emission trading schemes (ETS) are already in place in several OECD countries, including all EU Member States. These policies put a price on greenhouse gas (GHG) emissions, which discourages the behaviour that generates emissions. The policies further encourage emitters to look for, and implement the cheapest abatement options.

3 The Committee, at its fifty-ninth session in July 2009, in furtherance of IMO's role in achieving the greater good, agreed to disseminate a package of interim and voluntary technical and operational measures to reduce GHG emissions from international shipping; and agreed a work plan for further consideration, at future meetings, of proposed market-based instruments to provide incentives for the shipping industry to reduce GHG emissions. It is proposed in this submission that a price control mechanisms or emissions fee to be administered by port States offers advantages over quantity control mechanisms administered by flag States and proposes such a global price control mechanism utilizing the ship traffic, energy and environment model, STEEM developed at the College of Earth, Ocean and Environment at the University of Delaware.

4 MEPC 59 noted that there was a general preference for the greater part of any funds generated by a market-based instrument under the auspices of IMO to be used for climate change purposes in developing countries through existing or new funding mechanisms under the United Nations Framework Convention on Climate Change (UNFCCC) or other international organizations. One such vehicle is the Adaptation Fund established to finance concrete adaptation projects and programmes in developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change. Proceeds from the emissions fund could also be used to support research in mitigating other environmental impacts of shipping, e.g., ballast water discharges and support port reception facilities for oil and solid wastes generated from vessels and thereby providing some relief to developing countries from these costs.

5 Before discussing the proposal, this document first addresses the important question of whether it is easier to achieve reductions in GHG emissions from ships by means of a carbon tax or by fixing the amount by which the emissions are to be reduced. Permit or cap-and-trade systems set quantity targets that guarantee a fixed level of emissions while carbon taxes or emission fees guarantee a fixed financial incentive to reduce emissions (Pizer 1999).

Possible mechanisms

6 A ***quantity mechanism*** – usually referred to as a permit or cap-and-trade system – would operate by first requiring ships to obtain a permit for each tonne of carbon dioxide they emit, and then limiting the number of permits to a fixed level. CO_2 emissions can be determined very accurately by the volume of fuel consumed during the voyage and the emissions and inventories from ships have been quantified by various researchers (Corbett *et al*.). A permit system could operate either by requiring users of bunker fuels to obtain permits or by requiring bunkers producers or suppliers to obtain the requisite permits[1]. The latter approach has the advantage of involving far fewer individuals in the regulatory process, thereby reducing both monitoring and enforcement costs under such a system (Fischer *et al*. 1998).

[1] The disadvantage to this approach is that ships can utilize a wide range of choices of bunker suppliers. Vessels may even choose to be refuelled offshore. Therefore non-compliant producers could be able to circumvent the permit process and offer less expensive fuel than compliant producers and thus gain market share.

7 A ***key feature*** in a permit system is that ship operators would be free to buy and sell permits to obtain the lowest cost of compliance for themselves, in turn leading to the lowest cost of compliance for society. In particular, when shipowners observe a market price for permits, those that can reduce emissions more cheaply will do so in order to either sell excess permits or avoid having to buy additional ones. Similarly, those who face higher abatement costs will avoid reductions by either buying permits or keeping those they already possess. In this way, total emissions will exactly equal the number of permits while only the cheapest reductions are undertaken.

8 A ***price mechanism*** – usually referred to as a carbon tax or emissions fee, requires the payment of a fixed fee for every tonne of CO_2 emitted. Therefore a cost is associated with emissions of CO_2 and a fixed monetary incentive is created to reduce emissions. Such price-based systems have been used in Europe to regulate a wide range of pollutants. According to the International Council on Clean Transportation, Sweden has experimented with a market-based approach by imposing a system of environmentally differentiated fairway and port dues that vary with ship emissions. That led to an increased usage of low sulphur fuels and to the installation of selective catalytic reduction systems on a number of ships calling at Swedish ports (ICCT 2007).

Choosing between price and quantity controls

9 Choosing between price and quantity controls, as well as choosing the appropriate stringency of either policy, requires making judgments about climate change consequences as well as controlling costs. As an example, consider an extreme case where there is a known climate change threshold. When carbon dioxide emissions are below this threshold, the consequences are negligible. Above this threshold, however, damages are potentially catastrophic. For example, research suggests that the process by which carbon dioxide is absorbed at the surface of the oceans and circulated downward could change dramatically under certain circumstances (Broecker 1997). If we further believe that these changes will have severe consequences and we can identify a safe emission threshold for avoiding them, then quantity controls may be preferable. Quantity controls can be used to avoid crossing the threshold and actions in order to meet the target are justified by the dire consequences of failure.

10 Now consider the other extreme; that every tonne of carbon dioxide emitted causes the same incremental amount of damage. These damages might be very high or low, but the key is that each tonne of emissions is just as bad as the next. Scientists suggest that the damage caused by each tonne of emitted CO_2 may be quite high but that there is no threshold; damages are essentially proportional to emissions. Each additional tonne is equally damaging, whether it is the first tonne emitted or the last (Roughgarden and Schneider 1999). Pizer argues that price-based GHG controls are much more desirable than quantity targets, taking into account both the potential long-term damages of climate change and the costs of GHG control. Environmental economists have argued that in situations such as where a pollutant exhibits constant marginal damage, such as CO_2 emissions, a price control mechanism may be advantageous to quantity control mechanism (Weitzman 1978).

11 In the case of shipping emissions, it is optimal in theory to use a price instrument although other proposals suggest a cap and trade system. Specifically, an emissions charge equal to the damage per tonne of CO_2 will lead to exactly the right balance between the cost of reducing emissions and the resulting benefits of less global warming. Every time a vessel emits CO_2, it would be confronted with an added financial burden equal to the resulting environmental damage. This would lead to reduction efforts as well as investments in new technology that are commensurate with the alternative of climate change damage. In this scenario, little emphasis is

placed on reaching a particular emission target because there is no obvious quantity target to choose. This argument applies even if there are uncertainties about the magnitude of climate damage per unit of CO_2.

Arguments for Price Policies

12 Given this characterization of circumstances under which alternative price and quantity mechanisms are preferred, this document presents arguments for an emissions fee generally and specifically as it relates to shipping. The general argument hinges on two basic points. The first point is that climate change consequences generally depend on the stock of greenhouse gases in the atmosphere, rather than annual emissions. Greenhouse gases emitted today may remain in the atmosphere for hundreds of years. It is not the level of annual emissions that matters for climate change, but rather the total amount of carbon dioxide and other greenhouse gases that have accumulated in the atmosphere. The second point is that while scientists continue to argue over a wide range of climate change consequences, few advocate an immediate halt to further emission. If only the stock of atmospheric GHGs matters for climate change, and if experts agree that the stock will grow at least in the immediate future, there is virtually no rationale for quantity controls (Pizer 1999). International regulators should therefore move away from short-term quantity controls for emissions and toward long-term quantity controls for the *stock*. It should not matter whether a tonne of CO_2 is emitted this year, next year or ten years into the future, if what is significant is the total amount in the atmosphere. Presuming that the stock will grow over the next few decades, this suggests that there is some room to rearrange emissions over time and that a short-term quantity control on emissions is unnecessary.

13 Quantity controls derive their desirability from situations where strict limits are important, when dire consequences occur beyond a certain threshold. Such policies trade off lower expected costs in favour of strict control of emissions in all possible outcomes. However, under the assumption that it is acceptable to allow the stock of greenhouse gases to grow in the interim, there is no advantage to such strict control. The regulators would give up the flexible response of price controls without the benefit of an avoided catastrophe. Even for those who believe the consequences of global warming will be dire and that current emission targets are not aggressive enough, price policies are optimal. An aggressive policy designed to *eventually* stabilize the stock does not demand a strict limit on emissions before stabilization becomes necessary. The outcome under a price mechanism is more abatement when costs are low and less when costs are high. When the World eventually moves closer to a point where the stock must be stabilized, a switch to quantity controls will be appropriate (Pizer 1999).

14 The shipping specific arguments for a price mechanism are substantial. The global shipping industry presents a political and legal challenge as ships operate largely outside of national boundaries. Ships frequently operate in third party territory, i.e. a different territory from that of the owner and/or the flag State. This is because ships are mobile assets, with mobility referring both to their physical location as well as their corporate location. Ships frequently change nationalities as a consequence of changing flag preferences by the owner, due to a sale or simply due to a commercial transaction in the case of a demise charter which facilitates the change. The international process for establishing any new regulatory requirements for these mobile assets is further complicated by the complex relationships that exist between those nations to which most ships are registered, the so called open registries that account for the majority of the world's tonnage, and the large shipping interests (typically headquartered in other nations) that own most of the ships.

15 For purposes of illustration consider a ship with an underlying registration in country A, with beneficial ownership in country B, bareboat chartered to a company in country C, operating under flag D, trading primarily between countries E and F and purchasing bunkers from a supplier in country G. These complexities would create difficulties for a permit system such as problems of applicable jurisdiction, difficulties in monitoring and enforcing emissions, and not accounting for damages from permissible emissions. A permit system could also represent a transfer of wealth to flag States not in proportion to their domestic trade or pollution impacts. An emissions reduction mechanism administered by port States (see institutional arrangements below) and targeting the vessels themselves would overcome these challenges.

16 Maritime regulations worldwide require ships to provide advance notice of their arrival to port and harbour officials. In the case of the United States, the Ports and Waterways Safety Act authorizes the Coast Guard to require the receipt of notice from any vessel destined for or departing from a port or place under the jurisdiction of the United States. The purpose of this rule is to prohibit a vessel from operating in United States waters without having on board a valid copy of a Company's Document of Compliance Certificate or a valid original of the vessel's Safety Management Certificate (ISM Code).

17 It is therefore mandatory for Notices of Arrival and Departure (NOA/D) to be transmitted electronically to the United States Coast Guard. Consequently, the United States Coast Guard maintains a database of all vessels arriving at a United States port and also which port the vessel is coming from. Other countries have variations to this systems but serving essentially the same purpose. By using a matrix of all possible port pairs it is possible to determine the distance travelled to arrive at a particular port. Using predetermined factors based on STEEM calculations for particular vessel specifications one can determine the amount of bunkers and marine diesel consumed during the voyage and determine GHG emissions. Vessels will then be charged the emissions fee along with the other port dues. Such a mechanism has the advantages of charging each unit of pollution, being universally applicable in all countries and ports, uniform in its fee structure, flexible adjustment mechanism, trade-related, and allow benefits to be accrued in the areas were the damage occurs. Even though the principle of common but differentiated responsibilities does not strictly apply, its tenets are captured because as a result of the majority shipping being beneficially controlled by developed countries and most of world trade taking place between developed countries, they would bear the costs in direct proportion to their emissions.

Arguments against a price mechanism

18 Even if an emissions charge is preferable to a cap-and-trade approach in terms of social costs and benefits, this policy may face steep political opposition in some countries. Shipping interests may oppose imposition of emission charges because of the possible transfer of revenue to the Government. Under a permit system there is a possibility that some, if not all, permits would be allocated for free. However as mentioned below, emissions charges revenues can be redistributed to support adaptive and mitigation actions. Others oppose emissions charges for an entirely different reason: they are unsatisfied with the prospect that an emissions charge, unlike a permit system, fails to guarantee a particular emission level. As mentioned above a particular emission threshold is indeterminate making efforts to minimize emissions more significant. Typically monitoring requirements of an emissions charge are more stringent than those for a typical permit system but these objections are overcome utilizing the approach highlighted below that incorporates the STEEM system.

Institutional arrangement for a GHG fee for ships

19 The ship traffic, energy and environment model, STEEM, developed by Wang *et al*., has applications that can be used to characterize ship traffic, estimate energy use and assess environmental impacts of shipping. The feature of STEEM that is particularly relevant is its ability to estimate emissions inventories to determine the level of the charge. STEEM can also be used to determine individual ship emission on the basis of ship installed power, service speed and travelled distances. From the amount of fuel consumed one can determine the amount of pollution in the form of CO_2, NO_2, SO_2, PM, POM, CO, etc., emitted during the voyage and levy the appropriate fee.

Proposal

20 It is hereby proposed that via a global agreement solution under the auspices of IMO, all countries would be authorized to allow their ports to levy a globally uniform emissions charge on all vessels calling at their respective ports. The charge would be staggered higher for heavier and dirtier fuels and lower for cleaner fuels such as natural gas and structured in such a way to achieve the global reduction targets for greenhouse gases. This proposal targets the ship itself with an emission charge as it arrives in port, irrespective of the owner, operator or charterer, and thus provides an easy to administer institutional mechanism. The process would be enforced by the Port State by way of the respective port authorities. The amount of pollution produced by the ship during the voyage in arriving at a port would be used as the basis to levy an emission charge.

Action requested of the Committee

21 The Committee is invited to consider the information in this document and to take these views into account as it proceeds with addressing the issue of reduction of GHG emissions from ships.