The required size of a levy to make international shipping meet its CO_2 cap

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Foreword

Within the International Maritime Organization (IMO) two different policy instruments for curbing CO_2 emissions from international shipping are currently being discussed; emissions trading (METS) and a levy that would finance a Greenhouse Gas Fund. The two have many elements in common. The perhaps most significant among them is to offset emissions above a cap or baseline by purchasing emission credits from CO_2 abatement projects in developing countries.

The major difference between the two options under discussion is that while emission trading establishes a binding cap on emissions from international shipping, the levy may or may not be set at a level that allows the sector to offset all emissions above the baseline. Thus, in emissions trading the outcome is certain while the price will not be known in advance. With a fixed levy, the price is known but not the effect on emissions.

The purpose of this small paper is to contribute to the analysis of the levy. The focus is on the difficulties involved in setting the level of the charge when not knowing the future price of emission credits. The levy should ideally allow the scheme to raise the money needed to buy emission credits in the open market that offset any emissions above the baseline, thus making the baseline equivalent to a cap.

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Introduction

Part of the shipping industry would rather see a levy on its CO_2 emissions than be subject to emissions trading under a legally binding cap. In principle there is nothing wrong with environmental taxes. The problem, however, is that often they are set too low to have any significant impact. And so the reason for some ship owners favoring the levy is, obviously, that they hope that this arrangement will be cheaper for them than being subject to a scheme of emissions trading where they would need to buy their allowances at auction. However, many stakeholders and observers appear not to have understood the implications of a levy when it is set too low.

The purpose of this paper is to analyze the effect on shipping emissions and the sector's contribution to climate change mitigation and adaptation in developing countries of the two competing schemes submitted to the IMO's MEPC by respectively Denmark (a levy) and Norway, Germany and France (emissions trading).

The levy

Denmark has put forward a submission[1] to the MEPC proposing the introduction of a levy on CO_2 emissions from international shipping where the proceeds would be directed to an *International Fund for Greenhouse Gas Emissions from Ships* and be used for:

- Climate change mitigation and adaptation in developing countries;
- R&D projects on more energy efficient ship designs and propulsion systems;
- Technical cooperation within the existing IMO framework;
- Administrative expenses for operating the International GHG Fund.

However, the Danish submission says that the scheme should offset any emissions above a baseline, with the baseline being gradually reduced over the years. Offsetting would be achieved by financing abatement measures in developing countries.

The legal character of the baseline is not clear from the Danish submission. The fact that Denmark uses a *baseline* rather than a *cap* may indicate that the target would not be legally binding under all circumstances.

It would be very difficult to know in advance how high the levy would need to be in order to be able to buy sufficient credits to offset any emissions above the baseline and, in addition, raise money for the other purposes mentioned by Denmark. The only indication in the Danish submission as to the size of the levy is provided by four examples ranging between USD 7.5 and 45 per ton bunker fuel. As the combustion of one ton of fuel causes emissions of three tons of CO_2, the effective charge on CO_2 will, in these four examples, fall within the range of USD 2.5-15 per ton emitted (€1.8-10.5).

The idea is to use most of the proceeds for buying emission credits from what is called, under the Kyoto Protocol, CDM-projects in developing countries. There is currently a market for credits (CERs) for such projects, and Denmark evidently expects that the price of such credits will stay substantially below that of CO_2 allowances generated within the existing and future

[1] *An International Fund for Greenhouse Gas Emissions from Ships*, submission by Denmark to MEPC 59, 1 April 2009.

emissions trading schemes of the developed countries, e.g. the European Emissions Trading System, EU ETS.

The METS

Germany, France and Norway have in two recent submissions[2] to the MEPC jointly proposed the introduction of a Maritime Emissions Trading Scheme (METS). The idea is to set a cap on CO_2 emissions from international shipping at a global level and distribute the allowances by auction (or possibly to some extent free of charge) to the shipping industry. Ships would, as the legally responsible entity, have to surrender allowances equal to the emissions caused by the fuel consumed. The METS would be open to trade with other existing or future emissions trading schemes, and the shipping industry would in addition be allowed to purchase emission credits from projects in developing countries. The METS is presented in greater detail in Kågeson (2007)[3].

Common elements

The Danish levy and METS have several elements in common. They reflect real emissions and provide incentives for operational measures as well as efficient designs of new builds. Both would have universal coverage and provide equal treatment to all ships above a certain size, regardless of flag. Both would be based on Flag State obligations and Port States rights and make use of the existing bunker delivery notes for monitoring compliance. Finally, both would depend on the market for emission credits.

Where to set the cap?

None of the submissions made by Parties to the MEPC has indicated the level at which the cap or baseline would be set. As world shipping is dominated by shipments on behalf of customers in the developed nations, one may anticipate that the sector should make a contribution to climate change mitigation that in relative terms is equal to, or at least not much smaller than, those expected from land-based sources in the developed countries. The 2020 targets for individual countries are yet to be set and may result from the Copenhagen process. Anything less than minus 20 per cent, counting from the 2005 levels, would be a disappointment. Actually more is required to stabilize GHG concentrations at a level that prevents the global mean temperature from exceeding its pre-industrial level by more than 2 degrees Celsius.

According to an assessment by the IMO, global shipping in 2007 emitted approximately 843 million tons of CO_2. This figure represents the central consensus of an IMO-commissioned study team composed of the principal experts in fleet-wide emission modeling – however, the team also found that possible 2007 emissions ranged from 685 Mt CO_2 to 1039 Mt CO_2.

Let us assume, as an example, that the UNFCCC decides that global shipping emissions by 2020 need to be reduced by 20 per cent relative to the 2007 level. This means in the case of METS, that allowances equal to 674 Mt CO_2 would be sold on auction or (partly) distributed free of charge to the shipping industry, while in the levy-based scheme, any emissions above this limit would have to be offset by credits from abatement projects in developing countries.

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[2] *Cornerstones for an outline of an convention of a Global Emissions Trading Scheme for International Shipping*, and *Positive Aspects of a Global Emission Trading Scheme for International Shipping*, submissions by Germany, France and Norway to MEPC 59, 08 May 2009.

[3] Kågeson, P. (2007), *Linking CO_2 Emissions from International Shipping to the EU ETS*. A report commissioned by the Federal Environment Agency, Germany, 2 July 2007.

The fact that international shipping under normal economic circumstances is growing rapidly and that its demand for fuel under business-as-usual probably would double within 30 years, is no reason to allow the sector a more favorable treatment than land-based installations. A system of open emissions trading allows shipping to become a net-buyer of allowances and credits which makes it possible for the sector to continue to grow. Likewise the introduction of a levy on all bunker fuel purchased puts no cap on the growth of the industry.

An example based on minus 20 per cent

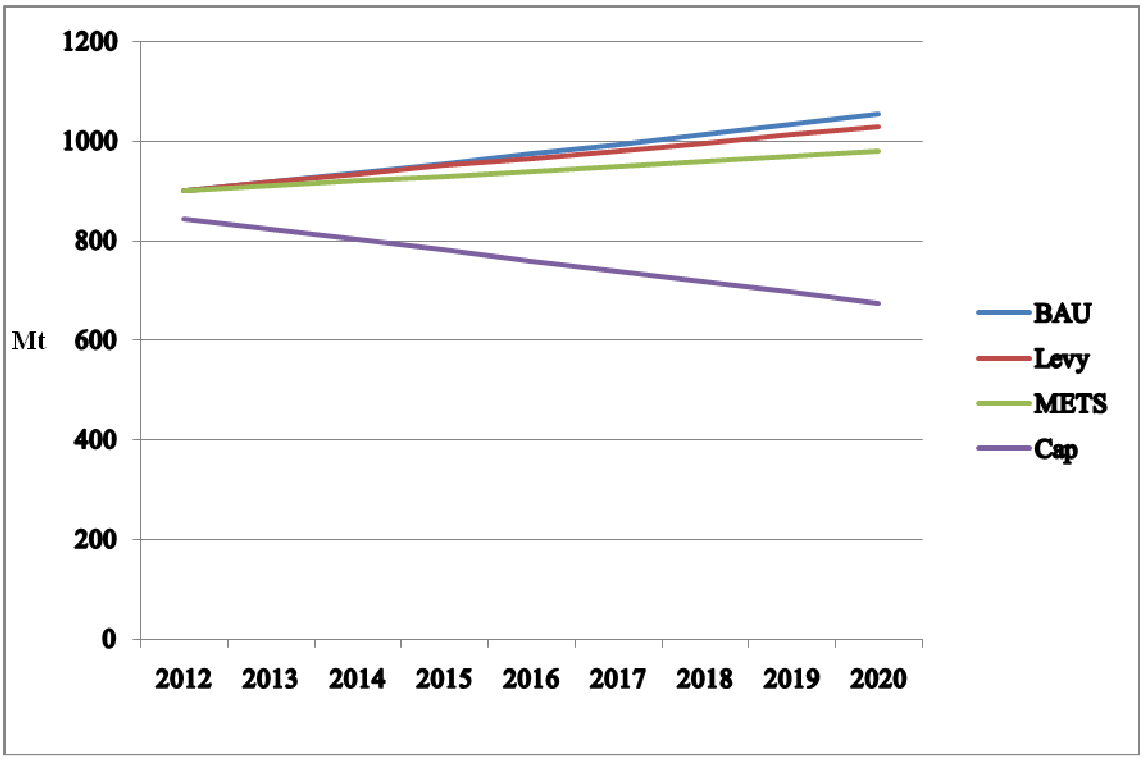
The below example illustrates a situation where the cap is initially set at the emission level of 2007 and gradually lowered by 20 per cent over the years between 2012 and 2020 while at the same time international shipping grows by 3 per cent annually after having recovered from the current recession. It is assumed that aggregate emissions have reached 900 Mt by 2012 and that under business-as-usual they would continue to rise by 2 per cent annually thereafter. That fuel demand already rises more slowly than industrial output in the BAU scenario, is a result of increasing bunker prices and efforts by the industry to reduce consumption. Under these conditions, the emissions would reach 1,054 Mt in 2020 in the BAU scenario.

Now let us assume that emissions trading under METS results in a marginal cost of USD 30 per ton CO_2 (€ 21) at the end of the period. The reason for this low estimate is that the German/French/Norwegian proposal does not put any limit on the amount of credits that may be purchased. Therefore it may be necessary to rule that entities that receive shipping allowances for free or are given an opportunity to buy them on closed auction must not become net sellers of allowances to other sectors or trading schemes. Otherwise the shipping sector may be tempted to sell all of its allowances to sectors that are not allowed unlimited access to the credit market in order to profit from the likely difference in price (see next section).

Let us further assume that the levy is set at USD 30 per ton of bunker fuel, the second highest example provided in the submission by Denmark. This equals USD 10 per ton CO_2 emitted (€7/ton). As indicated in Figure 1, the difference in marginal incentive (USD 30 vs 10) will result in fewer abatement measures being taken onboard ships in the case of a levy than in the case of METS. The exact difference is difficult to predict as many other parameters influence both investment decisions and operational strategies, e.g. bunker prices and freight rates.

However, provided that the levy-baseline is legally binding (in effect is a cap), the two schemes would result in the same total reduction of GHG. The difference lies in where reductions take place. A low to moderate levy would produce more reductions outside the shipping sector and less in ships than the METS. However, this is only true in the case where the proceeds from the levy are sufficiently high to buy all the emission credits required for offsetting any emissions above the baseline.

Figure 1. Potential effects of the levy and the METS when the cap is lowered by 20 per cent between 2012 and 2020, the allowance price is USD 30 and the levy corresponds to USD 10 per ton CO2.



In order to offset all emissions above the cap, the proceeds of the levy must be used to buy credits that match the difference between the levy-line and the cap in Figure 1. By 2020, in this example, the gross revenues of the levy would amount to USD 10.3 billion (1,029 Mt x USD 10). Assuming administrative expenses of only 2 per cent, the net result would be 10.1 billion. The quantity of emissions that need to be offset is in this case 355 Mt. In order for the Fund to be able to buy the credits required, they must therefore on average cost no more than USD 28.4 per ton (€19.9/ton). To make it possible for the Fund to raise any money for its two remaining objectives, the price must, of course, fall below this level. At a market price of USD 30 per ton CO_2 the scheme would face a deficit and not be able to offset all excess emissions. One way out of this dilemma could, of course, be to refrain from making the baseline a legally binding cap.

Figure 1 is limited to the eight years between 2012 and 2020, a relatively short period. Post 2020, the cap will continue to decline, perhaps to as little as 143 Mt in 2050. This would correspond to a reduction of 83 per cent from 2007, equal to the proposed reduction of domestic GHGs in the American Waxman-Markey Bill between 2005 and 2050. These restraints will cause scarcity to grow in the emissions market, while at the same time the proceeds of the levy must be sufficient to offset a growing volume of shipping emissions (the difference between the levy-line and the cap post 2020). As a result, the size of the levy must grow substantially over time, and eventually it will come close to the price of CO2.

The situation for METS is very different. In this case, the industry will be allocated allowances corresponding to the level of the cap. If by 2020 all permissible allowances are auctioned and the average price on those auctions is USD 30 per ton CO_2, the resulting revenue stream would amount to USD 20.2 billion. This is money that, after deduction of administrative expenses, can be used for climate change mitigation and adaptation in developing countries. In addition, the shipping industry will buy emission credits in the open market to match all emissions above the cap. In this example, ships will buy 307 million credits to the benefit

of the environment and the developing countries involved in this trade (the difference between the METS-line and the cap in Figure 1).

The real difference

In summary, the levy can achieve reductions equal to those of the METS, provided that the level is high enough. A difference, though, is that less will be done in the shipping sector and more in other sectors compared to METS.

However, one important difference remains; while the levy will raise little or no money beyond what is needed for offsetting shipping emissions above the cap, the METS will create large funds that can be used for climate change mitigation and adaptation beyond what is required for achieving the sectoral target. As shown by Kågeson (2009)[4], the net revenue from METS and a similar scheme for international aviation may over the next decades be in the order of USD 50 billion per year (equal to 0.13% of the GDP of the OECD countries). This is money without an owner that could be spent on climate change mitigation and adaptation and relieve the budgets of the rich countries of some of the pressure of assisting the developing nations.

The market for credits

The key issues are, as noted above, the price of credits, and the extent to which that price may diverge from the market price of allowances. What may argue in favor of a lower price of credits compared to allowances, is that scarcity will drive the price of allowances upwards, while many inexpensive abatement options still remain to be exploited in the developing countries. However, for abatement projects to be accepted as a source of credits, they need to provide "additionality", i.e. generate cuts that would not occur in the absence of support. This means that the least expensive measures will not provide any additionality as they are profitable at the pre-existing energy market prices.

Another factor that will have an impact on credit prices is the fact that installations that are subject to the current EU ETS or the proposed American scheme (the Waxman-Markey Bill) will be allowed to offset some of their emissions by buying credits from projects in developing countries. When this is less costly than undertaking additional measures at home, they will use this opportunity. Their demand for credits will compete with the Fund proposed by Denmark and a possible similar fund created by the aviation sector. As the willingness-to-pay for credits among land-based installations is only limited by the marginal cost of domestic abatement measures, one might expect the prices of allowances and credits (for immediate use) to converge, at least in the longer term.

However, the outcome also depends on the rules to be adopted by the UNFCCC (at COP 15) on future emission credit transactions. The current CDM-system may be replaced by a new order that transfers all or some of the supply-side responsibilities and rights from corporate entities in the developing countries to the national governments. If this happens, the GHG Fund will have to negotiate with the governments of the developing countries for a share of the credits on offer. As they will do this at least in partial competition with land-based emitters, one might assume that the supply-side will take advantage of the situation in order to generate a considerable producer surplus.

[4] Kågeson, P. (2009), *Making international transport pay its climate bill*. Paper presented at International Transport Forum's "Transport for a Global Economy: Challenges and Opportunities in the Downturn", Leipzig, Germany, 26-29 May 2009.

On the other hand, the Fund may have a significant advantage of presumably being the, by far, single largest player on the demand-side (unless the ICAO creates a similar scheme for aviation). It may therefore succeed in making long-term deals with the governments of individual countries for credits to be delivered in years to come. Credits for future delivery can be expected to be cheaper than those that are made available for immediate consumption. However, early payments may be required, which will require access to sufficient funds.

It should be recognized that the open market price of CO_2 may, by 2020, exceed the USD 30 per ton used in the above example. In the EU ETS, installations subject to the scheme have to cut emissions by at least 21 per cent from their 2005 levels, and by more if the EU adopts a minus 30 per cent GHG target for 2020. Power production is currently responsible for close to 2/3 of the emissions under the cap of the EU ETS, and demand for electricity is rising. As a result, the power sector is not likely to be able to reduce emissions by 21 per cent (or more) by only adding electricity from new renewable sources to the grid. The industry probably has to rely on Carbon Capture and Storage (CCS), which, if it becomes a technical success, may cost €40 per ton or more (USD 57).

Nobody knows

The above example was designed to illustrate a dilemma, not to predict future prices. The author of this paper is in no position to forecast what those prices may be. His only point is that the delegates to the MEPC and the Council of the IMO are in no better position. In order to come to a decision on the size of the levy, they would also have to make intelligent guesses about the development of a number of parameters relevant to the future prices of emission credits and allowances, among them economic growth, crude oil prices, bunker fuel prices and demand for transport by ships. With so many uncertainties, the risk of miscalculation is evident.

The risk of raising insufficient funds may, of course, be significantly reduced by setting the levy at a very high level. This option, on the other hand, runs the risk of making the industry pay a levy which is higher than the cost they would alternatively have incurred under the METS.

Another way out of the dilemma could be to refrain from making the baseline legally binding. In this case, the IMO could decide to split the net-revenue in three parts, one for each of the three objectives of the Fund. The key could be, for instance, 80 per cent for offsetting, and 10 per cent for each of the other two objectives. However, this means that the gap between what the levy and the METS can achieve would widen significantly, and the developing countries would receive less (unless compensated by the rich countries in some other way).

Potential ways around the dilemma

One way around the problem could be to take a long-term decision to tie the size of the levy to the price of carbon. This would potentially solve the liquidity problem but means, on the other hand, that the Parties would not be able to influence the size of the levy. Another difficulty lies in having to decide at an early stage on which price the levy should be tied to. There may turn out to be more than one price on carbon in the world if major countries cannot agree on terms that make two-way open links possible between their national or regional trading schemes.

However, if a universal price on CO_2 can be established and the size of the levy is linked to that price, the only real difference between the levy and METS would be that in the former, the Fund would on behalf of the shipping industry buy all the credits needed to offset any emissions above the baseline/cap, while in the METS, each ship owner or operator would purchase allowances or credits matching the ship's fuel consumption and emissions. The funds that the two systems can raise for mitigation and adaptation in developing countries would in this case be identical. The key issue, then, is whether a design of this kind would be acceptable to the industry?

A third option may be to take a decision to allow the steering committee of the Fund to set the level of the levy and to change it whenever needed. The role of the IMO would in this case be limited to deciding on the targets to be achieved. This could be done by adopting instructions or guidelines that make clear the levy should be set at a level which allows the Fund to offset any emissions above the baseline/cap and in addition generate a certain sum of money to be spent on the two other objectives; R&D projects on more energy efficient ship designs and propulsion systems and technical cooperation within the existing IMO framework.

Please note that an effect of all of the three options discussed above is that ship owners will not know the future size of the levy.

Make the METS more savory to the industry?

If the only reason for governments to consider a levy (rather than the METS) is to make life easier for ship owners, a better idea than creating a complicated levy might be to stick to emissions trading but give the industry some of the allowances for free. This would, of course, reduce the net-contribution to climate change mitigation and adaptation in developing countries by raising less money. However, it would not reduce the marginal incentive to undertake measures that will cut emissions from ships. This is important as lots of opportunities to cut emissions exist in the maritime sector and many of them can be applied to existing ships.

The most advanced method for partially compensating the industry would be to give each ship some free allowances based on its environmental performance. However, given the large number of vessels of various types and sizes, this would require large quantities of data and result in high administrative costs. If free allocation is intended for a limited period only, this model should be avoided.

Another way of gradual introduction of full liability would be to *recycle allowances*, a mild form of grandfathering. Ships could, during a few years, be awarded some allowances free of charge based on the reported individual emissions of the previous year. The first year of operation could be used as a trial when ships have to report emissions but do not have to surrender any allowances. As each ship would be granted free allowances during the forthcoming year based on its emission report, the trial would provide a strong incentive to deliver data. For year three, the emissions of year two would be the basis for calculating the amount of free allowances, and so on. This makes new entries rather easy. However, most of the disadvantages of grandfathering remain. High polluting ships are rewarded (even though they only get back allowances matching part of the emissions caused) and they will actually have less to gain from cutting emissions than under traditional grandfathering when permits for a longer period of time are allocated free of charge and an entity can sell surplus allowances that result from taking measures to reduce emissions. Therefore this simplistic model for compensating

the industry should only be used during a short transitory period during which the share that is allocated free of charge is gradually reduced to zero.

A gradual introduction of full liability whereby ships only have to surrender allowances matching part of their emissions is more problematic. This means that the scheme will not provide any incentive to cut shipping emissions until the free share approaches zero. However, provided that all allowances are auctioned, it will raise substantial funds that can be used to offset the extra emissions caused.

From these examples, it is obvious that methods for taking away part of the burden on industry of having to pay the marginal cost for reducing emissions below a baseline or a cap are problematic, regardless of whether the IMO prefers a levy or emissions trading. However, the final choice between these two competing systems should reflect long-term needs of fairness and cost-efficiency rather than short-term considerations. In this context, it may be worth noting as underlined in one of the submissions by Germany, France and Norway, that an ETS is inherently counter-cyclical. In periods of high economic growth, demand for allowances will also be high and since the supply is fixed by the cap, prices will rise. Conversely, in periods of low demand growth, allowance prices will fall, thus reducing the financial burden of the entities involved. This is, of course, also true to some extent for emission credits from projects in developing countries although they are by nature bound by longer-term contracts.