INTERNATIONAL MARITIME ORGANIZATION

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MARINE ENVIRONMENT PROTECTION COMMITTEE
57th session
Agenda item 4

MEPC 57/INF.13
21 December 2007
ENGLISH ONLY

PREVENTION OF AIR POLLUTION FROM SHIPS

A global levy on marine bunker, primarily to be applied for the acquisition of CO_2 emission quotas through the purchase of CO_2 credits

Submitted by Denmark

SUMMARY

Executive summary: This document is submitted in support of document MEPC 57/4/4. In this document a global bunker levy is debated and evaluated on a preliminary level, and the impact and potential effects are assessed against relevant evaluation criteria.

Action to be taken: Paragraph 3

Related documents: MEPC 56/4/9, MEPC 56/23; MEPC 57/4/2, MEPC 57/4/3 and MEPC 57/4/4

Introduction

1 In document MEPC 57/4/4 Denmark suggests the initiation of a debate and a decision making proces potentially leading to the establishment of a global levy on marine bunker, primarily to be applied for the acquisition of CO_2 emission quotas through the purchase of CO_2 credits.

2 The annex to this document provides relevant information regarding such a measure.

Action requested of the Committee

3 The Committee is invited to note the information provided in this document and its annex.

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ANNEX

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1 Introduction

There is no single miraculous solution to the massive challenge of effectively reducing greenhouse gas (GHG) emissions, and particularly CO_2 emissions, from international shipping. The substance of this challenge is underscored by the fact that the industry has always endeavoured to optimize its fuel consumption but also that growth in shipping is expected to continue and that ships and marine engines have long lifecycles.

In document MEPC 57/4/3 it is proposed to create a substantially stronger incentive for implementing both existing and new technologies by means of the development of a mandatory CO_2 emisson design index for newbuildings. Such measures will, though, only take full effect in a longer term perspective.

It is just as crucial, however, for the shipping industry to simultaneously assume responsibility for the climate change issue and contribute actively in a short term perspective. As a way forward, the establishment of a globally applicable levy on marine bunker is suggested, primarily to be applied for the acquisition of CO_2 emission quotas through the purchase of CO_2 credits world wide.

The two proposed contributions, a mandatory CO_2 design index for new ships and a levy on marine bunker primarily for acquiring CO_2 emission reductions through the purchase of CO_2 credits world wide, may be regarded as a package providing both short term effects as well as longer term impact.

2 Proposal for a global bunker levy system

The proposal for a global bunker levy scheme set out in this paper represents an outline of certain design elements and - constraints, leaving some room for the determination of specific elements. However, the central elements of the proposal are as follows;

- The maritime sector world wide will become subject to a flat bunker levy, established at a defined cost level per ton of fuel bunkered.
- Revenues collected nationally will be channelled to an international maritime greenhouse gas (GHG) emission fund, managed by parties/organizations yet to be determined.
- The revenues are to be applied for the following purposes;
    a) purchase of emission quotas/credits generated in other industrial sectors,
    b) funding of adaptation projects in developing countries, or to adaptation under the United Nations Framework Convention on Climate Change (UNFCCC), and
    c) funding of the IMO Technical Corporation programme, as appropriate.
- Revenues should not be perceived as an alternative revenue source for mainstream IMO activities or other activities not closely related to emission mitigation objectives.
- Revenues are explicitly not to be utilised for vessel specific GHG reduction projects, e.g., retrofitting of specific vessels or fleets, whereas there might be merit in considering R&D projects whit all-embracing benefits to the shipping industry to be funded under the scheme.

- The appropriate level for CO_2 emissions from international shipping in the future remains to be established.

With due regard to industry experience over the past years, where the industry has proven capable of absorbing significant increases in fuel oil market prices, it appears that a bunker levy is unlikely to significantly impact on maritime emission levels per se. It does, though, potentially constitute a significant contribution to the reduction of overall CO_2 emission growth, through the allocation of financial resources as described above.

At this point, it deserves mention, that the establishment of a GHG emission fund has elements in common with the proposal put forward by Norway in MEPC56/4/9[1]. While the Norwegian proposal does not explicitly define the fund collection mechanism, it does indeed open the issue of a bunker charge approach.

The proposal in this submission is evaluated further in section 4, where various design elements and options are considered in order to evaluate their feasibility and effectiveness.

3 Impact and Implementation Assessment

Bunker levies applied to international shipping are a policy option, which has been subject to evaluation by various parties over the years. One study that is apportioned particular attention in this paper was published by the OECD in cooperation with the Annex I Expert Group on the UNFCCC[2]. While published under substantially different bunker price level conditions in 1997, it establishes an analysis framework that has been drawn upon in the present work. It should be borne in mind as well, that the IMO greenhouse gas study published in 2000[3], based on the same OECD study, provides an updated analysis of impacts and implementation issues. Both of these studies retain their validity today.

Bunker levies, while being technically feasible, has in broad terms had a peripheral role in newer studies, largely being addressed in vague terms if not ignored, most likely due to the challenging implementation issues. Such a case would be *Linking CO2 emissions from international shipping to the EU ETS, Nature Associates. July 2007*, a report commissioned by the Federal German Environment Agency. Similarly, it is a policy option that to a certain degree becomes conspicuous by absence from the options considered in central work performed by institutions such as CE Delft[4].

Shipping, however, is not in a position to reject proposals, unless suitable alternatives to such proposals exist. The core matter being, that there is no easy way ahead. If such options had existed, they would have emerged at this time.

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1 Prevention of air pollution from ships. Elements of a possible market based CO2 reduction scheme. MEPC 56/4/9, Norwegian authorities, May 2007.

2 Special issues in carbon/energy taxation: marine bunker fuel charges. OCDE/GD(97)/77, OECD 1997.

3 Study of greenhouse gas emissions from ships. Final report to the International Maritime Organization. Issue 2, 31 March 2000.

4 Greenhouse gas emissions for shipping and implementation guidance for the marine sulphur directive. CE Delft, December 2006.

3.1 General considerations

This section contains a brief overview of issues that have emerged when analysing bunker levies. It leans on work performed for and summarized by OECD and IMO, as mentioned above. A more detailed evaluation of the proposal in this paper is carried out in section 4.2 onwards.

3.1.1 Environmental and other impacts of a carbon charge

With reference to the reports of OECD and IMO it would appear reasonable to expect that a bunker levy to some extent could reduce bunker demand and associated CO_2 emissions through:

- Energy efficiency improvements in ship engines and ship design
- Changes in operative practices, including load factors, routing and sailing speeds
- Turning to different, more “efficient” vessel types
- Turning to alternative energy sources such as LNG or renewables
- Reductions in the amount of maritime traffic.

Such expectations, however, are only partially supported by actual fleet experience over recent years. While it is obvious that no international bunker levies have been implemented, there has been a dramatic increase in marine fuel prices. In 1997 bunker prices (heavy fuel oil) were at approximately 100 USD/ton, whereas recently, the price has been hovering around the 500 USD/ton mark (Bunkerworld, http://www.bunkerworld.com/markets/prices/). Over the same period of time, marine distillates have experienced a price increase from 150 to approximately 800 USD/ton.

In recent years, an unprecedented growth in the size of the world fleet and the amount of goods shipped has taken effect. Given that a uniformly applied carbon charge, on an operative level, would have the same effect on the ship operator as a fuel price increase; it remains difficult to claim that a bunker charge could be expected to support and drive overall emission reductions. While it remains clear that increasing fuel prices have led to optimized efficiency throughout the world fleet, by means of some of the mechanisms listed above, this improvement has been more than outnumbered by the increased demand for shipping transportation services.

Carbon charges should therefore not be expected to have significant impact as a policy instrument, other than as a driver of efficiency optimization, and even so, the level of the charge would have to be a significantly higher percentage of the base fuel price if the impact should approach the impact caused by fuel price fluctuations alone.

As a corollary to the above argument, a case can be made that elasticity of price, as reported in the reports of the OECD and IMO, is uncertain, and does in general terms not appear to be supported by recent experience. While more rigorous analysis would be necessary to firmly substantiate this claim, it is to a certain degree underpinned by the fact that for a bulk of the world cargo volume, there is no viable transportation alternative to shipping – and thus, the amount of cargo moved on ships will tend to follow the market demand, as generated by overall economic activity.

In other words, world economic growth rate appears to be the dominating factor rather than bunker price. It should be noted, that this presumes that ship owners and operators can maintain satisfactory profit margins by means of forwarding increased transportation costs to the customer. Hence, predictions stating that a certain price increase for fuel (whether through increased oil prices or levy mechanisms) will cause a corresponding reduction in performed transportation work are at best dubious in a booming economical environment.

Here, the unprecedented long-lasting global economic growth remains the core issue. The world economy has demonstrated remarkable resilience, when facing increasing energy prices, with few indications of growth slowing down, even as crude oil prices approach 100 USD/barrel. If the situation was to change into a scenario with high energy prices and a global recession – and corresponding reduced global economic output – a sudden drop in the demand for shipping could be expected. With operators and owners then most likely having problems forwarding full fuel costs to cargo owners, a drop in the amount of maritime traffic would be likely, similar to what was observable in the early eighties. A bunker levy in such a scenario would most likely achieve such a tendency.

Related factors to be considered when and if applying a bunker levy to international shipping are the transport niches where shipping face actual competition from other transport modes. This applies to certain cargo types, intra-regional trade and short-sea shipping. In these cases a carbon charge on shipping will tend to reduce its competitiveness compared to air, rail and road, increasing the transportation work carried out by such more CO_2 intensive transportation modes. Unless this is balanced by ensuring that these other sectors also internalize their environmental impact costs through equivalent levy mechanisms, the net result for these segments may be an increase in total CO_2 emissions related to the transport work carried out.

Looking at second-order environmental impacts, one has to examine on the practice of vessel bunkering. In this context, the environmental impact of potential levy evasion requires examination. Unless a bunker levy becomes a truly global policy instrument, applicable globally including in international waters, significant evasion potential will prevail. Presently, offshore bunkering is a well-established practice for ships wishing to avoid port fees or being constrained by load limits in ports. Furthermore, transportation costs for fuel are relatively low compared to general sector price levels; in 1997, the OECD reported that the costs of supplying fuels from Africa or the Middle-East, or from South- to North-America, were in the range of 10-15 USD/ton.

Any carbon charge in excess of this would thus provide an incentive to transport fuel to supply points immediately outside national jurisdiction applying the bunker levy. This extra transportation work, plus the additional factor of vessels altering their routes to bunker at these levy-free points could lead to a net increase in CO_2 emissions. While this incentive would vary for different shipping sectors, it could still have a significant impact. A “non-distorting” bunker levy would therefore have to be truly international in nature, and not limited to a few select countries.

Finally, as the OECD points out, from a world trade perspective, a bunker levy will have different impacts on different countries depending on the size and type of their export economy. Nations competing in markets for agricultural and manufactured goods and raw materials, relying on maritime transport for the bulk of their exports, may potentially face significantly increased costs from a bunker levy. In spite of the potential impact being unquantified, it appears likely to have two major consequences; 1) developing nations may face an unfair cost burden, and 2) the World Trade Organization will likely have to take a stand on the introduction of a bunker levy as it may potentially be construed a trade barrier.

3.1.2 General implementation issues

Over the years, several implementation issues of a general nature have been raised. Amongst these challenges, the allocation of emissions has received substantial attention.
Delving deeply into the allocation debate, though, would go beyond the scope of this paper. Shipping is in its nature the most internationalized industry of all. It lacks purpose to debate allocation schemes, since such schemes would lead to substantial circumvention and evasion strategies and leave the scheme with none or a very little effect.
It should, however, be noted, that all allocation options suffer from negotiation and implementation difficulties, and that applying a uniform levy on national bunker sales is simpler to implement than a charge on the movement of ships, passengers or freight. OECD notes, that a key factor is that of a significant part of the global market being supplied by dealers independent of the oil majors. Charge collection at the point of sale would be administratively complex, as even the definition of the appropriate point of sale for levying the charge will be difficult. As noted above, bunkering outside national waters is a viable option, thus fuel can in principle come from anywhere and be loaded anywhere.

3.2 Evaluation criteria

For the purpose of analysing the impact of the proposal in this paper, the following basic criteria have been applied.

- Does the proposed levy scheme warrant a commercially level playing field?
- Does the proposed levy scheme enable and facilitate efficient international trade?
- Does the proposed levy scheme cater to a need for simple and fraud free implementation and operation?
- Does the proposed levy scheme drive and promote investments in emission reducing technology, or otherwise impact positively on CO_2 emissions?
- Does the proposed levy scheme promote optimized technical, operational and commercial ship deployment practices?
- Does the proposed levy scheme cater to a need for accomplishment of the goals at minimum overall cost?
- Does the proposed levy scheme provide a predictable long-term framework?
- Does the proposed levy scheme appear legally acceptable with respect to international legislation?

Selecting criteria, and applying them, when considering any kind of policy scheme is obviously not an exact science. Arguments can always be raised as to whether or not any given assessment is completely objective and unbiased. The assessment details are to be found in the following sections.

3.3 Commercial considerations

Provision of a commercially level playing field means, that incurred additional costs shall not impact the relative competitiveness of the key players in the maritime industry, or cause other types of trade distortion. Applying a uniform levy on fuel should in principle satisfy this criterion, with the following potential exceptions:

In geographical areas where other transportation modes (in practical terms rail and road transport) are available, increasing the cost of shipping will tend to shift cargo towards the other modes. The effect will depend on a range of factors, primarily the size of the levy, but also depend on how carbon charges are applied (if at all) to the other modes. It should be noted that the net effect may be a mode shift in transport work counter the goals set in other policy measures.

Measures would need to be considered for ships running on alternative fuels, e.g., natural gas or renewables. The scheme could be applied to render the reduction of CO_2 emissions more attractive, i.e., by changing to natural gas or renewables as a primary fuel in particular trades, by explicitly allowing these fuels to be either exempt from a fuel levy, or by applying a carbon charge reduced in proportion to the reduced emission level. In this case, a distortion of the "level playing field" would be a deliberate environmental policy, rewarding the application of innovative and emission efficient fuels and technologies.

Application of a fuel levy implies a risk of being construed as establishing a trade barrier by the WTO, since its impact on increasing the cost of export cargo will vary in accordance with the different export levels of export countries. While the risk of distorting trading patterns appears low, it is likely that the WTO would need to be consulted in the process of devising such a scheme.

3.4 Efficiency of international trade

Given that the scheme is global in nature, a detrimental effect on international trade should not be expected. The considerations regarding relatively higher impacts on exporting nations and potential WTO aspects should be borne in mind and considered further.

3.5 Simple and fraud free implementation and operation

This requirement can be satisfied, provided that adequate and reliable practices can be established for collecting the levy in the fuel supply chain, transferring the funds to the GHG fund, and applying the revenues to purchasing carbon credits that are certified under internationally accepted mechanisms. These elements are discussed in further detail below.

3.5.1 Collection and transfer of funds

A key issue in any bunkers levy scheme remains the question of where in the fuel production and supply chain a levy can be imposed. This is not a straightforward issue, as there are advantages and drawbacks associated with all options. The key gap is an accepted process for determining international shipping's fuel use and to verify this at the international level. A brief summary drawn from the OECD report supplemented by sources in the refinery industry gives the following considerations;

Option 1 – imposing a levy at the refinery level

While oil companies routinely act as tax collectors on behalf of the government, and thus in this respect would appear as a feasible collection point, a prevailing issue, though, is the fact that refineries do not necessarily have a sufficiently concise overview of their product streams and end customers. For the relevant fuel grades the situation is, that some product travels inland, some is traded and some goes to marine sales, without the refinery necessarily knowing the final destination of the product.

Option 2 – imposing a levy at sales organizations or using an IOOPC fund mechanism

It seems obvious that one should seek to collect the levy as high in the value chain as possible. Given the remarks under option 1 it should preferably be just below refinery level. Thus it would potentially be more sensible to target the specific sales organizations as a collection point. In some cases this sales organization might reside in the same oil company as the refinery, in other cases it might not.

It should be noted that attempting to impose a levy at the point of sale from refinery to the bunker dealer would be feasible, as long as the sale takes place within national jurisdiction, but that a levy could be avoided if a sale took place in international waters, or in non-participating countries. There is thus a significant evasion potential for such a model.

During consultations with individuals within the industry it has been expressed that trying to identify some intermediate point where any levy could be applied is verging on the impossible, since it becomes extremely difficult to control and track the product in an effective way once out of the refinery.

If that is the case more innovation is needed. A way forward might perhaps be to impose a levy on all residual products leaving the refinery but with a mechanism for rebating the charge if the recipient could show that the product was not destined for vessel fuel. There are allegedly already precedents for this in some locations where it is necessary to distinguish between kerosene for domestic/industrial use and kerosene for use as aviation fuel.

In terms of collecting the levy, both refiners and terminals already declare volumes on an annual basis to facilitate IOPC fund contributions, it seems to be a straight forward process to add residual fuel oil to this and to follow the process above. The levy would then be collected and controlled through IOPC fund mechanism. This has the advantage of not requiring a new IMO body and utilizing an existing mechanism that is recognized, the IOPC would also be responsible for following up with Member States and for accounting for the fund. Clearly, disbursing funds may involve a considerable level of discretion and would require a different process. In any event, the mandate or guidelines for the application of the revenue in the Fund would need to clearly articulated by the IMO.

Option 3 – imposing a levy at the point of sale to the vessel

In principle, this is a feasible option, as it is completely clear at this point in the fuel supply chain that the fuel is actually being delivered to marine entities. The marine bunker industry, however, at this level in the supply chain has a large variety of dealers, traders and re-sellers, ranging from small independent dealers to large oil company owned sales organizations, with the business being dominated by independents, with respect to sales volume. A collection scheme would thus have to be applied to a large number of small companies who, to an extensive degree, may have limited previous experiences in acting as tax collectors on behalf

of their respective governments. It is also an unfortunate fact that, with an increasing number of collection points for a bunker levy, the risk of fraud and evasion does increase. The same off-shore evasion issues as addressed in 3.5.1 become applicable here as well.

As is well known, the adoption of an IMO resolution as an international regulation does not imply that all relevant countries have ratified it. There will therefore almost certainly be non-participating countries, of which some are likely to be acting as suppliers of marine bunker. The only way to prevent such countries from becoming preferred suppliers would be for the participating port States to create legislative national enforcement mechanisms whereby arriving ships would have to document payment of bunker levies. One way of potentially implementing this would be for the bunker delivery note to include a certificate or an equivalent statement, issued by, or on behalf of, a recognized body or organization, stating that levy has been paid on the fuel. As a drawback to be borne in mind, this would of course add another level of bureaucratic complexity to the national administration of a scheme.

Finally, it is generally known in the industry that governmental control of the bunkering activity is less strict in some locations than others. It is therefore possible that the government in some locations would have to implement enhanced control schemes. There might also potentially be a need for some type of international supervision of the scheme to ensure common practice across borders, as well as transparent and fraud free operation, especially when it comes to verification mechanisms to ensuring that the collected revenue is indeed transferred to the GHG fund. This is undoubtedly controversial, as it can be taken to imply a surrender of national jurisdiction to an international body, something a number of countries will be extremely reluctant to do.

3.5.2 GHG fund design and disbursement issues

When establishing an international GHG fund, it is not obvious which body should be nominated to establish and run it. While the IMO, due to its pre-eminent position in the maritime sector, is recognized as the prime candidate for establishing it, it is conceivable that the IMO or its Member States would not want the Organization to be involved in fund operations; preferring instead an oversight role so as to free itself from any potential allegations of misuse of funds or economic power.

Among many potential corporate constructs and other options, one potential option is that in principle an independent foundation could be established, with a charter defined by the IMO. It is considered beyond the scope of this paper to go deeply into this matter; let it suffice to state, that having Members of IMO agreeing on the design of the appropriate legal entity, as well as an agreement on the mandate governing its strategic and operational actions would be a politically complex issue. This would be of particular concern when it comes to defining the rules and requisite supervision for management and disbursement of the significant amount of charges to be handled. Also in this context it appears obvious to consider whether the IOPC Fund could facilitate and assist to such endeavours.

3.6 Investments in emission reducing technology; impact on CO_2 emissions

From a general perspective, a flat levy on fuel provides limited incentives to invest in radically innovative means to limit fuel consumption and thereby CO_2 emissions (examples: sophisticated heat recovery installations, alternative propeller and stern designs). A bunker levy will have the same impact, as expectations of escalating fuel costs do represent an incentive to improve efficiency. However, to justify expensive investments leading to radical emission reductions, a very high bunker charge (with resulting conveyance of high bunker price to the operator) would have to be applied for the operator to achieve a satisfactory return on investment due to fuel savings alone. A bunker levy will thus most likely drive only incremental efficiency improvements.

Consequently, as previously discussed in 3.1, it is not anticipated that a bunker charge will have significant direct impact on world fleet CO_2 emissions. The economic activity levels worldwide are expected to continue to create a strong demand for transportation services, far outweighing the relatively limited dampening effect of a carbon charge. While this, as debated previously, is dependent on the precise level of the levy, the growth in shipping capacity and volume has proven itself fairly insensitive to increases in bunker prices under the present market conditions. Hence the contemporary proposal for a mandatory CO_2 design index.

This notwithstanding, a bunker levy scheme can have a direct and possibly significant environmental impact through the purchase of CO_2 emission credits. Note, however that the impact is not necessarily easily quantifiable, as it ties in with market mechanisms governing operations in the carbon markets, as per below.

3.6.1 Qualitative assessment of environmental and scheme impact on carbon pricing

In general terms, it can be stated that when a carbon credit is purchased, the revenue created is financing emission reductions where the credit was generated. In this sense, the number of carbon credits purchased by means of revenue collected from the shipping industry, can be considered to be a direct measure of environmental impact. The bunker levy level and funds collected will thus directly affect the amount of emission credits that can be purchased, and thus, by extrapolation, the environmental impact.

A reasonable bunker levy level will have to be subject to negotiation and agreement. If the intent should be that international shipping is to truly cover the costs of emission and redeem these by purchasing emission credits generated elsewhere, the argument can be made that a levy rate should be linked to the CO_2 credit costs. The levy would then be set to match the cost of the CO_2 credits that must be purchased, so as to cover the cost of the CO_2 emissions generated by burning the fuel.

Consider the following example;

As of 22 November 2007 the December ’08 futures cost for Phase II of the European Union Allowances of the EU Emission Trading Scheme hit €24/ton CO_2.

Using the present exchange rates, a ratio of 3.17 tons CO_2 generated per ton of fuel, a bunker charge would have to be set at approximately USD 110 per ton, before administrative overhead costs to cover the cost of purchasing the requisite emission credits.

This would then generate a per annum revenue stream of in excess of USD 30 billion (assuming a world bunker consumption of approximately 300 Mton), in a world carbon market presently valued at approximately USD 70 billion.

It should be noted that a factor complicating this picture is that the largest carbon market in the world, the EU ETS system, deals in carbon allowances (EUA's), not carbon credits[5]. However, carbon credits (CER's) generated under the Kyoto Mechanisms (notably JI and CDM) can be converted to EUA's, thus creating competition between EU industries and the shipping GHG fund for a limited amount of credits. (The Kyoto Mechanisms JI and CDM generated credits are today valued at approximately USD 5 billion.)

It is not at all clear how disruptive this will be to the shipping industry, or specifically to the carbon trading mechanisms. While the shipping industry has proven itself capable of absorbing these kinds of fuel price increases, the carbon exchanges will likely see an excess of money chasing far too few credits. What this will do to the price of credits, and what kind of impact it will have on the carbon costs for other industry sectors, is by no means clear, but based on standard economic considerations an increase in prices would be likely.

In order to reduce disruptive impacts in other industries, it may be presumed that funds would have to be either limited in amount (by lowering the levy level and thus leaving international shipping only partially covering the cost of its emissions), or allocated to other activities. One obvious option would be, as proposed, to channel a significant amount to climate adaptation measures. This, while a reasonable option considering the intent of the scheme, will, however, not directly impact emission levels.

3.7 Promoting enhanced technical operational and commercial ship deployment practices

Fuel saving derived from improved operational practices (better main engine tuning, better voyage monitoring, better tactical and weather routing, improved autopilots, speed adapted to consider waiting time in arrival port, etc.) and new contractual practices between cargo and ship owners (larger ships, ships with improved adaptation to transportation needs, higher ship utilization, slower steaming, etc.) are all possible actions that target the achievement of increasing energy efficiency in performing the required transport work.

Similarly to what is the case for stimulating investments in emission reducing technology (sec. 4.6), a bunker levy will have the exact same effect as a bunker price increase. It is clear that there is a certain total bunker price threshold (including market price and levy) where an improvement in technical operations and deployment practices will be a likely consequence; this price level, however, will also depend on the operators' ability to pass on fuel price increases in the form of higher transportation costs. At present it may appear that we are close to a fuel price/transport cost ratio that in certain shipping segments will by force imply such improvement, most notably in the international container trade. A case to be quoted in this context may be the recent decision by French container operator CMA CGM to reduce the speed of all vessels operating between Europe and Asia (Lloyds register – Fairplay web links, 15 November 2007). Even taking into account the ensuing need for an additional ninth vessel on the route, the company is expecting to see significantly reduced total fuel costs and emissions. It remains to be seen whether this will become a solution adopted by other operators as well.

[5] CO_2 price dynamics: The implications of EU emissions trading for the price of electricity, J.P.M. Sijm, S.J.A. Bakker, Y. Chen, H.W. Harmsen &W. Lise. Energy research Centre of the Netherlands (ECN), September 2005

It is therefore considered possible that a sufficiently high bunker levy may drive improvements, but it seems likely that for any "reasonable" levy level the incentives will be sufficient for significant impact only for certain industry sectors.

3.8 Accomplishment of the goals at minimum overall cost

Different incentive schemes may target and accomplish the same goals but at different overall costs. A comprehensive study, based on detailed design information on a bunker levy scheme would be required to comment on this issue more precisely. It would be particularly crucial to base such an assessment on a defined levy level. The qualitative analysis performed by the OECD[2] in 1997, based on interviews in various industry areas, indicate that ship operators would tend to emphasize evasion strategies and increased transportation costs rather than investments in energy efficiency. Fuel costs are at a significantly higher level today, so the findings may no longer be relevant, but they are indicative of the industry position. Nevertheless, this again emphasizes the need for the mandatory CO_2 design index.

From a more general perspective, and considering overall analyses of various policy options, the following general findings tend to apply[6].

- It is the experience with land based schemes, that flat levy or tariff based schemes are less effective than schemes with more targeted incentives which by all means appear obvious.
- Schemes which address the performance of individual plants (or ships) and companies are more effective than schemes collectively addressing an industry
- Schemes which promote performance, based on functionally stated goals, leaving it to the participating parties to decide on the applicable means in each case, are more effective than schemes which prescribe specific solutions

3.9 Predictable long-term frame conditions

The suggested scheme is both global and controlled by the shipping community through the IMO. Depending on design decisions, the requisite elements for a stable system can be inherent. However, a key issue remains, namely what type of mechanism would be utilized to define the appropriate levy level, and what would be the criteria governing adjustments, e.g., if the rate was linked directly to the cost of acquiring the requisite CO_2 credits, the end result would most likely be an extreme volatility in the levy rate, as exemplified by the extreme changes in CO_2 credit price over the last few years. Provided that this issue can be addressed in an appropriate manner, all components exist to provide a framework which is as predictable as it can possibly be, considering the inherent associated uncertainties.

[6] See Greenhouse gas emissions for shipping and implementation guidance for the marine sulphur directive. CE Delft, December 2006 *and* Economic Instruments for Reducing Ship Emissions in the European Union. NERA Economic Consulting, September 2005.

3.10 Legal issues

When considering legal issues, it is important that a proposed bunker levy in no way conflicts with other international legal instruments or binding conventions. An IMO instrument would be considered internationally binding and enforceable in the sense that port States would be entitled to establish mechanisms ensuring that ships trading on their harbours would have to demonstrate compliance with such regulations. There would likely be less legal grounds for interfering with non-complying ships merely passing through national waters, ref. the right of innocent passage defined in United Nations Convention on Laws Of the Sea (UNCLOS).

While a detailed legal analysis should be performed as part of a policy design, it is considered from a general perspective that a bunker levy scheme would be legally acceptable.

The choice of legal instrument is a matter of its own. Taking into account the urgency of the matter, no choice appears more appropriate than a solution within the MARPOL convention. Any new dedicated instrument could perhaps be preferable – for other reasons – but alone the uncertainty of actual entry into force of such instruments appears to preclude that option.

4 Operational experiences from other fee schemes

As of today, all fee schemes in the maritime industry are localized in nature. The level of application ranges from port fees and fairway dues, up to and including national taxes on various emissions. The approaches taken in establishing these schemes range from merely setting an appropriate fee level in order to promote green local operations (e.g., port of Gothenburg port fees), up to attempting to set a fee level defined to reach national emission goals (e.g., the Norwegian NOx tax). Port and fairway taxes are generally something an operator is subject to in order to trade at the location, and are thus difficult to avoid. National level taxes, however, tend to create opportunities for evasive strategies. The Norwegian CO_2 tax on fuels for instance, has created a situation where coastal cargo carriers tend to divert to Denmark on a regular basis with the sole purpose of bunkering. This is obviously not environmentally beneficial, even if it makes economic sense to the operator.

Likewise, the implementation of the NOx fee, and the way it differentiates between flag States has led to cases of vessels being re-flagged so as to reduce or avoid the level of taxes paid.

The examples of evasive strategies are numerous and manifold, underscoring the argument that the design of a global bunker levy system, in a world where there will most likely be non-participating countries, possibilities of off-shore bunkering, etc., will have to be very carefully contemplated if undesirable effects are to be avoided. The principle of no more favourable treatment, however, is a very strong tool as long as the overwhelming part of the world subscribes to the measure.

5 Conclusions

Based on the preceding discussions and analyses the following may be concluded;

- A levy applied to marine bunker is in general not likely to have a significant impact on total emissions of CO_2 from international shipping. At best it would drive a limited amount of ship efficiency improvements, thus possibly somewhat dampening the present growth in emissions.
- A levy can, however, be utilized to achieve significant CO_2 emission reductions elsewhere through the purchase of CO_2 credits. A key issues in determining impact would be to define to what extent the maritime industry should counterbalance its CO_2 emissions and consequently how or if the bunker levy level should be linked to the market price of CO_2 credits.
- The funds generated by a bunker levy may potentially have a significant disruptive impact in the existing carbon markets, possibly having adverse cost consequences for other industrial sectors buying credits in the same market. Further economic modelling and analysis is required to evaluate this in detail.
- The establishment of a transparent and fraud free levy collection, transfer and disbursement system appears to be complex, but possible. The mechanism under the IOPC Fund indicates that complex global collection systems can be achieved and made workable.
- The principles of no more favourable treatment must be applied to preclude any non-participating countries potentially providing a source of bunker with no levy imposed.

To summarize – it will be challenging to design a bunker levy system but there seems to be no alternative if the shipping industry shall meet its responsibility towards the urgent issue of global warming.

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