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REDUCTION OF GHG EMISSIONS FROM SHIPS

Full report of the work undertaken by the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures

Note by the Secretariat

SUMMARY

Executive summary:	This document contains the report of the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures, established by the Secretary-General as requested by the Committee at its sixtieth session
Strategic direction:	7.3
High-level action:	7.3.2
Planned output:	7.3.2.1
Action to be taken:	Paragraph 2
Related documents:	MEPC 59/INF.10, MEPC 59/24 (annex 16); MEPC 60/4/57, MEPC 60/WP.7, MEPC 60/22 and MEPC 61/4/39

1 The Committee will recall that, at its sixtieth session, it decided to undertake a feasibility study and impact assessment of all the proposed market-based measures submitted to that session in accordance with the work plan for further consideration of market-based measures, which was agreed at its fifty-ninth session (MEPC 59/24, annex 16). Having held an in-depth debate on the issue, the Committee agreed that an expert group was the best available solution to undertake the feasibility study and impact assessment and agreed to its Terms of Reference (MEPC 60/22, annex 8). In order to fulfil the above need, the Committee requested the Secretary-General to establish the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures.

Action requested of the Committee

2 The Committee is invited to note the report of the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures and take action as it may deem necessary.

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LIST OF ABBREVIATIONS

AAU	Assigned Amount Unit
BAU	Business as usual
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
EEDI	Energy Efficiency Design Index
EEOI	Energy Efficiency Operational Indicator
ERU	Emission Reduction Units
ETS	Emission trading system
EUA	EU emission allowances
GHG	Greenhouse gas
ICAO	International Civil Aviation Organization
IGO	Intergovernmental Organization
IMF	International Monetary Fund
IOPC	International Oil Pollution Compensation
IPCC	Intergovernmental Panel on Climate Change
IPTA	International Parcel Tankers Association
IUCN	International Union for Conservation of Nature
JI	Joint Implementation
LDCs	Least developed countries
LIS	Leveraged incentive scheme
MAC	Marginal abatement cost
MARPOL	International Convention for the Prevention of Pollution from Ships
MBM	Market-based measures
MEPC	Marine Environment Protection Committee
NGO	Non Governmental Organization
PSC	Port State control
PSL	Port State Levy
R&D	Research and development
RM	Rebate Mechanism
RO	Recognized Organization
SBSTA	Subsidiary Body for Scientific and Technological Advice
SECT	Ship Efficiency and Credit Trading
SIDS	Small island developing States
STEEM	Ship Traffic, Energy and Environment Model
UNCLOS	United Nations Convention on Law of the Sea
UNFCCC	United Nations Framework Convention on Climate Change
VES	Vessel Efficiency System
WTO	World Trade Organization
$	United States dollar

1 EXECUTIVE SUMMARY

BACKGROUND

1.1 The Marine Environment Protection Committee, at its 60th session decided to undertake a feasibility study and impact assessment of the market-based measure (MBM) proposals submitted in accordance with the work plan for further consideration of market-based measures.

1.2 In order to undertake this study, the Secretary-General established an Expert Group on Feasibility Study and Impact Assessment of Possible Market-Based Measures (the Expert Group). The Expert Group was made up of experts nominated by Member Governments and organizations, but each expert served in their own personal capacity. Consistent with the terms of reference given by the Committee, the experts were to evaluate the various proposals with the aim of assessing the extent to which they could assist in reducing GHG emissions from international shipping. To guide its analysis, the Expert Group was given the following nine criteria:

.1 the environmental effectiveness, e.g., the extent to which the proposed MBM is effective in contributing to the reduction of greenhouse gas (GHG) emissions from international shipping;

.2 the cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development;

.3 the proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies;

.4 the practical feasibility of implementing the proposed MBM;

.5 the need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island development states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions;

.6 the MBM proposal's relation with other relevant conventions such as the UNFCCC, Kyoto Protocol, and WTO, as well its compatibility with customary international law, as depicted in UNCLOS;

.7 the potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM;

.8 the potential additional workload, economic burden, and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM; and

.9 the MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework.

1.3 This Expert Group study comes at a critical time in IMO's deliberations on how to address greenhouse gas (GHG) from the maritime sector. As noted in the Second IMO GHG Study 2009, international shipping contributed to 2.7% of the global emissions of CO_2 in 2007. This contribution is expected to increase in the future due to projected growth in world trade and the demand for seaborne transport. International shipping is, by far, the most energy efficient method of transporting goods; however, the resulting emissions will contribute to climate change due to the long lasting effects of CO_2 in the atmosphere.

1.4 The ten proposals analysed describe programmes that would target GHG reductions through in-sector emission reductions from shipping or out-of-sector emissions reductions through the collection of funds to be used for mitigation activities in other sectors that would contribute towards the overall goal of reducing global GHG emissions. The submission by Germany was not evaluated since this was an impact assessment and could not be reviewed against the nine criteria. It was thus treated as an information resource to assist in the assessment of the proposals under review.

1.5 To manage the work in a tight time scale, the Expert Group established four task-groups: Environment, Shipping and Maritime, Administrative and Legal, and Trade and Development and Developing Countries. In addition to the three meetings of the Expert Group, at the IMO headquarters, in London, the task-groups worked by various means including electronic correspondence, face to face meetings, and telephone conferencing. Two external consultants were commissioned to undertake detailed analytical work.

1.6 All of the proposals directed at establishing a MBM to reduce GHG emissions bring forward concepts that have merit for achieving cost-effective reductions in GHG emissions. However, many of the issues considered by the Group were complicated by the fact that none of the proposals have final legal text from which to evaluate the administrative and legal criteria given by the MEPC.

1.7 The MBM proposals seek to achieve similar objectives to a greater or lesser extent through differing methodologies. Some mechanisms clearly state all objectives and/or they are reflected in the design of the MBM. In other cases the policy objectives would need to be developed further and these could influence the environmental effectiveness and other benefits delivered by the MBM.

1.8 The Report is organized in five main parts related to the evaluation of the various mechanisms as follows:

- Proposals evaluated (Chapter 6)
- Assumptions (Chapter 7)
- Evaluation of the ten proposals against the nine criteria (Chapters 9 to 18)
- General impacts of market-based measures on trade, competition and consumer prices (Chapter 19)
- Conclusions (Chapter 20)

OVERVIEW OF THE VARIOUS PROPOSALS

1.9 The following provides a brief overview of the ten proposals analysed. The order of analysis was agreed by the Expert Group and this order follows the structure of the full report.

.1 **An International Fund for Greenhouse Gas emissions from ships (GHG Fund) proposed by Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA (MEPC 60/4/8)** – would establish a global reduction target for international shipping, set by either UNFCCC or IMO. Emissions above the target line would be offset largely by purchasing approved emission reduction credits. The offsetting activities would be financed by a contribution paid by ships on every tonne of bunker fuel purchased. It is envisaged that contributions would be collected through bunker fuel suppliers or via direct payment from shipowners. The contribution rate would be adjusted at regular intervals to ensure that sufficient funds are available to purchase project credits to achieve the agreed target line. Any additional funds remaining would be available for adaptation and mitigation activities via the UNFCCC and R&D and technical co-operation within the IMO framework.

.2 **Leveraged Incentive Scheme (LIS) to improve the energy efficiency of ships based on the International GHG Fund proposed by Japan (MEPC 60/4/37)** – is designed to target "direct" reduction of CO_2 emission primarily from the shipping sector. The concept of the Leveraged Incentive Scheme is that a part of the GHG Fund contributions, which are collected on marine bunker is refunded to ships meeting or exceeding agreed efficiency benchmarks and labelled as "good performance ships".

.3 **Achieving reduction in greenhouse gas emissions from ships through Port State arrangements utilizing the ship traffic, energy and environment model, STEEM (PSL) proposal by Jamaica (MEPC 60/4/40)** – an IMO global agreement, Member States participate in levying a uniform emissions charge on all vessels calling at their respective ports based on the amount of fuel consumed by the respective vessel on its voyage to that port (not bunker suppliers). The proposal is directly aimed at reducing maritime emissions of CO_2 without regard to design, operations, or energy source. The Port State Levy would be structured to achieve the global reduction targets for GHG and could be leveraged in a manner as proposed by Japan to reward vessels exceeding efficiency targets.

.4 **The United States proposal to reduce greenhouse gas emissions from international shipping, the Ship Efficiency and Credit Trading (SECT) (MEPC 60/4/12)** – is designed to focus emission reduction activities just in the shipping sector. Under SECT, all ships, including those in the existing fleet, would be subject to mandatory energy efficiency standards, rather than a cap on emissions or a surcharge on fuel. As one means of complying with the standard, SECT would establish an efficiency-credit trading programme. The stringency level of these efficiency standards would be based on energy efficiency technology and methods available to ships in the fleet. These standards would become more stringent over time, as new technology and methods are introduced. Similar to the EEDI, these efficiency standards would be based on a reduction from an established baseline and would establish efficiency standards for both new and existing ships. The SECT is designed to achieve relative GHG reductions, i.e. reductions in emissions per tonne mile and not to set an overall target for the sector.

.5 **Vessel Efficiency System (VES) proposal by World Shipping Council (MEPC 60/4/39)** – would establish mandatory efficiency standards for both new and existing ships. Each vessel would be judged against a requirement to improve its efficiency by X% below the average efficiency (the baseline) for the specific vessel class and size. Standards would be tiered over time with increasing stringency. Both new build and existing ships would be covered. New builds must meet the specified standards or they may not operate. New builds, once completed, are not defined as existing ships. The system applicable to existing ships sunsets when today's fleet turns over. Existing ships may comply by improving their efficiency scores through technical modifications that have been inspected and certified by the Administration or recognized organizations. Existing ships failing to meet the required standard through technical modifications would be subject to a fee applied to each tonne of fuel consumed. The total fee applied (non-compliant ships only) would vary depending upon how far the vessel's efficiency (as measured by the EEDI) falls short of the applicable standard. A more efficient ship would pay a smaller penalty than a less efficient ship that falls short of the standard by a wide margin.

.6 **The Global Emission Trading System (ETS) for international shipping proposal by Norway (MEPC 61/4/22) –** would set a sector-wide cap on net emissions from international shipping and establish a trading mechanism to facilitate the necessary emission reductions, be they in-sector or out-of-sector. The use of out-of-sector credits allows for further growth of the shipping sector beyond the cap. In addition the auction revenue would be used to provide for adaptation and mitigation (additional emission reductions) through UNFCCC processes and R&D of clean technologies within the maritime sector. A number of allowances (Ship Emission Units) corresponding to the cap would be released into the market each year. It is proposed that the units would be released via a global auctioning process. Ships would be required to surrender one Ship Emission Unit, or one recognized out-of-sector allowance or one recognized out-of-sector project credit, for each tonne of CO_2 they emit. The Norwegian ETS would apply to all CO_2 emissions from the use of fossil fuels by ships engaged in international trade above a certain size threshold. The proposal also indicates that limited exemptions could be provided for specific voyages to Small Island Developing States.

.7 **Global Emissions Trading System (ETS) for international shipping proposal by the United Kingdom (MEPC 60/4/26)** – is very similar in most respects to the global ETS proposal by Norway. Two aspects of the UK proposal that differ from the Norwegian ETS proposal are the method of allocating emissions allowances and the approach for setting the emissions cap. The UK proposal suggests that allowances could be allocated to national governments for auctioning. It also suggests the net emission cap would be set with a long term declining trajectory with discrete phases (for example, five to eight years) with an initial introductory or transitional phase of one to two years.

.8 **Further elements for the development of an Emissions Trading System (ETS) for International Shipping proposal by France (MEPC 60/4/41)** – sets out additional detail on auction design under a shipping ETS. In all other aspect the proposal is similar to the Norwegian proposal for an international ETS.

.9 **Market-Based Instruments: a penalty on trade and development proposal by the Bahamas (MEPC 60/4/10)** – does not set explicit standards or reductions to be achieved in the shipping sector or out-of-sector for GHG reductions. The proposal clearly sets forth that the imposition of any costs should be proportionate to the contribution by international shipping to global CO_2 emissions. Bahamas' Focal Point has indicated that it is assuming that mandatory technical and operational measures would be implemented such as the EEDI. The proposal would apply to all ships engaged in both domestic and international maritime transport as fuel prices impact all market segments and trades.

.10 **A Rebate Mechanism (RM) for a market-based instrument for international shipping proposal by IUCN (MEPC 60/4/55)** – focuses on a Rebate Mechanism to compensate developing countries for the financial impact of a MBM. A developing country's rebate would be calculated on the basis of their share of global costs of the MBM, using readily available data on a developing country's share of global imports by value as a proxy for that share (or another metric such as value-distance if data becomes available). The proposal indicates that, in principle, the Rebate Mechanism could be applied to any maritime MBM which generates revenue such as a levy or an ETS. In order to evaluate the proposal, the Rebate Mechanism has been assessed integrated with a MBM (see MEPC 60/4/55).

ENVIRONMENTAL OVERVIEW

1.10 The Environment task-group evaluated the various proposals against criteria numbers 1 and 2 (in part).

Reduction mechanism employed by the proposals

1.11 The proposed MBMs deliver reductions in GHG emissions through eight mechanisms. One or more of these mechanisms are used in combination by each MBM. These mechanisms work to deliver reductions in GHG emissions either within the sector or from outside the sector. The mechanisms are described below.

In-sector mechanisms

1.12 **Mandatory EEDI:** Mandatory EEDI design standards that apply to all new builds prior to entering the fleet. Reductions from the standards would be determined by the stringency of the standards over time and the penetration of new builds into the fleet.

1.13 **SECT with efficiency trading:** An efficiency standard which applies to all ships operating in the international fleet combined with an efficiency trading scheme. Ships which are more efficient than the standard could generate efficiency credits while ships below the standard could purchase credits as a second option for complying with the standard. Emission reductions would be determined by the stringency of the standards over time.

1.14 **VES existing ship standard combined with fuel based charge:** An EEDI standard which would apply to ships built prior to the scheme entering into force, with the option of paying a fee for ships failing to meet the standard. In general, existing ships for which it is technically feasible to meet the standard would comply with the standard or pay the charge depending on which option would be judged to be most cost-effective. The extent, to which in-sector emission reductions are stimulated in existing ships would therefore, largely be a function of the fee. The base fee would be a significant fraction of the fuel price.

1.15 **Price incentive applied to fuel**: A broad based price signal applying to all fuel consumed by ships engaged in international trade (above an agreed threshold). This price signal could arise from paying a contribution or levy on fuel, or through being required to purchase and surrender emission allowances or credits for emission from fuel use. The price would primarily influence the amount of in-sector reductions achieved through this element, and the MBMs under review differ on how this price is established.

1.16 **Leverage refund incentive:** Ships that meet certain 'good performance' criteria would be eligible to receive a full or partial refund on a levy (price signal) they are required to pay on fuel. This increases the incentive for in-sector reductions over a standard price signal by directing revenues back into the sector.

Out-of-sector mechanisms

1.17 **Purchase of out-of-sector credits by the shipping sector:** Ships would be required to surrender one Ship Emission Unit (an allowance) or credit/allowance from outside the sector for each tonne of GHG they emit. By only releasing a limited number of Ship Emission Units into the market each year, any emissions that exceed that limit would be offset by the sector's purchase of project credit/allowance from outside the sector.

1.18 **Prescribed purchase of out-of-sector reductions by a fund:** Revenue collected in the operation of an MBM would be used by a central (global) fund in accordance with agreed rules to purchase emissions reductions outside the sector. This mechanism is prescribed by two proposals: the GHG Fund, where the rules prescribe that sufficient offsets must be purchased to deliver a net emission target; and the Rebate Mechanism, where the rules prescribe that a fixed portion of the revenues must be used to purchase offsets.

1.19 **Remaining proceeds:** Revenue collected in the operation of a MBM which is not explicitly allocated to mitigation. This revenue could be used for a range of purposes including climate change adaptation and mitigation, R&D and technological cooperation, or as compensation. These are largely policy considerations, but to the extent that revenues would be used for mitigation it would increase the environmental effectiveness of the proposal, although there is an obvious trade-off between delivering environmental benefits and delivering other benefits. Rebates and other proceeds designated under the direct control of national governments are not included in Remaining Proceeds.

Emission reduction and other benefits

1.20 A model was developed to examine in-sector and out-of-sector emission reductions and costs of the MBM proposals under a range of scenarios. The "remaining proceeds" and the potential supplementary out-of-sector reductions that could be delivered should 100 per cent of proceeds be used for mitigation (calculated for comparative purposes) was also estimated in the modelling:

.1 two growth rates; B2 (1.65 per cent growth) and A1B (2.8 per cent growth);

.2 three targets 0%, 10% and 20% below 2007 GHG emission levels (as per Second IMO GHG study 2009) for the GHG Fund, and ETS proposals, with an additional 10 per cent contribution assumed under the GHG Fund for adaptation and R&D purposes (shown as remaining proceeds);

.3 28 per cent of revenues are used for mitigation under the Rebate Mechanism proposal and 25, 50 or 75 per cent of revenues refunded to "good performing ships" under the LIS proposal';

.4 three stringencies for efficiency index standards for the SECT and VES proposals; low, medium and high; and

.5 two carbon price scenarios; medium and high; and two fuel price scenarios; reference and high.

	GHG Fund[1]	Leveraged Incentive Scheme (LIS)	Port State Levy (PSL)	Ship Efficiency and Credit Trading (SECT)	Vessels Efficiency System (VES)	Emission Trading Scheme (ETS) (Norway, France)	Emission Trading Scheme (ETS) (UK)	Bahamas	Rebate Mechanism (RM) [2]
Mandatory EEDI (Mt)				123-299	123-299			3	
SECT standard with efficiency trading (Mt)				106-142					
VES existing ship standard combined with fuel based charge (Mt)					14-45				
Price incentive applied to fuel (Mt)	1-31	32-153[4]	29-119			27-114	27-114		29-68
Leverage refund incentive (Mt)									
Purchase of out-of-sector project credits by shipping sector (Mt)						90-539	90-539		
Prescribed purchase of out-of-sector reductions by fund (Mt)	152-584								124-345
Total reductions (% of BAU)	13-40%	3-10%	2-8%	19-31%	13-23%	13-40%	13-40%	2	13-28%

1 Includes an illustrative additional contribution of 10% for the purposes of adaptation, R&D and technical cooperation.

2 The Rebate Mechanism has been integrated with an MBM system following the IUCN submissions to MEPC 60/4/55 and further details provided in the IUCN Technical Report submitted to the MBM-EG under paragraph 4.7 of the Terms of Reference of MBM-EG (MEPC 60/J/9). This option of the proposal is referred to in this document as "RM integrated" and illustrates how the mechanism can be operationalized; and allows the proposal to be comprehensively assessed.

3 Should the EEDI be accepted by the Committee, EEDI reductions would be taken into account in the BAU scenario, and thus accounted for in the evaluation of the Bahamas proposal.

4 Includes in sector reductions from the price incentive applied to fuel and the leverage refund incentive.

	GHG Fund	Leveraged Incentive Scheme (LIS)	Port State Levy (PSL)	Ship Efficiency and Credit Trading (SECT)	Vessels Efficiency System (VES)	Emission Trading Scheme (ETS) (Norway, France)	Emission Trading Scheme (ETS) (UK)	Bahamas	Rebate Mechanism (RM)
Remaining proceeds ($billion)	$4-14	$10-87	$40-118	$0	$5-18	$28-87	$0[5]	0	$17-23[6]
Potential for purchase of supplementary out-of-sector reductions using remaining proceeds(Mt)	104-143	232-919	917-1232	0	45-454	696-870	0[4]	0	187-517[5]

Certainty of emission reductions

1.21 Different MBMs provide different levels of certainty over an absolute or relative target (or in some cases no certainty over a target). The GHG Fund, SECT and shipping ETS are designed to deliver certainty over a particular outcome. For the GHG Fund and shipping ETS this outcome is to constrain the sector's net emissions to an agreed level. On the other hand, SECT is designed to deliver certainty over a relative target of emissions per tonne mile.

1.22 The other proposals are not designed with the goal of strict certainty of outcome in mind with regards to emissions reductions. Nevertheless this does not mean that the reductions achieved by these mechanisms could not be predictable, to a greater or lesser extent. Moreover, some of these proposals would generate remaining proceeds, which could be used for a range of purposes, and policies that guide the use of this revenue could have a significant bearing on the certainty of outcome.

1.23 The reductions shown in the table above for the different mechanisms indicate:

.1 There is a high degree of certainty that reductions achieved by mandatory technical standards would be delivered, as ships that do not meet the standard would not operate.

.2 The extent to which reductions would be achieved in response to a price signal (charge on fuel) are generally uncertain, due to the influence of non-price barriers. However, where a price signal is used in the context of the GHG Fund or ETS, more or less reductions in-sector would be compensated for by more or less reductions out-of-sector.

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5 While this proposal would raise revenue from auctioning allowances it appears that auction revenues will remain with national Governments. This revenue has not been considered available for supplementary reductions. Such revenues could however be made available subject to decisions and implementation of mechanisms at the national level.

6 While this proposal would raise revenue from a levy it appears that 30 per cent of revenue which is rebated will remain with national Governments. This revenue has not been considered available for supplementary reductions. Such revenues could however be made available subject to decisions and implementation of mechanisms at the national level.

.3 Reductions achieved in response to a leverage refund incentive are also somewhat uncertain as shipowners would make decisions on whether or not to respond to this incentive on the basis of its likely costs and benefits.

1.24 Certainty can also be viewed from the perspective of whether the reductions are verifiable. For all MBMs the integrity of the scheme depends on robust monitoring, reporting and verification requirements for the shipping industry and well designed compliance and enforcement systems. Similar, monitoring, reporting and verification systems as well as robust processes for managing the additionality would be required for any out-of-sector reductions accessed through the MBM. This element needs to be further developed for most of the proposals. In relation to other out-of-sector reductions accessed through the MBM, comparable system for monitoring, reporting and verifications is also required.

SHIPPING OVERVIEW

1.25 The Shipping task-group evaluated the various proposals against criteria numbers 2 (in part), 3 and 8. In its analysis, the task-group commissioned a marginal abatement cost study. Cost effective operational and technical emission reduction measures are available to the shipping sector. However barriers exist in the uptake of many of these measures.

Cost Effectiveness

1.26 All of the proposals were modelled to enable an assessment of their environmental effect together with the indicative cost. The cost of reductions was determined by relating the delivered in-sector and out-of-sector emission reductions to the cost to the industry.

1.27 The potential cost-effectiveness was determined by considering the combined effect of assessed in-sector emission reductions, together with the out-of-sector mitigation possible by utilization of all available remaining funds related to the cost to the industry.

Potential to Provide Incentives to Technological Change

1.28 The potential of each proposal to drive investments in additional energy efficiency measures was evaluated together with the benefit to be gained from early implementation of energy efficiency improvements.

Potential Additional Workload

1.29 The cost relating to the additional burden to crew associated with operation and maintenance was evaluated. This was then calculated as a percentage of the gross cost to the industry of each measure for comparative purposes. The table below highlights the Group's evaluations of each of the above considerations for the MBMs under evaluation.

MBM	Cost of MBM, based on A1B 2030 Scenario	Investment certainty comments	Early action benefit	Potential additional on board workload
GHG Fund (Denmark *et al.*)	The cost of reductions is estimated to be 50 $/tonne CO_2 abated. The maximum cost-effectiveness potential of the proposal is 39 $/tonne CO_2 abated assuming all funds are allocated to mitigation (including the additional 10% contribution rate)	Cost predictability involves two aspects: .1 inherent stability of fixing the price for a given time period; and .2 need to adjust the price between periods to compensate for any over/under collection in the period compared to the CDM market fluctuations within the same period. The level of contribution has to be set on the basis of the global carbon price. Averaging over several periods this proposal will not be more or less costly than other proposals hinging on the Model Carbon Price.	Neutral	$0.1 billion or less than 0.5% of the gross cost of the proposal
LIS (Japan)	The cost of reductions is estimated to be 319 $/tonne CO_2 abated. The amount of funds collected for other purposes is $24 billion. The maximum cost-effectiveness potential of the proposal is 36 $/tonne CO_2 abated assuming all funds are allocated to mitigation	Cost predictability involves aspects related to the inherent stability of fixing the price for a given time period.	Relatively high.	$0.9 billion or about 2% of the gross cost of the proposal. It shall be emphasized that this value is a gross estimation.
PSL (Jamaica)	The cost of reductions is estimated to be 770 $/tonne CO_2 abated. The amount of funds collected for other purposes is $49 billion. The maximum cost-effectiveness potential of the proposal is 38 $/tonne CO_2 abated assuming all funds are allocated to mitigation	Cost predictability involves two aspects: .1 inherent stability of basing the price on the carbon price; and .2 volatility of the carbon price.	Neutral	$0.8 billion or about 1.5% of the gross cost of the proposal
SECT (USA)	Not possible due to the modelling approach selected	The cost-effectiveness could not be calculated as the gross cost for the scheme could not be determined.	High	not priced

MBM	Cost of MBM, based on A1B 2030 Scenario	Investment certainty comments	Early action benefit	Potential additional on board workload
		However new ships will be built to achieve the mandatory EEDI standards and therefore both comply with the less stringent existing ship efficiency index standards, and be eligible to earn project credits.		
VES (WSC)	The cost-of reductions is estimated to be 247 \$/tonne CO_2 abated. The amount of funds generated for other purposes is \$7.4 billion. The maximum cost-effectiveness potential of the proposal is 34 \$/tonne CO_2	The Vessel Efficiency System is based on the EEDI. Investment in any improvement of the EEDI for an existing ship towards meeting the standard will thus generate a well-defined return in limiting the costs applied to fuel consumption.	High	The cost of additional workload onboard is \$0.4 billion or 5% of the gross cost.
ETS (Norway)	The cost of reductions is estimated to be 96 \$/tonne CO_2 abated The amount of funds collected for other purposes is \$31 billion. The maximum cost-effectiveness potential of the proposal is 38 \$/tonne CO_2 abated assuming all funds are allocated to mitigation	The existing carbon market shows that volatility of the carbon price is similar to the volatility of the bunker price. However, the absolute variance (the amplitude) in terms of the difference between the maximum and the minimum level of the carbon price is much lower than the absolute variance of the bunker fuel price. It should be noted that shipowners are experienced in coping with fluctuating bunker prices.	Neutral	\$0.7 billion or about 1.5% of the gross cost of the proposal

MBM	Cost of MBM, based on A1B 2030 Scenario	Investment certainty comments	Early action benefit	Potential additional on board workload
Bahamas	There are no additional costs of the Bahamas proposal to those that would arise under business as usual, which include the normal costs of fuel.	The volatile price of fuel has historically been an inhibitor for investment stability in shipping.	Neutral	Introduction of a mandatory EEDI for new ships may add to the onboard workload due to addition of technology to reduce emissions.
RM (IUCN)*	The cost-of reductions is estimated to be 121 \$/tonne CO_2 abated. The amount of funds generated for other purposes is \$21 billion, The maximum cost-effectiveness potential of the proposal is 53 \$/tonne CO_2 assuming all funds are allocated to mitigation	The adjustment of the levy is relatively frequent (every 3 months) which potentially makes the price fluctuate more than the GHG Fund proposal where the re-setting of the contribution is anticipated to take place at years intervals	Neutral	\$0.8 billion or about 1.5% of the gross cost of the proposal

* Assessment refers to Rebate Mechanism (RM) integrated with MBM as referenced in MEPC 60/4/55

ADMINISTRATIVE AND LEGAL

1.30 The Administrative and Legal task-group evaluated the various proposals against criteria numbers 2 (in part), 4, 6, 7, and 8.

Relation with Other Conventions

1.31 The administrative and legal task-group was successful in highlighting some of the policy sensitivities inherent when discussing compatibility with the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. The experts recognized that the principle of common but differentiated responsibilities and respective capabilities apply in the context of the UNFCCC and its Kyoto Protocol and the IMO Convention specifies non-discrimination in IMO instruments. However there are different views on application of these principles among the experts. One view is that the UNFCCC provides the central policy infrastructure for global climate change action and the proposed market-based measures must take into account the principle of common but differentiated responsibilities and respective capabilities. Another view is that the principles of the UNFCCC do not apply in the IMO and that all of the market-based measures that aim to reduce emissions are therefore consistent with the UNFCCC.

Practical Feasibility

1.32 The experts agreed that all of the proposals could be implemented in a practical and feasible manner notwithstanding the challenges associated with the introduction of new measures. For all the proposals, the time necessary for the development of a legal instrument would be impacted by broader policy considerations.

1.33 The experts noted that all the proposals need further development so as to minimize concerns over possible carbon leakage, potential for fraud, and global implementation.

Administrative Burden and Compatibility with the Existing IMO Enforcement and Control Provisions

1.34 The administrative requirements of the proposals vary, but all of the MBM proposals require some additional administrative burden from flag States, port States, and shipowners/operators. Some proposals clearly identify the additional administrative issues, in other cases these issues will need to be developed further, which could impact the administrative burden.

1.35 The majority of administrative issues associated with the GHG Fund are related to the central administrative body collecting and distributing the revenue generated. There will also be port and flag State requirements.

1.36 The Emission Trading Scheme(s) would also require administration of a fund to collect and distribute revenue associated with the proposals. There will also be flag State requirements and port State rights.

1.37 The Rebate Mechanism would have the administrative characteristics of whatever proposals it is connected to. However, the Rebate Mechanism itself would require additional administrative responsibilities.

1.38 The Port State Levy does not specify what body will collect and distribute the revenues raised, but that body would have administrative requirements. Administrative requirements for the port State, flag State, and owner/operator will also exist under the Port State Levy programme and could be more than for some other proposals.

1.39 The Leveraged Incentive Scheme has many of the Administrative features in common with the GHG Fund, but as some of the revenues will be distributed to enhance in-sector reductions, it will likely have higher administrative burden than the GHG Fund itself for the administrative body as well as for shipowners/operators.

1.40 The Vessel Efficiency System would require an Administrative body to collect and distribute the revenues collected. Administrative requirements for the port State, flag State, and owner/operator will also exist under this programme.

1.41 The Ship Efficiency and Credit Trading proposal is solely designed to deliver reductions within the shipping sector and as such, does not require any administrative functions from a fund. Administrative requirements for the port State, flag State and owner/operator will also be necessary to ensure efficiency standards are met or an efficiency credit has been purchased.

1.42 The Bahamas proposal focuses on the need to deliver reductions within the sector through technical efficiency and operational measures and will only necessitate any administrative requirements associated with other regulations developed and agreed by IMO (e.g., EEDI).

TRADE AND DEVELOPMENT AND DEVELOPING COUNTRIES

1.43 The task-group evaluated the various proposals against criteria numbers 2 (in part) and 5.

1.44 Most countries, but developing countries in particular, have a strong reliance on international trade for their economic development and thus have a keen interest in proposals likely to increase the cost of shipping goods by sea thereby impacting on their GDP and general economic development.

Potential impact(s) on trade and sustainable development

1.45 The task-group reviewed a number of existing studies on trade impacts and commissioned additional quantitative analysis on consumer impacts of applying the MBM proposals. In general, the results showed that impacts will vary by trade route, vessel type, cargo shipped (especially value by weight), and by the structure of the market in the importing and exporting countries in terms of both local and other land based competition.

1.46 When discussing impacts of market-based measures for the maritime sector, one outcome of the analysis was that developing countries, especially SIDS and LDCs, should not be treated as a collective bloc or blocs of countries. Since the various proposals will have differing impacts on individual LDCs, SIDS and other developing countries.

1.47 Indirect economic costs and benefits were not considered in the quantitative assessment, despite their importance.

1.48 The analysis undertaken also showed that where there is a larger market share for domestic production, the less likely it is that the exporter would be able to pass an increase in transportation costs through to the end consumer due to competition from domestic producers. Conversely, where there is little or no domestic production, the exporter is more likely to be able to pass the increased costs on to the end consumer.

1.49 Increased freight costs will also have a larger impact where goods have a low value to weight ratio, as the increase in freight cost is a larger share of the final cost than for higher value added products. The impact on producers in exporting and importing countries will vary, depending on market shares and price elasticities.

1.50 To the extent that the measures provide incentives to increase the fuel efficiency of ships, there could also be a reduction in operating costs from fuel savings. What the effect might be of efficiency measures for any particular trade route or cargo was not modelled.

1.51 An impact assessment of the proposed MBMs was carried out by Indian National Shipowners' Association on some of their internationally trading vessels and the findings showed that implementation of technical and operational measures to reduce fuel consumption would result in substantial cost savings and reduce GHG emissions. However, ship operators would face challenges in implementing mitigation measures, including access to technology and additional finance.

Technology Transfer

1.52 All the proposals provide some form of incentives for shipowners to improve their ships technically or their operational efficiencies. While a number of measures or technologies that could result in fuel saving for ships exist, there may be hurdles to adopting such measures or technologies, including long payback periods. There could be a need for technology transfer to help improve ship and operational efficiencies.

CONCLUSIONS

1.53 The evaluation of the proposals was completed as requested by the Committee in accordance with the terms of reference and each evaluation provides the required assessment as described in the terms of reference specifically in its paragraph 2.5.

1.54 The evaluation was complicated by the different levels of maturity of the proposals. Proposals with a high level of maturity generated more discussion compared to those that were less developed.

1.55 The Group would like to point out that elements of the proposed measures would require further elaboration and development. Proposals at an early stage of development would be required to be developed further.

1.56 The Group reached its conclusions by consensus apart from a few instances where the evaluation of legal or administrative aspects led to different views as captured in the report.

1.57 All proposals address reduction of GHG emissions from shipping. Some of the proposals go beyond mitigation and propose a mechanism that provides for substantial contribution to address the adverse effects of Climate Change.

1.58 The proposals have different ways of reducing emissions, some focus on "in-sector" reductions and others also utilize reductions in other sectors. The extent of such reductions is detailed within the individual evaluation of each proposal in the report.

1.59 Cost effective operational and technical emission reduction measures are available to the shipping sector. However barriers exist in the uptake of many of these measures.

1.60 The Group has considered sustainable development in a holistic way so that it became an inherent part of the assessment, rather than as an isolated criterion because this was the best approach.

1.61 The Group has identified that the implications of implementing the different MBM proposals for international shipping are directly related to the stringency of the proposed measure. Irrespective of this, the Group concluded that all proposals could be implemented notwithstanding the challenges associated with the introduction of new measures.

1.62 The assessment of the impacts of an increase in bunker fuel prices and freight costs showed that implementation of the proposed measures would affect some countries and products more than others. In some cases even small increases in costs could have relatively significant consequences. Indirect economic costs and benefits were not considered in the analysis. Some of the proposed measures include mechanisms aiming to provide means to mitigate negative impacts.

1.63 The proposals lack, to various degrees, sufficient details for the necessary evaluation of issues such as international harmonization in implementation, carbon leakage, fraud, and traffic of vessels between non-party states, among others. These issues require further policy considerations in order to be more properly addressed.

2 TERMS OF REFERENCE

INTRODUCTION

2.1 The Marine Environment Protection Committee (the Committee), at its sixtieth session (MEPC 60), decided to undertake a feasibility study and impact assessment of all the market-based measure proposals submitted in accordance with the work plan for further consideration of market-based measures (MBM).

2.2 In order to fulfil the above, the Committee requested the Secretary-General to establish an Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures (the Expert Group). The scope of the Expert Group is to evaluate the various proposals on possible MBMs (set out in paragraph 7) with the aim to assessing the extent to which they could assist in reducing GHG emissions from international shipping, giving priority to the maritime sectors of developing countries, least developed countries (LDC) and small islands developing states (SIDS).

2.3 The Committee agreed that the MBM proposals to be assessed are those listed in paragraph 2.7 of this report, and that the Expert Group should work in accordance with the methodology set out below, and that the study/assessment report should be transparent and objective.

METHODOLOGY

2.4 The Expert Group was provided with the following Terms of Reference:

.1 The scope of the feasibility study and the impact assessment is to review the practicability of implementing the various options for a MBM that have been proposed to the Committee as referred to in paragraph 2.3 above.

.2 The study and assessment referred to in paragraph 2.4.1 above shall also aim to identify for each proposed MBM; the reduction potential on GHG emissions from international shipping, its impact on world trade, and the shipping industry, and the maritime sector in general, giving priority to the maritime sectors in developing countries, as well as recognition of the maritime sector in the global efforts to reduce the GHG emissions.

.3 The study/assessment carried out shall provide information on how the difference in the socioeconomic capability between developing and developed states, as well as the special needs and circumstances of developing countries, can be addressed by each different MBM proposal.

.4 The study/assessment will be conducted by a group of selected experts, nominated by IMO Member Governments following an invitation by the Secretary-General, with appropriate expertise on matters within the scope of the study, who, in the discharge of their duties, will serve the Group in their personal capacity.

.5 The Secretary-General will also invite a proportionate number of organizations in consultative status with IMO, and relevant United Nations entities, as well as intergovernmental or international organizations, which can contribute with data and/or with expertise to the work of the Expert Group and will participate as advisers.

.6 The Expert Group should at its establishing meeting, agree on its method of work and meeting dates in accordance with meeting room availability at the IMO Headquarters.

.7 The sponsors of the identified proposals under review should be invited to provide further details to the Expert Group and to comment on any assumptions made related to their proposal. Where more than one Member State or organization has co-sponsored a proposal, a single Focal Point should be appointed.

.8 It is imperative that the final report contains clear, precise, and robust conclusions and factual information.

.9 The Expert Group should, as far as possible, reach its conclusions by consensus, and if not, this should be recorded in the report.

.10 The end result should aim at assisting the MEPC to make well-informed decisions and should not make specific recommendations on policy issues.

.11 While taking into account relevant new information, the Expert Group should not duplicate work that has already been completed.

CRITERIA

2.5 Following the methodology outlined above, the Expert Group, giving priority to the overall impact on the maritime sectors of developing countries, is requested, for each of the submitted MBM proposals referred to in paragraph 2.3 above, to **assess:**

.1 the environmental effectiveness, e.g., the extent to which the proposed MBM is effective in contributing to the reduction of GHG emissions from international shipping;

.2 the cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development;

.3 the proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies;

.4 the practical feasibility of implementing the proposed MBM;

.5 the need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions;

.6 the MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS;

.7 the potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM;

.8 the potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM; and

.9 the MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework.

2.6 **The Expert Group should submit** its conclusions in a written report to MEPC 61.

2.7 MBM proposals to be assessed and evaluated:

MEPC 60/4/8	Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA	An International Fund for Greenhouse Gas emissions from ships
MEPC 60/4/10	Bahamas	Market-Based Instruments: a penalty on trade and development
MEPC 60/4/12	United States	Further details on the United States proposal to reduce greenhouse gas emissions from international shipping
MEPC 60/4/22	Norway	A further outline of a Global Emission Trading System (ETS) for International Shipping
MEPC 60/4/26	United Kingdom	A global emissions trading system for greenhouse gas emissions from international shipping
MEPC 60/4/37	Japan	Consideration of a market-based mechanism: Leveraged Incentive Scheme to improve the energy efficiency of ships based on the International GHG Fund
MEPC 60/4/39	WSC	Proposal to Establish a Vessel Efficiency System (VES)
MEPC 60/4/40	Jamaica	Achieving reduction in greenhouse gas emissions from ships through port State arrangements utilizing the ship traffic, energy and environment model, STEEM
MEPC 60/4/41	France	Further elements for the development of an Emissions Trading System for International Shipping
MEPC 60/4/54	Germany	Impact Assessment of an Emissions Trading Scheme with a particular view on developing countries
MEPC 60/4/55	IUCN	A Rebate Mechanism for a market-based instrument for international shipping

3 COMPOSITION OF THE EXPERT GROUP

3.1 The Expert Group was composed of representatives nominated by 24 Member Countries; eleven NGOs; and three IGOs. The composition of the Expert Group is set out as annex 1 to this report.

4 FOCAL POINTS FOR THE PROPOSALS UNDER REVIEW

4.1 Focal Points were nominated to represent the proposals being considered by the Expert Group. The Focal Points are as set out in annex 2 to this report.

5 METHOD OF WORK

5.1 The Expert Group met at the IMO Headquarters on three occasions as follows:

First meeting (MBM-EG 1):	10 – 12 May 2010
Second meeting (MBM-EG 2):	16 – 18 June 2010
Final meeting (MBM-EG 3):	9 – 13 August 2010.

5.2 Intersessionally, work was carried out by electronic correspondence, face to face meetings and by telephone and video conferences.

5.3 During the first MBM-EG meeting, four task-groups were established to undertake the detailed assessment work. These were as follows: Environment, Shipping and Maritime, Impact on Trade and Development and Developing Countries and Administrative and Legal. Each task-group was led by a task-leader agreed by the Expert Group:

- Environment – Dr. Andrew Pankowski
- Shipping and Maritime – Mr. Lars Robert Pedersen
- Impact on Trade and Development and Developing Countries – Dr. Leigh Mazany
- Administrative and Legal – Mr. Paul Sadler (and Ambassador Gilberto Arias in Mr Sadler's absence).

5.4 Members of the Expert Group participated in a maximum of two task-groups. Details of the participants in the various task-groups are provided in annex 3.

5.5 The nine criteria against which each of the MBM proposals were to be assessed were elaborated upon providing a more detailed list of considerations relevant to each criterion. The elaborated criteria were then grouped into the four task-group areas providing an agreed division of work between the task-groups as summarized below and set out in detail in annex 4.

Criteria	Task-Group
5.1	Environment
5.2	Environment Shipping and Maritime Administrative and Legal Trade and Development and Developing Countries
5.3	Shipping and Maritime
5.4	Administrative and Legal
5.5	Trade and Development and Developing Countries
5.6	Administrative and Legal
5.7	Administrative and Legal
5.8	Shipping and Maritime
5.9	Administrative and Legal

5.6 The main sources of information used by the Group were:

.1 information in the proposals which had been submitted to MEPC 60. The proposals were to be evaluated as submitted to MEPC 60 without additions but with further detail provided by the Focal Points as per paragraph 2.4.7 in the Terms of Reference;

.2 an extensive body of reference material comprising documents which had previously been submitted to IMO and further reports and other documents (Chapter 21);

.3 knowledge, expertise, data and information provided by the members of the Expert Group;

.4 data and information supplied by OECD and UNCTAD; and

.5 information provided by the Focal Points.

5.7 Two external consultants were commissioned to undertake detailed analytical work. These were as follows:

DNV – evaluation of MBMs based on total fleet emissions and development of marginal abatement cost curves for shipping for 2020 and 2030 using a combination of assumptions and scenarios.

Vivid Economics – The impact on trade of market-based mechanisms for greenhouse gas emissions from international shipping.

5.8 A model was developed to examine how the MBMs are likely to behave under defined scenarios. The model was developed by Dr. A. Stochniol supported by members of the Environment, Shipping and Maritime, and Impact on Trade and Development and Developing Countries task-groups. Further information on the model, assumptions and caveats are provided in annex 5.

6 PROPOSALS EVALUATED

6.1 The proposals evaluated by the Expert Group are as set out in the Terms of Reference and as listed in paragraph 2.7 with the exception that the German submission was not assessed against the nine criteria since it was an impact assessment (see annex 6). It could not therefore be reviewed against the nine criteria. This was agreed by the Expert Group and the Focal Point for Germany. The proposal was thus treated as an information resource to assist in the assessment of other proposals.

7 ASSUMPTIONS AND SCENARIOS

KEY ASSUMPTIONS

7.1 Key assumptions required for the detailed assessments undertaken by the task-groups were agreed by the Expert Group at its second meeting and included, *inter alia*, the following:

.1 Size of world fleet: Use data for 2007 in Second IMO GHG study 2009 projected forward to 2009 assuming also that emissions from shipping in year 2010 are equal to those emissions of the year 2007.

.2 Scenarios for growth in shipping: IPCC A1B & B2 scenarios from the Second IMO GHG Study 2009 (Scrapping rate 4% 2007-2012; 3% 2012 onwards). For further information on the growth scenarios, see paragraphs 7.11 – 7.14.

.3 Ships engaged in international shipping to be addressed using the same split as in the Second IMO GHG Study 2009. Emissions from domestic shipping to be excluded from the analysis and modelling.

.4 Rate of uptake of technical and operational measures for CO_2 reduction: assess medium and high uptake.

.5 For the purposes of the analysis and modelling, the datum used for all proposals is 2015, and the time points to be analysed are 2020 and 2030.

7.2 To understand the effectiveness, behaviour, impact and the marginal abatement costs of the proposed MBMs, the Expert Group used the following parameters in its analyses and modelling:

.1 For the Shipping ETS (Norway, France and the United Kingdom) and the GHG Fund (Denmark *et al.*): 0, 10 and 20% absolute reduction with respect to the 2007 emission level in the Second IMO GHG study 2009 (870 million tonnes of CO_2).

.2 For the SECT (United States) and VES (WSC): six tiers of energy efficiency standards for a mandatory EEDDI were used with three years intervals between the tiers.

.3 For the PSL (Jamaica) LIS (Japan) and Rebate Mechanism (IUCN) proposals: medium and high carbon prices (translated to fuel prices using values or limits given in the proposals, where applicable[7]) were used.

.4 For the proposal by the Bahamas: no target was used.

7.3 For those proposals where EEDI is an intrinsic part of the proposal, the effect of implementing the EEDI is included in the analysis and modelling while the effect of the EEDI is excluded for other proposals.

7.4 As ship threshold above which the MBM would apply, 400 gross tonnes was used, unless specified otherwise in the proposal in which case the specified value was used.

Table 7-1: Ship sizes, numbers and associated emissions

Ship size threshold (GT)	No. of ships	No. of ships as % of ships ≥400 GT	Emissions (as % of emissions from ships ≥400 GT)
≥400	42,697	100%	100%
≥500	39,180	92%	99%
≥,1000	34,866	82%	98%
≥2,000	30,138	71%	96%
≥4,000	24,267	57%	91%
≥5,000	22,311	52%	89%
≥10,000	17,346	41%	81%

Source: Ship analysis provided by Lloyd's Register

7.5 Based on relevant fuel price prediction by international organizations or renowned The Expert Group agreed Price of bunker fuel ($/tonne), as set out in appendix 2.

7.6 The split between heavy fuel oil (HFO) and marine distillate (MGO) usage was agreed as follows:

- 80% HFO:20% MGO (from 2015 to 2019), and

- 100% MGO (from 2020 and onwards).

7.7 The model price of Carbon used in the analysis and modelling was as follows:

For year 2010 $20

For year 2020 $25 (medium) $40 (high)

For year 2030 $40 (medium) $100 (high)

7.8 The analysis calculated all reductions achieved out-of-sector by using the model price of carbon.

7 The Group agreed for those proposals that do not contain any values or limits, the Secretariat will request input from the Focal Points to be provided by 23 June 2010.

7.9 For those proposals which do not contain any values or limits, the Expert Group based its analysis and modelling on input from the Focal Points.

7.10 Further information on the assumptions used in the Expert Group's analysis and modelling, such as details on fuel prices, input by Focal Points and other relevant information may be found in annexes 7 and 8.

Scenarios

7.11 Scenario planning is commonly used to evaluate an uncertain future can be used to provide possible fleet and emission growth projections into the future.

7.12 The scenarios used in the work of the Expert Group were based on the assumptions relating to global development in the IPCC Special Report on Emissions Scenarios[8] and correspond to the A1B and B2 scenarios examined in the Second IMO GHG Study 2009.

7.13 A1B assumes a more globalized world with rapid and successful economic development, economic and cultural convergence globally, pursuit of personal wealth and use of a balanced mix of energy sources. In contrast B2 assumes a world in which the emphasis is on local solutions to economic, social and environmental sustainability with continuously increasing population and intermediate economic development.

7.14 The predicted consequence of the different growth scenarios for CO_2 emissions from international shipping is depicted in Figure 7-1.

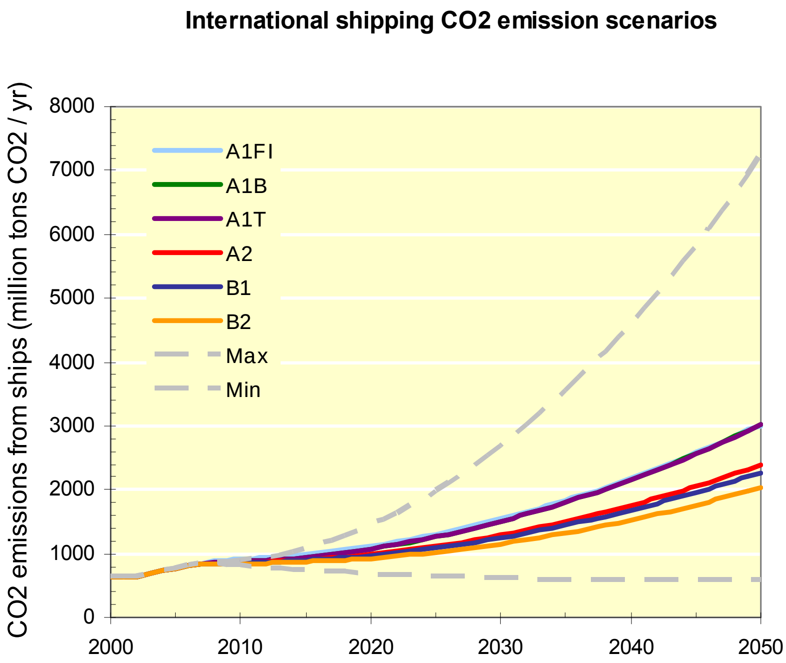

Figure 7-1: CO_2 emissions scenarios for international shipping (Second IMO GHG Study 2009)

8 Nakicenovic, N. and Swart, R. (editors), *Special Report on Emissions Scenarios: A Special Report of Working Group III of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, 2007.

8 COMMON CONCEPTS

8.1 The Expert Group evaluated the various proposals on possible MBMs with the aim of assessing the extent to which they could assist in reducing GHG emissions from international shipping. In assessing the overall impact, priority was given to the maritime sectors of developing countries, least developed countries (LDC) and small islands developing states (SIDS) as stipulated in paragraph 2.2 of the Terms of Reference of the Group.

8.2 In discussing the different elements of the proposals, it was found that there were a number of concepts which were common to many of the proposals. In order to try to maintain consistency, common elements were presented in a dedicated chapter in order to present common issues with common language.

8.3 Care must be exercised in interpreting the proposals in that more mature presentations will naturally accumulate more observations, and likewise, address more difficulties. By the same token, less mature proposals will not have the detail to deal with these issues and the Expert Group could likewise not speculate on how those less mature proposals deal with particular issues or difficulties. This should not be understood to mean that these less mature proposals have dealt satisfactorily with all issues not discussed in their own proposals, nor should less mature proposals be deemed to deal with issues in a manner that is less satisfactory than the more developed proposals.

8.4 In this exercise, the Expert Group has sought to normalize language surrounding certain concepts as found in this report.

8.5 The common concepts are divided into the following:

- Environmental issues
- Shipping issues
- Administrative and Legal issues

COMMON CONCEPTS ASSOCIATED WITH ENVIRONMENTAL ISSUES

Common concept 1 The carbon market

8.6 The future of a global carbon market is heavily linked to the negotiations on emissions trading and project based mechanisms under the international climate change regime (UNFCCC). Actions taken by individual countries as well as through bilateral and multilateral forums will influence how the carbon market evolves. The impact of these policies is therefore, difficult to predict. But it is relevant to note that under the Kyoto Protocol there are only three mechanisms: Clean Development Mechanism (CDM), Joint Implementation (JI) and Emissions Trading (ET).

8.7 The future of the Kyoto Protocol post 2012 is one of the two tracks under international negotiation in the current UNFCCC process. A number of factors will influence the supply and demand for Certified Emissions Reductions (CER) from CDM or project credits more broadly and these same factors will affect the carbon price.

8.8 The overall level of ambition of climate mitigation policies determines the project offset price. Investment in CDM projects as well as CERs purchasing has focussed on lowest cost emissions reductions opportunities compared to domestic mitigation actions by UNFCCC Annex I Countries (i.e.: developed countries). High levels of ambition reflected in national and supranational MBMs will require that more expensive abatement activities be pursued to meet higher demand.

8.9 The EU ETS is very relevant for the global carbon market and covers over 11,000 installations and more than 2 billion tonnes per year of GHG emissions in the 27 EU countries (and Iceland, Lichtenstein and Norway) with other countries currently negotiating association/joining agreements. New Zealand has also recently commenced emissions trading. A number of other countries, such as Australia, USA and Japan may implement domestic climate carbon market policies in the next few years.

8.10 CDM is the only mechanism that accepts voluntary participation of developing countries and is very relevant for the global carbon market. It is a fundamental instrument for developing countries under the sustainable development context, and at the same time it results in real, measurable and long term benefits related to mitigation of climate change.

Common concept 2 Fuel costs

8.11 Fuel costs are a significant slice of ship operating costs and are therefore an important factor determining the competitiveness of shipping operations. For example, a recent survey conducted by a participant of this Expert Group showed that fuel costs represent between 67% and 87% of voyage costs for a tanker owners at current fuel prices of around $500 per tonne. However even so the market indicates that there are a number of non-price barriers that restricts the uptake of fuel/energy efficiency operational and technical measures.

8.12 For voyage charter parties, fuel is normally provided and paid for by the owners, and hence the incentive for emission reduction measures are higher, while in the case of time and bareboat charter parties the fuel is generally provided and paid for by the charterer, and hence the incentive for emission reduction measures may be lower. Moreover, depending on the MBM, a different person may pay the carbon costs to the person who pays for fuel. These differences can influence the how shipping responds to a carbon price compared to a fuel price.

8.13 In general, higher fuel prices, or the expectation of high fuel prices in the future, will increase the motivation of shipping interests to implement technical and operational measures to conserve fuel and reduce emissions from their operations. A carbon price on fuel consumption broadly has the same effect. While carbon prices are affected by a number of factors in general the carbon price has a positive correlation with fuel prices. In recent years fuel prices and carbon prices have experienced similar pattern of fluctuation, hence carbon costs in the EU ETS have remained approximately 10 to 15% of fuel costs.

8.14 Perhaps the most immediate repercussion of higher fuel prices is their impact on the operational profile of a vessel. Depending on the state of the market, high prices may induce slow steaming, which would reduce CO_2 and other emissions, the optimal speed being a function of fuel prices and the state of the market.

8.15 The magnitude of such price increases may need to be significant before action is taken to implement some technical and operational improvements. This is particularly the case for those emissions reduction opportunities with a long payback period. In the absence of mandatory technical regulation these are only likely to occur if expectations are that future fuel and carbon prices will be high enough to deliver a return on such investments.

8.16 While fuel prices, and the expectation of future fuel prices, are an important driver for determining whether emissions reduction measures are profitable or not, non-price barriers can be equally important in influencing the uptake of emissions reduction opportunities. Higher fuel prices may help to overcome some of these non-price barriers, such as access to capital, investment priorities, including a reluctance to invest in opportunities with long pay back periods, and contract structures, particularly where there is an expectation that the price increase is permanent.

8.17 One driver for higher fuel prices which seems more certain is the MARPOL Annex VI requirements which are likely to result in widespread switching from less costly heavy fuel oil to more expensive marine gas oil in the medium term.

Common concept 3 Non-price barriers

8.18 At a given fuel price or carbon price it may be cost-effective for ships to implement certain technical and operational measures to conserve fuel and reduce GHG emissions. But not all measures that deliver net cost savings will be implemented because of non-price barriers. These non-price barriers include, access to capital, investment priorities including a reluctance to invest in opportunities with long pay back periods, ownership and operational structure, crew training and motivation, contract structures and access to information by decision makers on options for reducing fuel consumption and the financial benefits they would provide.

Common concept 4 Carbon Price

8.19 The carbon price here is the 'model carbon prices' as defined by the Expert Group at its meeting in June 2010 (annex 7).

8.20 In the EU ETS the carbon price is determined by the supply and demand of EU emission allowances (EUA) on the open carbon market. The price is influenced by a wide range of factors that include, *inter alia*, the level of economic activity, energy prices, weather, and technological development. As the primary source of demand, the EU ETS prices tend to impact the price of CDM Certified Emission Reductions (CERs)[9] although CER prices are also affected by several other elements. See also common concept 5 – Future availability of international emission project credits.

Common concept 5 Future availability of international project credits

8.21 A reasonable question to ask is whether sufficient GHG emission project credits will be available from other sources to meet demand from a maritime MBM and other project credit buyers.

8.22 The Clean Development Mechanism (CDM) entered into force in 2005. Since then, over 425 Mt of Certified Emission Reductions (CERs) have been issued[10], projects that could produce 2.8 billion CERs have already been registered and CDM could deliver over 7 billion CERs in this decade[11]. For the purpose of comparison, to meet an international shipping reduction target of 10% below 2007 levels with project credits alone, 4.2 billion tonnes of

9 A certified emission reduction or CER is a unit issued pursuant to Article 12 of Kyoto Protocol and requirements there under, as well as the relevant provisions in the CDM modalities and procedures, and is equal to one metric tonne of carbon dioxide equivalent, calculated using global warming potentials defined by decision 2/CP.3 or as subsequently revised in accordance with Article 5 of the Kyoto Protocol.

10 http://cdm.unfccc.int/Statistics/Issuance/CERsIssuedByHostPartyPieChart.html; 11.08.2010.

11 Current status of the project activities under the Clean Development Mechanism (CDM) in Brazil and the world – last compilation from the UNFCCC webpage: August 03, 2010.

credits[12] would be required between 2020 and 2030. The scale of project credits required to reach this target through offsetting could therefore be significant and should be explored further.

8.23 It is, however, important to note that the number of CERs expected to be delivered through the CDM in order to attend the demand for international project credits will depend on the level of ambition of carbon emission caps or targets in national and supranational MBMs (including any future IMO instrument) and any quota restrictions that these MBMs place on the use of international project credits. In other words, the market will respond to demand. The future potential of CDM in generating CERs depends on the negotiation of further commitments for Annex I Parties under the Kyoto Protocol. Nevertheless, there are some views that supply may still be limited by administrative factors. According to these views, the current project by project approach for setting baselines and assessing additionality in the CDM is causing bottlenecks resulting in process delays for project registration and issuance. On the other hand, there are other views suggesting that CDM is a success and its modalities and procedures ensure the environmental integrity of the Kyoto Protocol and on this basis these rules shall be retained in future commitment periods.

8.24 The EU ETS is currently the primary confirmed source of demand for post 2012. The recently commenced New Zealand emissions trading scheme will also accept CERs once full trading commences, with no quantitative limits on the number of CERs that can be used for compliance. The emissions trading scheme that was proposed for Australia has similar arrangements to the New Zealand scheme. International project credits have also featured in United States emissions trading legislation proposed in recent times, including the American Power Act and the American Clean Energy and Security Act which would allow a minimum of 500 Mt and 1,000 Mt of international project credits, respectively.

8.25 Discussions within UNFCCC are seeking to magnify the potential for credit flows.

8.26 The supply of credits and investment in projects will be slowed in the absence of greater certainty about the future scale of the demand for such project credits. Decisions taken under IMO could influence, to some extent, how this market develops.

8.27 Depending on the results from the negotiation on further Commitments for Annex I Parties under the Kyoto Protocol, additional project credits might be available from Joint Implementation (JI). Currently, the take up of JI has been limited relative to that of the CDM with 400 million Emission Reduction Units (ERUs) available in the period 2008 – 2012 (see footnote 5). Similarly, there is uncertainty regarding the availability and/or fungibility of Assigned Amount Units (AAUs) post 2012.

8.28 In the context of the UNFCCC, surplus AAU is a sensitive issue under the Kyoto Protocol and is currently under discussion. Hence, the use of AAUs causes concern with regard to environmental integrity, financial flow and market impact.

8.29 The link of IMO market-based measures with the Kyoto Protocol's CDM project credits must be carefully evaluated considering issues such as supply, cost, quality, environmental integrity and equity.

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12 Based on the modelling by this Expert Group and assuming a target of 10% below 2007, A1B growth scenario, reference fuel scenario and no effect of EEDI.

COMMON CONCEPTS ASSOCIATED WITH SHIPPING ISSUES

Common concept 6 Availability of technological and operational measures for CO_2 emission reduction

8.30 The Expert Group commissioned a study from DNV on technical and operational measures that have the potential to reduce CO_2 emission in-sector; the study considered 72 scenarios in accordance with the assumptions provided by the Expert Group. The range of measures considered in this study is enclosed in the table below. An indication of each measure's reduction potential based on one scenario for 2030 where growth is according to IPCC A1B[13], fuel price is according to the reference defined by the MBM-EG, uptake of measures is set at 50%, and with no mandatory EEDI regulation in force. In the table overleaf, "newbuildings" refers to ships manufactured in 2015 and later operating in 2030 and "existing ships" refers to pre 2015 ships still in operation in 2030. Potential CO_2 emissions reductions indicated by the Study are expressed in terms of million metric tonnes reduced in the year 2030. The calculated potential is influenced by all the above parameters and will vary for each measure in each of the 72 scenarios considered.

8.31 The results provided by DNV are based on research reported in "Pathways to low carbon Shipping: Abatement potential towards 2030, 2009".

8.32 The unique circumstances of a given trade will determine the level of uptake of both design and operational CO_2 reduction measures within the industry.

8.33 For those proposals that rely entirely on the EEDI performance of a ship, design and technical measures are critical. The actual marginal abatement cost (MAC) for implementing measures to reduce the EEDI value of a ship becomes of less importance than the effect on efficiency.

8.34 Several members of the Group raised concern with the indicated scale of reduction potential for some individual measures considered in the Study. The Group recognized that further work needs to be done on the actual in service cost, reliability, variability, scale, and cost effectiveness of these measures. It is important to recognize that the reduction potential estimates are not meant to reflect anticipated or expected reductions, but reductions that may be feasible given favourable market conditions and the elimination of barriers discussed elsewhere in this report.

13 A1B is one of the IPCC scenarios for global development. It assumes a more globalized world with rapid successful economic development, pursuit of personal wealth and use of a balanced mix of energy sources.

Table 8-1: CO_2 emission reduction potential for technical and operational measures, 2030

Measure	Application	Reduction potential 2030, Reference fuel price, 50% uptake (million tonne)
Air cavity lubrication	Newbuildings	22.5
Cold ironing	Both	4.3
Contra-rotating propellers	Newbuildings	34.3
Exhaust gas boiler on aux. engines	Newbuildings	1.5
Electronic engine control	Newbuildings	7.2
Engine monitoring & tuning	Existing ships	1.8
Fixed sails or wings	Both	11.5
Frequency convertor for electric motors	Newbuildings	17.0
Fuel cell	Newbuildings	14.6
Gas fuelled machinery	Newbuildings	90.0
General design improvements (10% by 2030)	Both	Included in BAU
Hull condition maintenance	Both	6.9
Kite	Both	15.0
Novell light system (LED based)	Newbuildings	1.4
Propeller efficiency maintenance	Both	4.5
Static propulsion efficiency devices (Newbuildings)	Newbuildings	11.6
Static propulsion efficiency devices (existing ships)	Existing ships	0.0
Reduced auxiliary power	Existing ships	0.5
Solar panel	Both	0.1
Speed reduction (fleet expansion)	Newbuildings	65.5
Speed reduction (Port turn around reduction)	Both	30.6
Steam plant optimization	Both	2.6
Trim/draft optimization	Both	6.0
Voyage execution (include optimum speed)	Both	14.6
Waste heat recovery	Newbuildings	38.0
Weather routing	Both	2.7
Wind generator	Both	0.3

Source: DNV, Pathways to low carbon Shipping: Abatement potential towards 2030, 2009

Common concept 7 Additional impact on the shipping industry (crew impact)

8.35 Consideration of crew behaviour, motivation and awareness is an important factor.

8.36 Implementing operational measures to increase efficiency of ship operations can depend greatly on the actions of the ship's crew. Lack of training and awareness can be an important barrier for successful implementation of operational CO_2 reduction measures and continued attention will be necessary to remain effective.

8.37 The cost for implementing successful crew behaviour optimization programmes and competency training is not likely to be significant in relation to the overall gross cost of any market-based mechanism; training should not be ignored.

Common concept 8 Calculation of cost of reductions and cost-effectiveness potential

8.38 Cost of reductions has been defined as:

$$\frac{gross\ cost - refunds}{(in\ sector\ reductions + out\ of\ sector\ reductions)}$$

8.39 Maximum cost-effectiveness Potential has been defined as:

$$\frac{gross\ cost - refunds}{(in\ sector\ reductions + out\ of\ sector\ reductions + \left(\frac{remaining\ proceeds}{carbon\ price}\right))}$$

8.40 For the purpose of calculating the maximum cost effectiveness potential, it is assumed that all funds (gross costs – (refunds + rebates + mitigation credit cost)) will all be spent on mitigation.

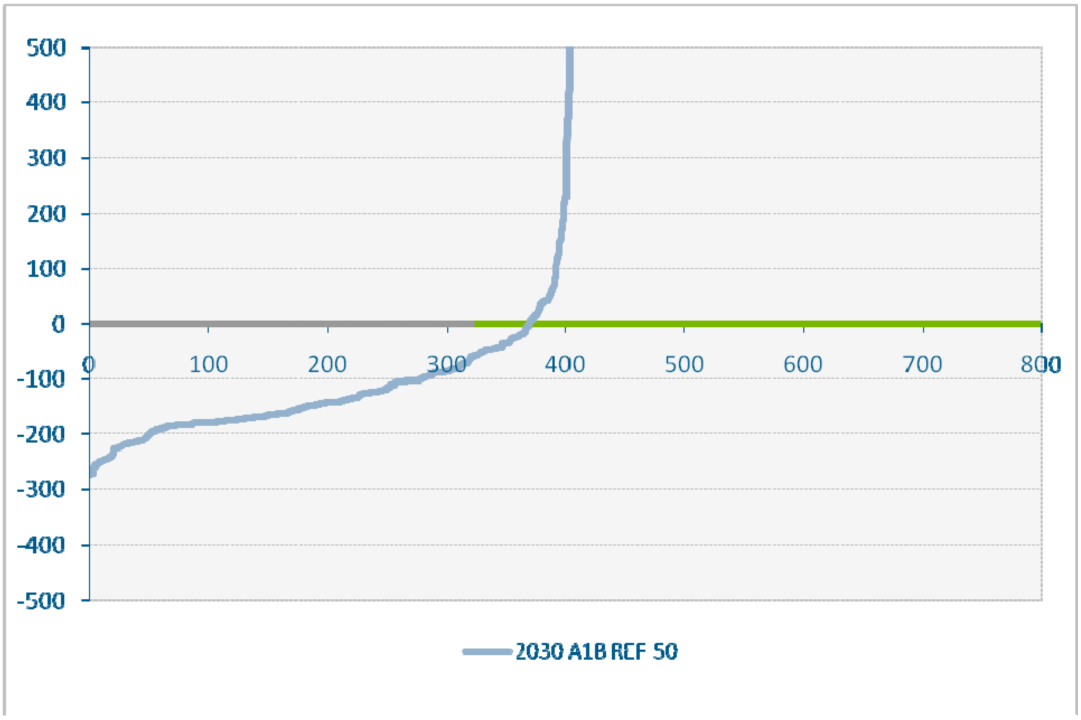
Common concept 9 Cost of in-sector emission reductions

8.41 The result of the MAC study carried out for the Expert Group by DNV (see annex 10) reveals that, in the A1B growth scenario, reference fuel price, 50% uptake, medium carbon price in 2030, the amount of cost effective measures, inclusive those being applied to comply with any mandatory EEDI standard for new ships, are more than sufficient to cater for the modelled emission reduction in the Study.

8.42 The MAC curve for the scenario described above is given in Figure 8-1: the cost-effective potential is approx 370 million tonnes of reductions and the maximum modelled combined EEDI and MBM driven emission reductions are 358 million tonnes as generated in the SECT proposal.

8.43 The rationale is thus that in all cases modelled the in-sector reductions do not add any cost to the industry in excess of the price signal from the MBM itself.

8.44 Large in-sector reductions will consequently reduce the value of the cost-effectiveness potential of all MBM interfacing the open carbon market.



Source: DNV, Pathways to low carbon shipping: Abatement potential towards 2030, 2009

Figure 8-1: Marginal abatement cost curve for A1B growth scenario in 2030 (reference fuel price, 50% uptake of possible measures, medium carbon price)

Common concept 10 Calculation of potential additional workload onboard

8.45 A model was developed to quantify the aggregate potential additional workload onboard as a result of measures in the industry to reduce emissions from the fleet.

8.46 The model assumes a generic crew workload where the workload per emission unit to deliver the BAU emission is the same workload per emission unit for the calculated in-sector emission reduction for the MBM.

8.47 The crew cost has been assumed to equal an average size ship with high salary Far East engine crew.

8.48 The model is not relevant for an individual ship but gives an indication of the aggregate additional burden imposed by the MBM. The ratio of the additional onboard workload to the gross cost of the MBM is thus the important value to assess.

COMMON CONCEPTS ASSOCIATED WITH ADMINISTRATIVE AND LEGAL ISSUES

Common concept 11 Administrative costs including any central administrative requirements

8.49 **Administrative body** – establishment and maintenance of an international administrative body (supranational organization). Costs (particularly employment and permanent accommodation – noting that agreement on the correct *situs* of this body, for fiscal and operational neutrality, would be delicate – and expenses incurred in auditing the system) will be taken from the charges collected.

8.50 **Record keeping** – processing of contributions and record keeping for audit purposes (both by those making the payments to the international administrative body – i.e. the port States – and by the international administrative body upon receipt, including acknowledgement of payments received).

8.51 **Audit of international body** – Annual reporting by, and independent audit of, the international administrative body (to be paid for from the charges collected).

Common concept 12 IMO implementation lead time

8.52 History indicates that 7.3 years is an average time period from the decision to develop a new mandatory IMO instrument until it enters into force. This period is made up of two elements – the time to develop the text of a new instrument up to the time it is adopted; and thereafter the time for the instrument to enter into force (pending ratification). It is recognized that the latter of these two periods, i.e. between adoption and entry into force; is a function of the conditions (number of States and percentage of tonnage) that are agreed at the time of adoption, which are not known at this time; and the policy will of, and the priority given by, governments to ratify the instrument.

Common concept 13 Model carbon leak

8.53 A form of carbon leakage might occur if the establishment of such a MBM causes a shift away from shipping to other modes of transport. Within the international shipping industry, carbon leakage may occur depending on which States become parties to the new instrument and how rigorously the scheme is implemented and enforced. In particular, the risk of shipowners being caught not paying contributions will depend very significantly on the initial robustness of the flag State control and, thereafter, the Port State Control (PSC) regime. The benefits to the port State in ensuring the proper functioning of the system may not be as evident as in the case of PSC activities relating to checking adequacy of the safety, security and environmental protection systems onboard ships.

8.54 These elements may pose less of a risk than may seem apparent as an IMO approach will not be developed in isolation to other initiatives directed at this issue, some of which are already in place.

Common concept 14 Compatibility with UNFCCC

8.55 This section proved particularly challenging for the Expert Group's discussions on consensus text. As a result, the following texts were agreed to maintain the discussion on technical aspects of analysing the MBM. These texts apply to all proposals, with the exception of the Bahamas proposal, which has its own text in light of the special nature of that particular proposal.

UNFCCC 1

8.56 Issues related to compatibility of the proposed market-based measures and the United Nations Framework Convention on Climate Change (UNFCCC) are politically difficult and complicated by the ongoing negotiations under the UNFCCC. Further, the issue of whether the UNFCCC principle of common but differentiated responsibilities and respective capabilities or the IMO framework of no more favourable treatment should apply to this proposal remains. There is recognition that the principle of common but differentiated responsibilities and respective capabilities applies in the context of the UNFCCC and its Kyoto Protocol and the IMO Convention specifies non-discrimination in IMO instruments. However there are different views on application of these principles among the Experts.

8.57 One view is that the UNFCCC provides the central policy infrastructure for global climate change action and the proposed market-based measures must take into account the principle of common but differentiated responsibilities and respective capabilities.

8.58 Another view is that the principles of the UNFCCC do not directly apply in IMO and that all of the proposed market-based measures that aim to reduce GHG emissions are consistent with the UNFCCC.

UNFCCC revenue

8.59 There are different views on whether the proposal's funding for climate change actions in developing countries could resolve some of the policy difficulties.

8.60 The proposal could be viewed to be against the principles and provisions of the UNFCCC because its Article 4.3 could be viewed as mandating only developed country parties to provide funding to mitigation action by developing countries. At the same time the proposals could be viewed as not being in conflict with the UNFCCC because nothing in the UNFCCC precludes developing country Parties from providing funding for climate change actions, where this may happen, and the UNFCCC does not speak to the provision of funding in other entities (under other conventions or negotiations streams) at all.

8.61 This view approach projects developing countries to be net receivers of funds.

UNFCCC efficiency

8.62 There is general agreement in the Group that as many countries are implementing energy efficiency approaches, efficiency measures could help to resolve some of the policy hurdles to implementing an approach in IMO. However, there are still different views.

8.63 One view is that efficiency proposals could adversely impact shipowners in some developing countries, and further analysis is needed, while another view is that mitigation activities undertaken by developing country Parties through efficiency measures would be consistent with all Parties obligations under UNFCCC's Article 4.1. (b) to implement measures to mitigate climate change and Article 4.1. (c) to promote and cooperate in the development of practices and processes that reduce emissions, including the transport sector.

Common concept 15 Kyoto Protocol

8.64 Issues related to compatibility of the proposed market-based measures and the Kyoto Protocol of the UNFCCC are complicated by the ongoing negotiations under the UNFCCC Ad-Hoc Working Group on further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). Article 2.2 of the Kyoto Protocol states that Parties included in Annex I shall pursue limitation or reduction of GHG not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the ICAO and the IMO, respectively. This was subject to different views among the Experts.

8.65 One view is that Article 2.2 mandates action by Annex I Parties (developed countries) only. Another view is that it applies to all Parties, who should work through IMO, to pursue limitation or reductions of GHG emissions from marine bunker fuels.

Common concept 16 WTO

8.66 The negotiations within the World Trade Organization are just as complicated as the negotiations under the UNFCCC. The proposals are not currently mature enough in their legal components to assess compatibility. This was subject to different views among the Experts.

Common concept 17 Compatibility with national law

CO_2 as a pollutant

8.67 Any proposal which includes a definition of CO_2 as a pollutant may, according to some definitions and national provisions (MEPC 60/22, paragraphs 4.28 to 4.33), impose legal challenges in transposing the treaty provisions into domestic law, as there are different views on the treatment of this gas as a pollutant.

International contribution

8.68 Similarly it appears that some States would have challenges with the principle of the collection of 'international' contributions being inconsistent with national law. Inherent in such concerns is the challenge nations may have in collecting private funds out of commercial enterprises for the benefit of international funds.

8.69 In some jurisdictions, a contribution collected within its national borders may normally be subject to internal fiscal or exchange restrictions. Therefore, some changes in national law, or even in a national constitution, may be required.

Common concept 18 National implementation concerns

8.70 As is usual with mandatory IMO instruments, domestic law would have to be enacted – especially to impose sanctions in the event of non-compliance. In States where there operates a two tier system of legislation (primary and secondary), it is likely that these proposals would require new primary legislation, which will require resources and parliamentary time to progress. In this regard, it is also relevant to note that some States have internal procedures that require extensive consultation with affected stakeholders to be undertaken before new legislation can be enacted. Such national legal processes may have to be completed, or significantly progressed, before a new IMO Convention, implementing a MBM for international shipping, can be ratified or acceded to.

9 AN INTERNATIONAL FUND FOR GREENHOUSE GAS EMISSIONS FROM SHIPS – CYPRUS, DENMARK, THE MARSHALL ISLANDS, NIGERIA AND IPTA (MEPC 60/4/8)

FOCAL POINT SUMMARY OF THE PROPOSAL

Aim

9.1 The aim of the International GHG Fund is to ensure that shipping makes a contribution towards the reduction of global GHG emissions through offsetting. It is proposed to be achieved via a new IMO convention which will provide a level playing field for all potential party states and the global shipping community.

Scope of the application

9.2 All party ships engaged in international trade and emissions from all marine fuels are included in the scheme.

9.3 The convention will mandate the registration of bunker fuel suppliers located within the territory of a state party. Bunker fuel suppliers located in a non-state party will be able to be registered on a voluntary basis. When taking bunkers, a GHG contribution is due. The contribution should be made to the International GHG Fund by the registered bunker fuel supplier, or alternatively by the shipowner.

9.4 The GHG Fund Administrator will receive the contributions, all necessary records, and monitor the information for the benefit of the Parties. It will allocate the revenues according to the Parties' decisions and keep a ship-specific registry or account. It will maintain a global list of all registered bunker fuel suppliers and submit an annual report.

Implementation

9.5 Party ships will be obliged to purchase fuel from registered bunker fuel suppliers. Suppliers will provide a Bunker Delivery Note which should be kept on board for future inspections. Port State Control may request such documentation and take appropriate steps in cases of suspected non-compliance. Further, Party flag States have an obligation to monitor and enforce convention obligations.

9.6 The global reduction target could be set either by UNFCCC or IMO. The target will be essential for the Parties to decide the size of the GHG Contribution. The industry will be rewarded for its increased fuel efficiency since the GHG Contribution should be adjusted at regular intervals to ensure that emissions above (and only above) the target line are offset. International shipping will be a partner in the GHG global emission reduction effort.

Allocation of revenues

9.7 Revenues should be allocated consistent with the UNFCCC objectives and be compatible with any future global climate change agreement. Allocation of revenues should ensure that emissions above the target line are offset. The shipping industry should be recognized for its contributions towards mitigation and adaptation purposes with emphasis on LDCs and SIDS. The revenues will also cover administration cost of the GHG Fund Administrator as well as Research and Development (R&D) activities, and for Technical Cooperation within the existing IMO framework.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

9.8 The International Fund for Greenhouse Gas Emissions from Ships (the GHG Fund) would establish a global reduction target line for international shipping, set by either UNFCCC or IMO. The target line would set a limit on net[14] emissions from international shipping and would be achieved largely by purchasing approved project emission reduction credits. Project credits are anticipated to come from the CDM or other regulated carbon markets. See common concept 1 – The carbon market – for more detail on carbon markets.

9.9 The quantity of project credits purchased by the GHG Fund would be calculated on the basis of the difference between the actual emissions from international shipping (based on bunker data) and the agreed target line, the unit price being based on the market value of carbon. In this way project credits would be purchased to offset those emissions from international shipping that are above the target line.

9.10 The offsetting activities of the GHG Fund would be financed by a contribution paid by ships on every tonne of bunker fuel purchased. It is envisaged that contributions would be collected through bunker fuel suppliers or via direct payment from shipowners. The contribution rate would be adjusted at regular intervals (MEPC 60/40/8 proposes every 4 years) to ensure that sufficient funds are available to purchase agreed project credits to achieve the agreed UNFCCC or IMO target line, any additional funds remaining would be available for adaptation and mitigation activities via the UNFCCC, and R&D and technical co-operation within the IMO framework. To illustrate the costs of the potential supplementary funds additional modelling runs were made adding 10% to the contribution rate level.

9.11 The GHG Fund would apply to all ships engaged in international shipping over an agreed size threshold and to all fossil fuels[15].

9.12 Whilst the primary objective of the GHG Fund is to offset emissions that exceed the target line, the addition of a contribution to fuel costs could also deliver some in-sector emission reductions (price signal – c). For discussion on fuel costs see common concept 2 – Fuel costs.

9.13 In general, the rate of the contribution (that is; the amount paid per tonne of fuel) would be a small percentage of a much larger fuel price. For example, based on middle range carbon and fuel prices assumptions used by this Expert Group, and a target line of 10% below 2007 levels, the contribution rate is likely to represent less than 2 per cent of fuel costs in 2020 and less than 4 per cent of fuel costs in 2030.

9.14 Whilst the increase in fuel prices arising from the contribution is likely to be small, the extent to which emissions reduction opportunities are cost-effective is a function of fuel price (see common concept 2 – Fuel costs) and hence the contribution will increase the volume of emissions reductions opportunities that are cost-effective for ships.

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14 "Net emissions" are used to describe emissions generated by international shipping minus those emissions offset through carbon reduction projects undertaken outside of the international maritime sector.

15 MEPC 59/4/5, the basis document for the proposal indicates that in principle, the contribution should be proportional to GHG emissions from the fuel (based on carbon content to CO_2 factors for fuel type), and that this principle should apply also to the possible introduction of low carbon fuels including natural gas.

9.15 Non-price barriers (see common concept 3 – Non-price barriers) may influence the uptake of some cost-effective emissions reduction opportunities.

9.16 Price incentives provided by the GHG Fund proposal may overcome some of these barriers, particularly if the price is predictable and perceived as permanent. Certainty would also be afforded by the target line if that is agreed sufficiently far into the future and at a level to encourage /overcome barriers.

9.17 The response towards this price incentive could also be enhanced with simple measures that target informational barriers, such as providing tools for ships to understand the reductions and cost savings to be achieved through operational measures. Additional measures might be paid for out of the technical co-operation element of the GHG Fund. Programmes under the R&D element of the GHG Fund may reduce the cost of existing technologies or bring forward new ones, leading to additional in-sector reductions.

9.18 The implication of MEPC 60/4/8 is that the primary purpose of the GHG Fund would be to offset emissions via the purchase of CDM (CER) credits and possibly other emission reduction units. Therefore, the bulk of reductions in GHG emission reductions delivered by the GHG Fund will be out-of-sector. The out-of-sector reductions achieved by the GHG Fund will largely depend on the target line that is agreed by IMO or UNFCCC.

9.19 In setting the contribution rate, it will be necessary to estimate the number of project credits needed to meet the target line over the period for which the contribution rate would be fixed (MEPC 60/40/8 proposes 4 years). It will also be necessary to estimate the expected price of carbon over that period, in carbon markets.

9.20 It is important to note that the GHG Fund proposal calls for funds for R&D as well as adaptation purposes in developing countries. The rate of contribution would therefore also need to reflect the funds deemed necessary for these purposes.

9.21 Since the rate of contribution is linked to the carbon price an increase or decrease in the carbon price will mean that the rate of contribution would need to be adjusted for the next 4 year interval (see common concept 4 – Carbon Price for a discussion of carbon price).

9.22 Higher target lines would also require a higher rate of contribution. For example, if meeting the target line required 25 per cent of the sector's total emissions to be offset, the contribution rate would be a minimum of one quarter of the external carbon price (with an any additional increment charged for other purposes). Similarly, if 33 per cent of the sector's total emissions would need to be offset to meet the target line, the contribution rate would be a minimum of one third of the external carbon price.

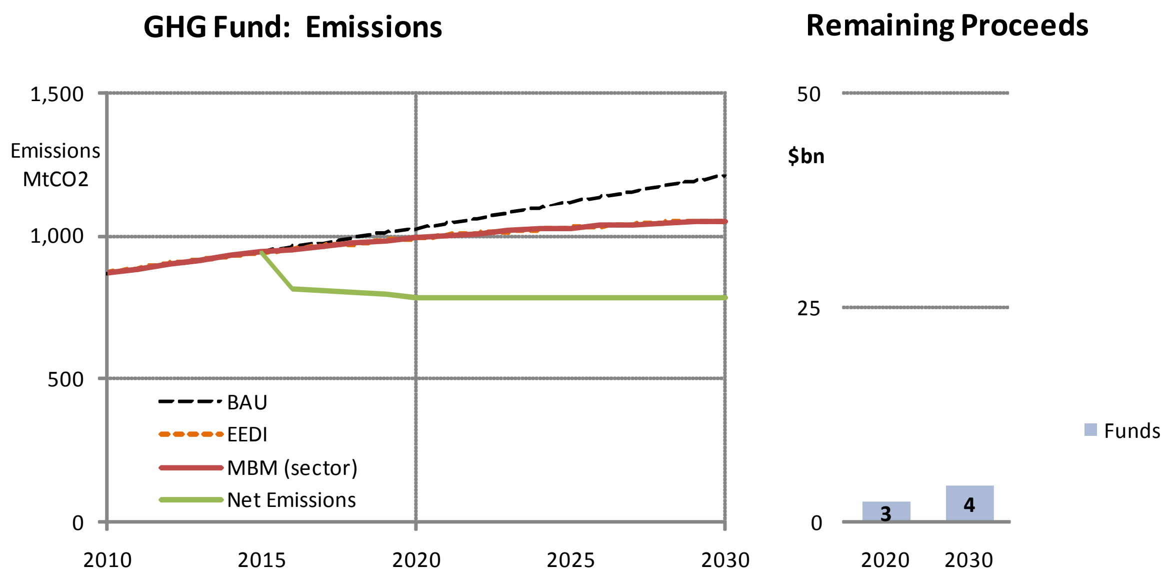
9.23 As noted earlier, the proposal also envisages that the rate of the contribution could be increased to fund additional activities. MEPC 60/4/8 envisages that any such additional increment could be used to finance; adaptation and mitigation in developing countries (above that associated with the CDM credits purchased) via the UNFCCC, and R&D, technical cooperation within the IMO framework, and administrative costs. Therefore, while there is potential for the GHG Fund to deliver additional in and out-of-sector reductions an additional increment would need to be charged for this purpose. The consequences of this additional contribution rate (set at 10 per cent) are illustrated in the model.

In-sector and out-of-sector reductions

9.24 In-sector and out-of-sector GHG emissions reductions and costs, as well as the amount of additional financial contribution delivered by the GHG Fund ('funds') were modelled for the fund under different target lines, growth rates, and model carbon prices. For further information about the assumptions that underpin the model, its limitations and the scenarios examined, see annex 5.

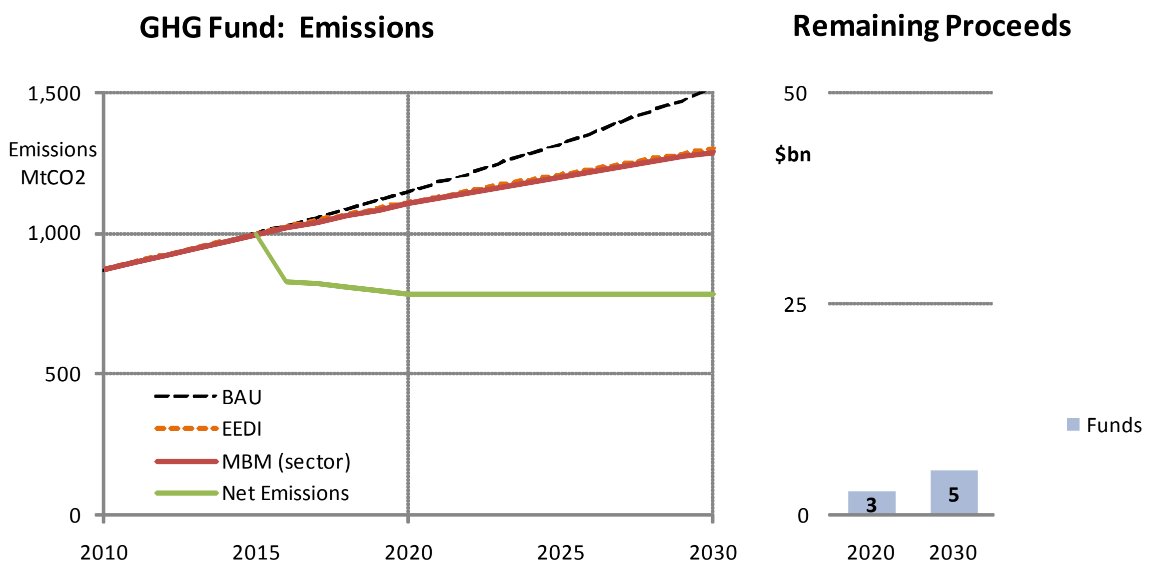
9.25 Figure 9-1 and Figure 9-2 illustrate modelled emissions under the GHG Fund for each growth scenario assuming a 10 per cent target line, a reference fuel price and medium carbon price. These scenarios are referred to below as the B2 and A1B reference scenarios for the GHG Fund. Since the GHG Fund proposes to raise funds for adaptation, R&D and technical cooperation in these scenarios an additional 10 per cent contribution rate has been assumed for these purposes.

9.26 The line graphs show, emissions under a business as usual baseline (black line), and for illustrative purposes, the expected emissions if a mandatory EEDI was implemented at a medium stringency (dashed orange line). It is important to note that the reduction in emissions from the EEDI are not to be attributed to the GHG Fund and would only occur if the EEDI is implemented mandatorily. The red line below the level of emissions under an EEDI represents the effect of the contribution rate on stimulating in-sector GHG reductions. The green solid line below that shows net emissions from international shipping after deducting the out-of-sector GHG emission reductions. In this case, an additional 10 per cent contribution to the GHG Fund has been assumed beyond that necessary to purchase project credits to meet the target line, shown as remaining proceeds to allow other non mitigation objectives to be achieved.



The GHG Fund proposes to raise funds for adaptation, R&D and technical cooperation. In this scenario an additional contribution rate of 10 per cent has been assumed for these purposes. The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Whilst in the case of the GHG Fund remaining proceeds are delivered by the additional 10 per cent contribution and are not proposed to be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated to be **100 Mt in 2020 and 109 Mt in 2030**.

Figure 9-1: Modelled emissions and remaining proceeds under the GHG Fund with a 10% target line under the B2 growth scenario with a medium carbon price and a reference fuel price and an additional contribution rate of 10 per cent



The GHG Fund proposes to raise funds for adaptation, R&D and technical cooperation. In this scenario an additional contribution of 10 per cent has been assumed for these purposes. The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Whilst in the case of the GHG Fund remaining proceeds are delivered by the additional 10 per cent contribution and are not proposed to be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated and found to be **112 Mt in 2020 and 135 Mt in 2030**.

Figure 9-2: Modelled emissions and remaining proceeds under the GHG Fund with a 10% target line under the A1B growth scenario with a medium carbon price and a reference fuel price and an additional contribution rate of 10%

9.27 Under the low growth B2 growth scenario achieving a 10 per cent target line below 2007 requires reductions of around 20 per cent of BAU emissions in both 2020 (209 Mt) and 2030 (271 Mt). Relative reductions of around 30 per cent of BAU emissions are required in 2020 (322 Mt) and 2030 (513 Mt) to meet this target line under the higher growth A1B scenario.

9.28 The nature of the GHG Fund is such that the stated target line must be met, as the rate of contribution would be set to ensure enough project credits could be purchased to reduce GHG emissions from shipping to the level of the target line. In meeting the target line the modelling indicates the GHG Fund would deliver a very small amount of in-sector reductions, no more than 1 per cent of the total reductions in the reference scenarios for the GHG Fund.

9.29 Key results for these scenarios are also shown in Table 9-1.

Table 9-1: Modelled emissions and emission reductions under the GHG Fund with a 10% target line for B2 and A1B growth scenarios with medium carbon price and reference fuel price and an additional 10% contribution rate

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	783	783
	2030	783	783
MBM in-sector reductions (Mt)	2020	1	2
	2030	5	11
MBM out-of-sector reductions (Mt)	2020	208	319
	2030	265	501
MBM reductions (% of BAU)	2020	20%	28%
	2030	22%	34%
MBM in-sector reductions (% of MBM reductions)	2020	1%	1%
	2030	2%	2%
Potential for supplementary out-of-sector reductions (Mt)	2020	**100**	**112**
	2030	**109**	**135**

The GHG Fund proposes funds for adaptation, R&D and technical cooperation. In this scenario an additional contribution of 10 per cent has been assumed for these purposes. The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Whilst in the case of the GHG Fund remaining proceeds are delivered by the additional 10 per cent contribution and are not proposed to be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation is shown.

9.30 Achieving a tighter target line of 20 per cent (not shown) would result in a slightly greater portion of total reductions being achieved in-sector due to the higher contribution rate required to meet that target line. Similarly, a higher model carbon price (not shown) would also result in a slightly greater share of reductions being achieved in-sector, but under all the modelled scenarios in-sector reductions were never more than 3 per cent of the total.

9.31 The range of responses observed under all modelled scenarios are shown in Table 9.2. The term 'remaining proceeds' is explained in the caption to Table 9.1.

Table 9-2: Ranges for emission reductions observed when modelling the GHG Fund in 2030

Key elements	GHG Fund with additional contribution rate of 10%		GHG Fund without additional contribution rate	
	High	**Low**	**High**	**Low**
MBM in-sector reductions (Mt)	31	1	20	0
MBM out-of-sector reductions (Mt)	584	152	590	154
MBM reductions (% of BAU)	40%	13%	40%	13%
MBM in-sector reductions (% of MBM reductions)	5%	1%	5%	0%
Remaining proceeds ($billion)	14	4	0	0

9.32 Uncertainty around the responsiveness of shipping to price incentives is of relatively low significance for modelling the GHG Fund, since a change to the estimates of in-sector reductions would deliver an equivalent but opposite change in the estimates of out-of-sector reductions.

Certainty of reductions

9.33 The GHG Fund aims to achieve a net target line for total emissions agreed by IMO or UNFCCC; that is, the proposal aims to achieve a target line equal to total gross emissions from international shipping minus reductions achieved through project credits from outside the sector. Provided a sufficient safety margin in the contribution rate exist, there is high degree of certainty that the GHG Fund would achieve this goal (see also common concept 4 – Carbon price and common concept 5 – Future availability of international emission project credits) The extent to which in-sector reductions will contribute towards the target line, by reducing gross emissions from international shipping below business as usual, is difficult to predict given uncertainty around future carbon and fuel prices and the role that non-price barriers will play in any response to the price impact of the contribution. However, in general in-sector reductions will make only a minor contribution. This would not impact the overall effectiveness of the GHG Fund as it is designed primarily as an offsetting mechanism.

9.34 From year to year, the GHG Fund may not strictly deliver the annual target line. This could result from the process of setting the contribution rate since assumptions would need to be made about the amount of in-sector reductions likely to result from future (unknown) fuel prices, other drivers, the contribution itself, and technology innovation. Shortfall (or indeed an excess) of the GHG Fund could also occur for reasons associated with the changes in the market price of carbon. However, unless serious price variations within the carbon market occur, the degree of deviation from the annual set target line is not expected to be significant.

9.35 The situation where the contribution rate (as needed to purchase emission project credits) results in less revenue than that required to purchase project credits to meet the annual target line is not explored in MEPC 60/4/8. It is possible to envisage that a number of options could be open to manage any shortfall in the GHG Fund to avoid failing to meet a target line.

9.36 The regularity by which the contribution is set will affect the 'drag' in any adjustment that will be necessary to ensure that the target line is consistently achieved. A process for managing this potential 'borrowing' and 'banking' would be necessary, with clear and binding rules that ensure the integrity of the target line is maintained by timely and appropriate adjustment to the contribution rate. Without these structures the rate of contribution could be affected by 'policy' considerations which would undermine the integrity of the MBM, primarily by influencing the amount of project credits that could be purchased to meet the agreed target line.

9.37 Decisions on how the revenue will be balanced between that used for purchasing emissions project credits and remaining proceeds (if additional increment is charged for these purposes) would influence this adjustment process.

9.38 The GHG Fund relies significantly on project credits from outside the shipping sector and therefore considerations about the future supply of project credits are relevant for this proposal, see common concept 5 – Future availability of international emission project credits.

9.39 The integrity of the target line under the GHG Fund depends on robust monitoring, reporting and verification of both fuel used in international shipping and out-of-sector reductions (offsetting), as well as robust processes for managing the additionality of any out-of-sector project reductions (CDM and JI).

9.40 In this regard the accuracy and transparency of bunker fuel delivery records are critical to ensuring that the emissions target will be achieved. Inaccuracies in reporting of fuel would result in the GHG Fund purchasing insufficient or excess out-of-sector credits to offset gross emissions from international shipping. Monitoring, reporting and verification processes will therefore need to be designed to deliver certainty over fuel reporting and the payment of contributions. Provided this can be achieved the potential for fraudulent behaviour to impact on the environmental effectiveness of the scheme will be minimized.

9.41 On a similar theme, out-of-sector project emission reductions to be achieved through the GHG Fund are intended to occur through internationally regulated markets such as the CDM. The current market has processes for managing project additionality, and measures designed to promote credible and transparent monitoring, reporting and verification of emission reductions.

Cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development

The cost-effectiveness of the proposed MBM

Cost of reductions

9.42 Table 9.3 shows gross costs under the reference scenarios for the GHG Fund. The amount of contribution charged was calibrated to deliver the target line and a surplus of additional 10% of the contribution as unassigned funds. The table shows no rebates or refunds since there are no such mechanisms proposed for the GHG Fund.

Table 9-3: Modelled costs under the GHG Fund with a target line 10% below 2007 for B2 and A1B growth scenarios with medium carbon price and reference fuel price

	Year	B2	A1B
Financial: gross costs ($billion)	2020	8	11
	2030	15	25
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	5	8
	2030	11	20
Funds ($billion)	2020	3	3
	2030	4	5
MBM in-sector reductions (Mt)	2020	1	2
	2030	5	11
MBM out-of-sector reductions (Mt)	2020	208	319
	2030	265	501
Cost of reductions ($/tonne CO_2 abated)	2030	55	50
Maximum cost-effectiveness potential ($/tonne CO_2)	2030	39	39

9.43 Since the GHG Fund relies heavily on out-of-sector reductions, a significant source of uncertainty associated with costs of achieving reductions from the GHG Fund proposal, or indeed any other proposal that relies on out-of-sector reductions, relates to the future state of the carbon market. This is discussed in common concept 5 – Future availability of international emission project credits.

9.44 The total direct cost for the shipping industry in the A1B scenario is estimated to be $25 billion[16] in the year 2030.

9.45 Indirect cost consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in Port State Control Organizations and not least in operation of the GHG Fund mechanism. These costs are elaborated below.

A1B: Reference fuel price, 2030, medium carbon price

The cost of reductions is estimated to be 50 $/tonne CO_2 abated.

The amount of funds generated for other purposes is $5 billion

The maximum cost-effectiveness potential of the proposal is 39 $/tonne CO_2

Administrative costs (including any central administrative requirements)

9.46 The following comments address two options that are identified for this new International GHG Fund:

.1 Option 1 – the bunker supplier collects the contributions and transfers these payments into the GHG Fund; or

[16] A1B, Reference fuel price, Medium carbon price.

.2 Option 2 – the shipowner makes the contributions into the GHG Fund. Specifically, who this entity, the 'shipowner', is will need to be defined in the new instrument.

9.47 The principal activities that will incur administrative costs include:

.1 establishment and maintenance of the GHG Fund Administrator (not a person but an organization). Costs (particularly employment and permanent accommodation – noting that agreement on the correct *situs* of this body, for fiscal and operational neutrality, would be delicate – and expenses incurred in auditing the system) will be taken from the GHG Fund's revenues;

.2 registration and auditing of bunker fuel suppliers (Option 1 only);

.3 reporting mechanisms between parties (bunker supplier, shipowner, Fund Administrator, flag State, port State, etc.)

.4 processing of contributions and record keeping for audit purposes (both by those making the payments to the GHG Fund Administrator and by the GHG Fund Administrator upon receipt, including acknowledgement of payments received);

.5 Fund management (investments) and allocation;

.6 Annual reporting by, and independent audit of, the GHG Fund Administrator (to be paid for from the GHG Fund's revenues); and

.7 development of the necessary national legislation to implement the proposal, survey/inspection and enforcement by States (costs to be borne by the Parties themselves) and by the GHG Fund Administrator of non-Party bunker suppliers (costs to be taken from the GHG Fund's revenues)

9.48 The transfer of consolidated contributions to the GHG Fund is not discussed in detail in the proposal[17]. Any consequence of such consolidation may need further consideration in terms of the administrative burden to all parties Fund Administrator shipowner, flag State, port State, etc.

9.49 At this time, it was therefore taken that each bunkering event was considered against a separate account.

9.50 While the proposal does not consider the issue, it is possible that those responsible for transferring the contributions to the GHG Fund Administrator may charge an administration fee to the contributors. The impact of this on the administrative burden on all parties would need to be considered.

[17] Paragraph 14 of MEPC 60/4/8: "However, as bunker fuel suppliers transfer the GHG contributions to the GHG Fund the bunker fuel suppliers could accumulate large amounts of money and, in case of bankruptcy or fraud, the GHG contributions might be lost." Paragraph 20 of MEPC 60/4/8: "Another option could be to consider introducing some flexibility and allow payment to be made for example within a month. In this case, larger sums would have to be transferred to the GHG Fund Administrator.

Option 1

9.51 A verification function would need to be taken into account in the system, given the large value of collected contributions (possibly to be $ billions per annum). Such a regime would be costly due to the geographic spread of the suppliers. The verification level and cost would need to be balanced against the risk of fraud, and possible loss of the contributions. It must be noted, though, that this observation is common to practically all the proposals.

9.52 Option 1, if adopted, will stipulate financially binding obligations and other requirements on participating bunker fuel suppliers. While, at first sight, Option 1 might seem more cost-effective as less administrative entities phases are involved, the relative legal uncertainty about the legal status and liability regime of bunker suppliers in various countries might, in some cases, present significant practical challenges.

9.53 In the case of fuel suppliers located in a State party to the agreement, such requirements may be legally binding as a function of national implementing legislation. In the case of fuel suppliers located in a State not party to the agreement, fuel supplier participation would be fully voluntary, but subject to the provisions of participation and certification stipulated by the GHG Fund Administrator. In these cases, while participation is voluntary, it must be expected that there will be a strong market incentive to participate because most shipowners would want to purchase fuel from a supplier certified under the scheme. Failure to comply with the stipulated certification requirements and fiscal obligations would result in loss of certification and a consequent decrease in business revenue for any affected suppliers (depending upon their geographic location and client base). Fuel suppliers are subject to national requirements, including the collection and transfer of applicable taxes, so it can be reasonably anticipated that many fuel suppliers already have accounting and fiscal procedures in place for management and transfer of such funds.

9.54 Fuel oil suppliers globally are currently subject to IMO fuel oil quality requirements under regulation 18 of MARPOL Annex VI, as well as requirements concerning provision of a Bunker Delivery Note, as well as requirements on maximum sulphur content of fuels under regulation 14 of Annex VI.

9.55 One cost which may be anticipated under this proposal is the financial cost associated with a banker's guarantee for the levied funds whilst these are in custody of the bunker supplier; though it is acknowledged that this may be limited if netting to the proposed fund is relatively quick, but this may introduce other costs which may need to be covered by the bunker supplier increasing his margin. It is possible that the GHG Fund itself will act as the guarantor, assigning a re-insurance function to third parties, though this would be an additional 'task' and risk for the GHG Fund Administrator that would incur administrative costs to establish and maintain.

Option 2

9.56 The proponents of the scheme suggest that "if shipowners should pay the GHG contributions directly to the GHG Fund, the scheme would become more complicated and burdensome all together …"[18] and "… a drawback of introducing payment of GHG contributions by shipowners could be that more entities would be responsible for paying GHG contributions to the GHG Fund."[19] Others have alleged that utilizing fuel suppliers as collection agents could be subject to fraud. However, it is not clear why the risk of fraud should be diminished through a system that relies on direct payment from individual ships or

[18] Paragraph 18 of MEPC 60/4/8.
[19] Paragraph 23 of MEPC 60/4/8.

shipping companies. These issues would need further consideration should the Committee decide to further explore and refine the GHG Fund.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

9.57 Cost predictability for the GHG Fund proposal involves two main aspects; namely the inherent stability of fixing the price for a given time period, and the need to adjust the price between periods to compensate for any over/under collection in the period compared with the CDM market fluctuations within the same period.

9.58 Although the duration of a period with fixed price in the GHG Fund proposal has not been suggested, most members of the Expert Group have assumed the fixed price period to be several years duration. On this assumption the proposal is rated medium-high on cost predictability. However, averaging over several periods this proposal will not be more or less costly than other proposals hinging on the Model Carbon Price.

Credit for early action

9.59 The GHG Fund proposal is based on the amount of fuel consumed and any investments in efficiency improvements done prior or after entry into force of the proposal will thus result in similar emission reductions and hence impact the contribution to be paid similarly.

9.60 The GHG Fund proposal is thus rated "neutral" with regard to credit for early action in the sense that it does not provide enhanced benefits for early birds.

Availability of technological and operational measures for CO_2 emission reduction

9.61 The GHG Fund proposal recognizes all technical and operational measures that can limit the fuel consumption of a ship.

9.62 Given that the GHG Fund acts as a relatively low driver for uptake of in-sector measures this factor has similarly relative low importance for the proposals application to the world fleet.

Practical feasibility of implementing the proposed MBM

9.63 Assuming there is a political will to start substantive work on the development of this proposal in the near future it appears possible that a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

9.64 When considering this proposal, IMO Implementation Lead Time (see common concept 5) must be borne in mind.

9.65 In particular, it is considered that the following elements of the proposal will need careful consideration and are likely to be critical in terms of the timely completion of the work that will need to be taken in developing the proposal to its entry into force.

.1 Establishment of the GHG Fund Administrator.

.2 Decision on how the money is to be collected (bunker supplier/shipowner).

.3 Agreement on how the money collected is to be used.

.4 Discussions internally within governments (e.g.: harmonization with national legislation and appropriate adoption mechanisms, applicable to all proposals).

.5 Implementation of the necessary monitoring and enforcement mechanisms related to administration of the GHG Fund, in particular if Option 1 is adopted.

.6 Agreement on the mechanism to be used for adjusting the level of the contribution.

Experience from similar schemes

9.66 The proposal advocates that experience from the IOPC Funds can be used in establishing and operating an International GHG Fund. The IOPC Funds are part of an international regime of liability and compensation for oil pollution damage caused by oil spills from tankers. The IOPC Funds are financed by levies on certain types of oil carried by sea. The levies are paid by entities which receive oil after sea transport (threshold "50,000t"), and normally not by States. Anyone who has suffered pollution damage in a Member State may make a claim against the IOPC Funds for compensation. However, not all countries are signatories to the IOPC Funds because of legal concerns. One of the principal incentives for a State to ratify the IOPC Fund Conventions is that this fund compensates for costs of damage which the State would have to pay for itself otherwise. While there may be some similarities in the 'organizational frameworks' of the IOPC Funds and this proposal to establish an International GHG Fund, and that payments into the GHG Funds will be made directly to an international fund by entities other than governments; there are some significant differences in 'philosophy'.

9.67 There is no experience from similar international schemes on GHG emissions due to the fact that there is no global sectoral approach on reducing GHG emissions under other Conventions.

9.68 Therefore, any comparison with the existing IOPC Funds mechanism is considered relevant only in terms of the fund administration. The 'contribution' systems are assessed as being significantly different. For example, when considering Option 1, the large revenue and number of fuel suppliers that are envisaged in this GHG Fund are circa 100 times larger than handled by the IOPC Funds. It is also noted that contributions to the IOPC Fund relies on States reporting on persons or entities that received large amounts of oil (in excess of 150,000 tonnes of crude oil or heavy fuel oil). When considering Option 2, it is considered that operational experiences from the IOPC Funds are not that relevant to this option, as the collection mechanism is fully direct, and does not rely on States to provide information on who should pay.

Ease of implementation and potential for phased implementation

9.69 The proponents of this scheme advocate that it would be relatively simple both to develop and implement and that there would be no underlying regulations on trade between ships. In particular, it is noted that ships are already required to have Bunker Delivery Notes on board and to complete the Oil Record Book, which in many respects accounts for fuel usage.

9.70 Regarding Option 1, it is noted that direct regulation of the bunker industry is largely limited to regulations 14 and 18 of MARPOL Annex VI. Fuel oil suppliers are subject to national regulations including reporting and financial requirements relating to the collection and payment of taxes. As such, many fuel oil suppliers will already have accounting and reporting experience in collecting and forwarding fuel surcharges.

9.71 The successful implementation of the GHG Fund will rely on the timely and accurate reporting and registering of contributions by the interested entities.

9.72 In the absence of any lower limit on the amount of fuel supplied that triggers a mandatory registration requirement, even the smallest supplier will have to register, collect and pass on the GHG contributions.

9.73 Any phased implementation would have to be wary of facilitating carbon leakage. However, phased implementation via either a small amount of contribution or based on specific ship types or trades may be possible, though a consequence will be a limited amount for offset and therefore limited reduction potential during the phase-in period. Also, when considering Option1, phased implementation by ship size or by type would not seem to make the implementation significantly easier, as, except in trade specific ports, the bunker suppliers would still have to be registered and able to deliver fuel in accordance with the GHG Fund provisions. Phased implementation by regions or Parties would need to consider the administrative burden associated with how to pay the supplier when buying fuel in Party States, and to the GHG Fund when buying fuel in non-Party States.

Enforcement, potential for evasion and avoidance of carbon leakage

9.74 The proposal, if adopted as proposed, would apply equally to all ships engaged in international trade.

9.75 The common concept 13 – Modal carbon leak describes a relevant concern of the Expert Group in this section.

9.76 It is to be noted that the coverage may be affected due to increased fuel purchases in non-Parties by ships that thereafter trade only between ports in non-Parties, which may also result in carbon leakage; as has been noted, this concern is not exclusive to this proposal and must be borne in mind for all proposals.

9.77 With respect to bunker suppliers, Parties' obligations would be similar to those currently under MARPOL Annex VI, with the same obligation to take action against suppliers that do not fulfil their obligations. For vessels, it would be a relatively simple affair for flag and port State officers to check the records and establish whether the contribution has been paid.

9.78 Regarding Option 2, it is considered that holding a shipowner liable for payment when the contribution should have been made by the charterer or operator opens the door to litigated disputes which would raise the cost of the system and may leave funds not being collected. Moreover, it is necessary for the contribution to be treated as a clear supply to the vessel so that any claim can go against the hull *in rem*.

9.79 In the context of Option 1, possible bunkering at sea, in both territorial and international waters, should also be kept in mind with regard to carbon leakage issues.

9.80 Regarding Option 2, the risk of contributions being lost to fraud may be reduced by eliminating the intermediary/collection role of the bunker supplier. The direct contributions from ships may also be lower on average than the consolidated payments from the fuel suppliers (who obtain contributions from many ships), reducing the incentive to commit fraud. However, it should be recognized that most carriers will submit payments for all ships in their fleet. Considering this, consolidated payments occur under Option 2 as well. The truly large consolidated payments would come from the largest bunker centres and fleets. To mitigate the issues that arise with large aggregate sums being held outside the system, the system could require the largest suppliers and fleets to report and transfer monies on a more frequent basis. Furthermore, the risk of shipowners being caught not paying contributions will depend very significantly on the initial robustness of the flag State control and thereafter the Port State Control (PSC) regime. The benefits to the port State in ensuring the proper functioning of the system may not be as evident as in the case of PSC activities relating to checking adequacy of the safety, security and environmental protection systems onboard the ship.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

9.81 The incremental requirements for implementation and enforcement under this proposal are expected to be minimal. As a result, the need for capacity building is also expected to be minimal. For some States, the legislative implementation process could give rise to a need for capacity building and technical assistance with the relevant international organization.

9.82 There are no direct technology transfer needs required under this proposal. Shipowners may wish to improve their ship or operational efficiencies in order to reduce the contribution that they have to pay. While a number of measures or technologies could result in fuel saving for the ships, there may be hurdles to adopting such measures or technologies, including long payback periods. There could be a need for technology transfer to help technically improve ships and their operational efficiencies.

9.83 The contributions to the GHG Fund would be used to purchase emission reduction credits, such as Certified Emission Reductions (CERs) from the Clean Development Mechanism (CDM) projects. If CERs were purchased, this would help contribute to mitigation activities in developing countries. The number of credits purchased would depend on the emission reduction target set for the maritime shipping industry. Funds in excess of this amount could be used to fund other mitigation and adaptation activities in developing countries; R&D projects in the maritime sector; technical cooperation activities (within the IMO framework); and the administrative expenses of the International GHG Fund.

	Year	B2	A1B
Funds ($bn)	2020	**3**	**3**
	2030	**4**	**5**

9.84 Potential climate financing for developing countries comprise funds as shown in table above.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC

9.85 The common concept 14, UNFCCC 1 and UNFCCC REVENUE, describe the Expert Group's views on general compatibility with the UNFCCC for this proposal.

Compatibility with Kyoto Protocol

9.86 The common concept 15, Kyoto Protocol, describes the Expert Group's views on general compatibility with the Kyoto Protocol for this proposal.

Compatibility with WTO

9.87 The common concept 16, WTO, describes the Expert Group's views on general compatibility with the WTO for this proposal.

Compatibility with UNCLOS

9.88 Having reviewed UNCLOS, in particular Part XII and Articles 194, 203, 217 and 222, no compatibility problems have been identified.

Relations with other climate finance institutions or initiatives

9.89 The aim of the proposed GHG Fund, in its economically most efficient conception, is to raise only enough revenue as required to achieve the desired migration of the fleet towards the designated emission targets. This implies a discussion of technical-economic parameters as may be relevant to the scheme.

9.90 The valuation of the international trade impact costs associated with the net drain from the sector, and the monitoring and enforcement of the re-allocation strategies for these funds in other sectors would need to be considered.

9.91 Having said this, however, this scheme proposes a relatively straight forward method of raising revenues for any proposed allocation plan.

9.92 Also, from the point of view of developed countries, the proposal does not recognize the contributions from their citizens (end customers) which would be implicit if the GHG Fund contributions are passed on as part of the transport costs to the receiver of the goods being shipped.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

9.93 When considering this proposal, National implementation concerns (common concept 18) must be borne in mind.

9.94 In the event of Option 1 being adopted, there will be new significant responsibilities for Administrations to regulate closely bunker suppliers. This would involve the verification of the amount of bunkers sold, ensuring that the bunker suppliers are able to contribute to the GHG Fund, as well as the legal instruments to take action against the bunker suppliers in the event of non-compliance. Regarding the latter point, new procedures and possibly structures may be required to interact with the GHG Fund Administrator, as the GHG Fund Administrator would verify the GHG Fund contributions taking into account the returns from the bunker suppliers and the shipowners/operations. For bunker suppliers from non-contracting States which had registered voluntarily, directly with the GHG Fund Administrator, there would be a need to set up the necessary legal and administrative framework to regulate as well as to take enforcement actions against these bunker suppliers in the event of non-compliance.

9.95 In the event of Option 2 being adopted, there will be new significant responsibilities for Administrations, which will need to verify the amount of bunkers lifted by ships, and ensure that the shipowners make payment to the GHG Funds.

Additional workload for flag States per ship

9.96 Flag states will have to inspect their ships to ensure that the fuel is bought at registered suppliers and that GHG contributions have been paid. It was considered that this would be an additional, though minimal, task to other flag States responsibilities.

9.97 To detect fraud some detailed checks of Bunker Delivery Notes against the Oil Record Book will need to be undertaken, which will require appropriate training of flag State surveyors and additional survey time to undertake.

Impacts on port State inspections and additional workload per call or inspected ship

9.98 Depending on whether Option 1 or 2 is adopted, it was envisaged that Port State Control will include the checking of Bunker Delivery Notes to verify that ships have bought fuel at registered suppliers or that GHG contributions have been paid. This will be a paper control and as such not a significant burden. These existing documents are already subject to PSC inspection and such basic verification of compliance with the GHG Fund regime does not seem to imply a significant supplementary workload for PSC inspectors. Information would need to be readily available to the inspector to allow the bunker supplier to be verified as being registered and the correct contribution has been made.

9.99 However, to detect more complicated fraud some detailed checks of Bunker Delivery Notes against the Oil Record Book, the log book and other sources will need to be undertaken, which may require additional appropriate training for Port State Control Officers and additional inspection time to undertake.

9.100 An additional, but as yet unspecified, amount of non-standard work would be required, if the enter-into-the-scheme fee is to be collected and then passed on to the GHG Fund. This may require the establishment of relevant bank accounts and control processes.

9.101 In relation to Option 1, it appears that controls are not intended to be made on bunker suppliers by a kind of extension of the current system of PSC control (which for the time being applies only to ships and their crew). Rather, as it is the case today, the control of bunker suppliers will be organized and undertaken according to the national law and administrative organization of the port State. Exercising control regarding the obligations of bunker suppliers under the new Convention will rely on administrative systems of various nature and complexity.

Availability of skilled human resources

9.102 As discussed above, the acquisition of new skill sets and additional training might prove necessary and, in some cases the additional workload might necessitate – at least in Administrations of States with very large fleets – to increase the level of the work force, unless efficient electronic management systems are created as part of the GHG Fund conception development and implementation processes.

9.103 Regarding Option 1, while the proponents of the system advocate that "… there will be very limited need for additional human resources", it is considered that further examination will need to be given regarding the need for qualified, skilled and experienced professional accountants in order to verify the activities of fuel suppliers, e.g., to provide reports, monitor contributions collected and transferred to GHG Fund.

Compatibility with national law

9.104 The common concept 17, CO_2 as a pollutant, describes a relevant concern of the Expert Group in this section.

9.105 Similarly it appears that some States would have challenges with the principle of the collection of 'international' contributions being inconsistent with national law. Inherent in such concerns is the challenge some Nations may have in collecting private funds out of commercial enterprises for the benefit of international funds.

9.106 In some jurisdictions a contribution collected within its national borders may normally be subject to internal fiscal or exchange restrictions. Therefore, some changes in national law, or even in a national constitution, may be required.

Sovereignty implications

9.107 Revenue collected within a country may be subject to sovereign decision(s) on its appropriation/hypothecation. Decisions on the unit price for GHG Fund contribution (every four years) could be seen as infringing sovereignty. These issues will need to be discussed and resolved in the enabling international instrument.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

9.108 Ships are already required by MARPOL Annex I to carry onboard an Oil Record Book where amounts of fuel bunkered must be recorded. In addition to this, MARPOL Annex VI requires ships to keep onboard for 3 years the Bunker Delivery Notes issued by bunker suppliers.

9.109 In addition to this the GHG Fund proposal requires a ship to carry onboard proof that payments to the GHG Fund have taken place for the amount of bunker oil the ship has been taken onboard (through bunker supplier or directly).

9.110 The GHG Fund proposal will not significantly expand the requirements already placed on ships to maintain records of fuel bunkered and to carry appropriate related documentation.

9.111 The administrative burden onboard is thus considered to be medium-low.

9.112 The legal requirement is placed on the individual ship. Shipowners, operators and charterers will have to develop the necessary commercial agreements to ensure the contributions are paid in timely to avoid any potential disturbance of ships operations by PSC.

Additional workload onboard

9.113 In the assessment of the GHG Fund the Expert Group found that it is not likely to be a strong driver for uptake of emission reduction technologies and that in the reference scenario it drives less than 1% of the GHG Fund proposals total emission reduction potential. For the individual ship this represents an insignificant additional workload compared to what would be generated by a mandatory EEDI (extra 5% reductions) and in relation to the total workload onboard we cannot quantify it.

9.114 For the industry as a whole the Expert Group estimated the additional onboard workload to amount to some $0.1 billion or 0.5% of the gross cost to the industry of implementing the proposal.

Additional economic impact for individual ships and the shipping industry

9.115 The industry has established well functioning practices to make sure that the appropriate parties in the transport chain pays for the fuel.

9.116 The GHG Fund proposal places an additional price element on each tonne of fuel used onboard ships and it is reasonable safe to assume that industry will adopt appropriate contractual agreements to ensure the additional cost will be borne by those parties already responsible for paying the fuel billion.

9.117 The need for additional tonnage to counter for any uptake of slowing the fleet down due to the low in-sector emission reduction driven by this proposal is not considered to be of any significant importance.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for new IMO instrument

9.118 A new IMO Convention will be required.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

9.119 A GHG Fund Administrator will need to be established and maintained. Its tasks will include to receive, record and monitor information from ships and/or bunker suppliers; acknowledge receipt of paid GHG contributions; maintain and allocate revenue; maintain a ship-specific and/or bunker supplier registry; monitor ships' purchase of bunker fuel and payment of GHG contributions and notify parties of specific ships in case of any suspected non–compliance; and submit an annual report.

Role of flag State

9.120 There will be additional work for the flag State in liaising with the GHG Fund Administrator by routine reporting and in the event that enforcement actions are required to be taken regarding any non-compliance on ships flying its flag.

Role of port State

9.121 There will be additional work for the port State in liaising with flag States and/or the GHG Fund Administrator in the event that enforcement actions are required to be taken regarding any non-compliance by ships within their jurisdiction.

9.122 Port States will also be involved in collecting any 'enter-into-the-scheme' fees and passing these on to the GHG Fund.

9.123 In Option 1, the role of the port State might be more complicated than it has been traditionally, as the involvement of economic land-based stakeholders, not usually included in the IMO 'framework', traditionally ships, shipowners and crews, and prove a complex issue, due to the specificity of different national legal and administrative systems involved in international shipping.

Role of recognized organizations

9.124 The proposal does not discuss any role for Recognized Organizations. However, it is anticipated that Recognized Organizations might be authorized to act on behalf of Administrations, in a similar way as allowed for in other IMO Conventions. In this regard, it was noted that also the Recognized Organizations will probably have to acquire new skill sets and additional training will have to be undertaken for staff.

Survey, Certification and other means of control

9.125 Especially in the case of Option 1, bunker suppliers will need to come under a new form of regulation and control. Bunker Delivery Notes, perhaps in a new standardized format, will need to be modified to indicate that the fuel has been supplied by a registered supplier and that the appropriate contribution has been paid.

Involvement of other authorities (e.g., Treasury)

9.126 Involvement of possibly many other national authorities other than maritime Administrations (e.g., Government treasury, finance, anti-fraud and environment departments) appears to be very likely, especially in the case of Option 1.

10 CONSIDERATION OF A MARKET-BASED MECHANISM: LEVERAGED INCENTIVE SCHEME TO IMPROVE THE ENERGY EFFICIENCY OF SHIPS BASED ON THE INTERNATIONAL GHG FUND – JAPAN (MEPC 60/4/37)

FOCAL POINT SUMMARY OF THE PROPOSAL

Outline of Leveraged Incentive Scheme ("dual" incentive by refund)

10.1 The Leveraged Incentive Scheme is purposely designed to primarily target "direct" reduction of CO_2 emission from the shipping sector. The concept of the Leveraged Incentive Scheme is that a part of the GHG contributions which are collected on marine bunker is refunded to ships labelled as "good performance ships". The Scheme provides stronger incentives to improve the efficiency of individual ships. This is because it has a "dual" incentive structure. The first incentive is that shipping companies would have an incentive to reduce their fuel consumption as the amount of contributions is proportional to the fuel consumption. The second incentive is that a part of the paid contributions would be refunded to those "good performance ships".

What criteria should be used for the performance appraisal and labelling of "good performance ships"

10.2 The way to achieve the highest possible energy efficiency is to 1) firstly procure and use a good hardware (to be reflected in EEDI), and 2) then operate such hardware "wisely" (to be reflected in EEOI). Therefore, it is considered appropriate to use dual criteria for the refund appraisal: one is the performance of the hardware based on the EEDI (criteria No.1), and the other is the performance of operation based on the EEOI (criteria No.2).

How the Leveraged Incentive Schemes work

10.3 **Step 1**: The contribution is collected from all ships (possibly with an exclusion of small ships) in a mandatory manner, with a fixed amount per tonne of purchased fuel.

10.4 **Step 2**: In case of "criteria No.2 of the performance appraisal" (relating to the energy efficiency during operation), the EEOI values have to be monitored and recorded by each ship. This is NOT mandatory for all ships; only those owners/operators who think that their ships' performances are good or improved would conduct the data collection voluntarily, for possible refund of a part of the contribution that they had already made.

10.5 **Step 3**: In case of the refund relating to "criteria No.2 of the performance appraisal", the data collected in Step 2 should be verified by the Administration or the organization recognized by it, and the refund application should be accompanied by the verification report. The refund application with "criteria No.1 of the performance appraisal" (superior EEDI values in excess of required EEDI) should be accompanied by a relevant international certificate issued in accordance with the EEDI requirements, thus not requiring specific verification process.

10.6 **Step 4**: This administrative process is carried out by an International GHG Fund to be established. Labelling would be done as an automatic calculation based on the standard template of the submitted data, following the pre-determined criteria of "good performance ships" and corresponding refund rates, avoiding any arbitrary judgment. The international GHG Fund would have to predetermine the "budget" for refunding, considering both levels of incentives necessary for investing in improving the efficiency of ships and the allocation of revenue for other purposes.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

10.7 The Leveraged Incentive Scheme (LIS) proposed by Japan has many elements in common with the GHG Fund. The basis is a contribution charged on all bunker fuels supplied to ships in international trade and this aspect of the proposal would be regulated in the same way proposed within the GHG Fund (with the exception of setting the level of the contribution or a fixed target line discussed below).

10.8 The key difference is that in place of a target line related to overall net emissions for the GHG Fund, the LIS proposes a system of efficiency incentives in the form of graded refunds of the GHG contribution, to ships that attain certain standards of design and operational efficiency. The different categories of incentive are discussed in more detail below.

10.9 The LIS seeks to achieve the highest possible emissions reductions in-sector, on a per tonne mile basis. Instead of spending revenues on project credits outside the sector, it spends them on increasing the incentives for efficiency improvements within the sector. As a result, it does not propose to place an overall limit on net GHG emissions from shipping. The proposal notes that any remaining 'fund' could also be used to finance adaptation and mitigation actions in developing countries, but this would not be done in order to deliver a given target line.

10.10 The level of the contribution would be set to correspond with the carbon content of the fuel at the current carbon market prices. A tonne of bunker fuel yields approximately three tonnes of CO_2 when burned, so for example, a CO_2 price of \$20/tCO_2 would translate to a contribution of \$60 per tonne of fuel. The thresholds for securing a refund would be set in reference to standards agreed for the Energy Efficiency Design Index (EEDI) and Energy Efficiency Operational Indicator (EEOI). For instance, in the case that EEDI standards are set to reduce over time, a ship would secure a refund if it met a future EEDI standard before that standard became mandatory. The further in advance a ship achieve the standard, the greater the level of refund.

10.11 The contribution element would apply to all bunker fuels sold to ships for international trade. The refund element would apply differently to new and existing ships: new ships would be eligible for refunds if they met EEDI standards in advance; existing ships would be eligible if they met defined standards of good performance relative to EEOI.

10.12 The important impact of LIS is introducing direct competitiveness between similar ships involved in similar trades. The contribution element related to LIS would add a small but relatively stable price to the cost of bunker fuels, which would increase the range of emissions reduction actions that were cost effective. This price would function in the same way as discussed above for the GHG Fund, and be subject to the same caveats about the non-price barriers. It would however be larger than for the GHG Fund, as the formula for setting the contribution would make it equivalent to the full carbon price, not a fraction of the carbon price as with the GHG Fund.

10.13 The refund element would magnify the incentive for ships to improve efficiency, as they would be refunded part or all of the contribution if they attained given standards. Three different sorts of refund are proposed:

.1 For new ships, attainment of future (more stringent) EEDI standards ahead of time. It is envisaged that mandatory EEDI standards would be set for five year periods, that the standards would reduce over time, and that at any given time standards for at least two future periods would have been set. A 50% refund would be granted to a new ship attaining the EEDI one period ahead of time, and a 100% refund to any ship attaining the EEDI two periods ahead. So if a ship built in 2015 already attained the EEDI that would become mandatory for the period 2018-2022, it would receive a 50% refund in the years 2015, 2016 and 2017. In 2018 it would simply become a compliant ship and receive no refund. A ship built in 2015 that already attained the EEDI for 2023-2027 would receive a 100% refund for the years 2015-2017 (when it would be two phases ahead), a 50% refund for the years 2018-2022 (when it would be one phase ahead) and no refund from 2023 onwards.

.2 For existing ships, two 'patterns' of good performance are proposed, rated according to the average EEOI of a ship over a year. The first pattern is attainment of a given EEOI benchmark. Ships would receive a refund calculated according to how far they out-perform the benchmark: for instance, a ship that was 8% below the benchmark might receive a 60% refund.

.3 The second pattern is improved EEOI performance relative to a ship's own past performance. This pattern is proposed to give an incentive to improve the operational efficiency of a ship that may find it difficult to attain the absolute EEOI benchmark. The refund would be calculated according to the rate of improvements: for instance, a ship that achieved a 7% improvement in its annual average EEOI might receive a 40% refund.

10.14 It should be noted that the percentage refund figures quoted above are indicative, and it is proposed that the exact parameters of the standards and refunds would be set by the LIS Administrator / administrative body.

10.15 The different refund elements would increase the incentive to implement emissions saving measures (in both design and operations), since there would be a predictable financial reward for doing so. A greater range of measures would thus become cost-effective, leading to higher in-sector reductions than under the GHG Fund proposal. This effect would be partially offset by the increased administrative burden of the monitoring and reporting that would be required to obtain the refund – particularly for the EEOI-related elements.

10.16 It is proposed that remaining proceeds in the LIS fund (funds remaining after refunds had been granted) could be used to fund mitigation and adaptation action in developing countries. To the extent that remaining proceeds were spent on mitigation, they would deliver out-of-sector reductions. Those would be easy to quantify if they involved the purchase of CERs or other carbon market units. They would be harder to quantify, but still beneficial, if they funded non-market mitigation actions. Funds spent on adaptation would deliver an important social benefit to developing countries even though no 'emissions equivalence' would be calculated for such activities.

10.17 The amount of remaining proceeds available for these purposes would be a function of the carbon price, which would determine the initial size of the LIS fund, and the refund parameters, which would determine how much of the LIS fund remained after all refunds are granted. It is reasonable to assume that the LIS fund administrators would err on the side of caution when setting the parameters, as they would not wish to reach a situation where the LIS fund could not afford to pay the refunds on the basis that they had been promised to owners. Nonetheless, a substantial proportion of the LIS fund is likely to be used in granting refunds, and the implication of MEPC 60/4/37 is that out-of-sector reductions are not integral to the proposal.

In-sector and out-of-sector reductions

10.18 In-sector and out-of-sector GHG emissions reductions and costs were modelled for the LIS under different growth rates, levy rates, and with different amounts of revenues refunded to 'good performing ships'.

10.19 The modelling considered scenarios where 25%, 50% and 75% of revenues were refunded to 'good performing ships'. In all three scenarios it was assumed that half the refunds were 'full' refunds and the other half were 'half' refunds. The scenarios translate as follows:

Table 10-1: Assumptions used for the distribution of refunds under the leveraged incentives scheme

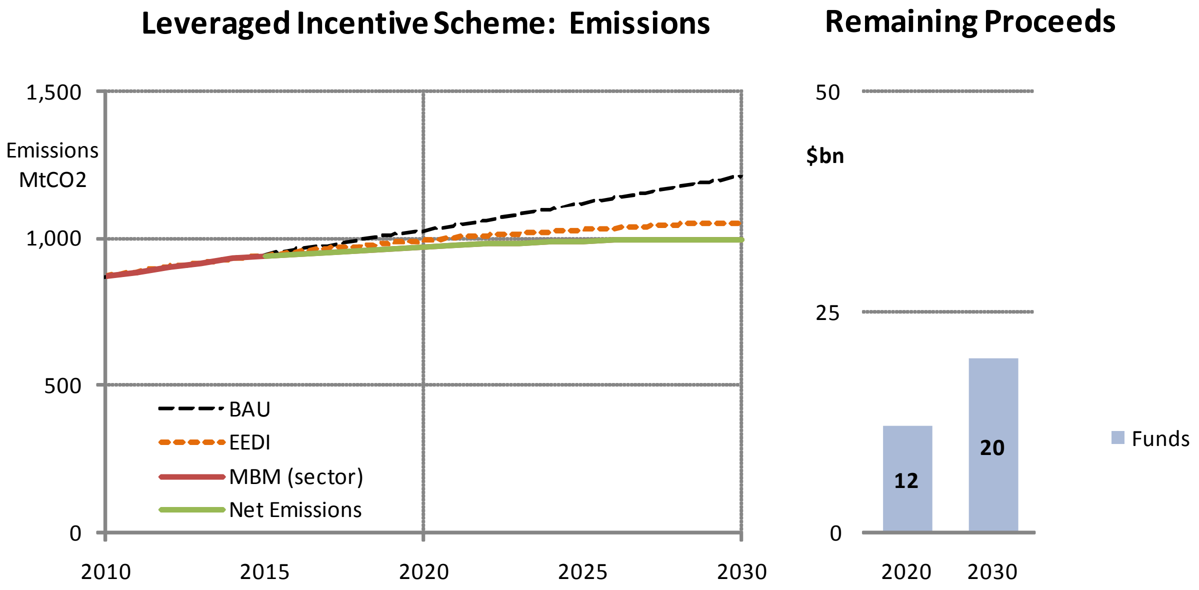
Revenue refunded	Portion of ships receiving full refund	Portion of ships receiving half refund
25 per cent	1/6 (17%)	1/6 (17%)
50 per cent	1/3 (33%)	1/3 (33%)
75 per cent	1/2 (50%)	1/2 (50%)

10.20 These refund scenarios were examined under the scenarios set out in annex 5.

10.21 Figure 10-1 and Figure 10-2 illustrate modelling for each growth scenario assuming 50 per cent of revenues are refunded, a reference fuel price, and medium carbon price translated into a fuel price (the levy). These scenarios are referred to below as the B2 and A1B reference scenarios for the LIS.

10.22 The line graphs show emissions under a business as usual baseline (black line), and for illustrative purposes the expected emissions if a mandatory EEDI was implemented at a medium stringency is also shown (orange dashed line). It should be noted that a mandatory EEDI is not included as part of the Japanese proposal, but the proposal envisages that a mandatory EEDI would be in place. Future EEDI limits in advance of the latest standard are used as one measure of good performing ships. The green line below the dashed EEDI line represents the effect of the LIS on stimulating in-sector reductions.

10.23 The bar charts show remaining proceeds of the LIS representing additional funds that could be used for adaptation, R&D and out-of-sector mitigation. How the remaining proceeds would be spent is not prescribed by the LIS and would be subject to policy considerations.



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Remaining proceeds collected under the LIS are those revenues not provided as refunds and are proposed to be used for the abovementioned purposes. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated to be **485 Mt in 2020 and 495 Mt in 2030**.

Figure 10-1: Modelled emissions and remaining proceeds under the Leveraged Incentive Scheme with 50 per cent of revenue refunded under the B2 growth scenario with a medium carbon price and a reference fuel price

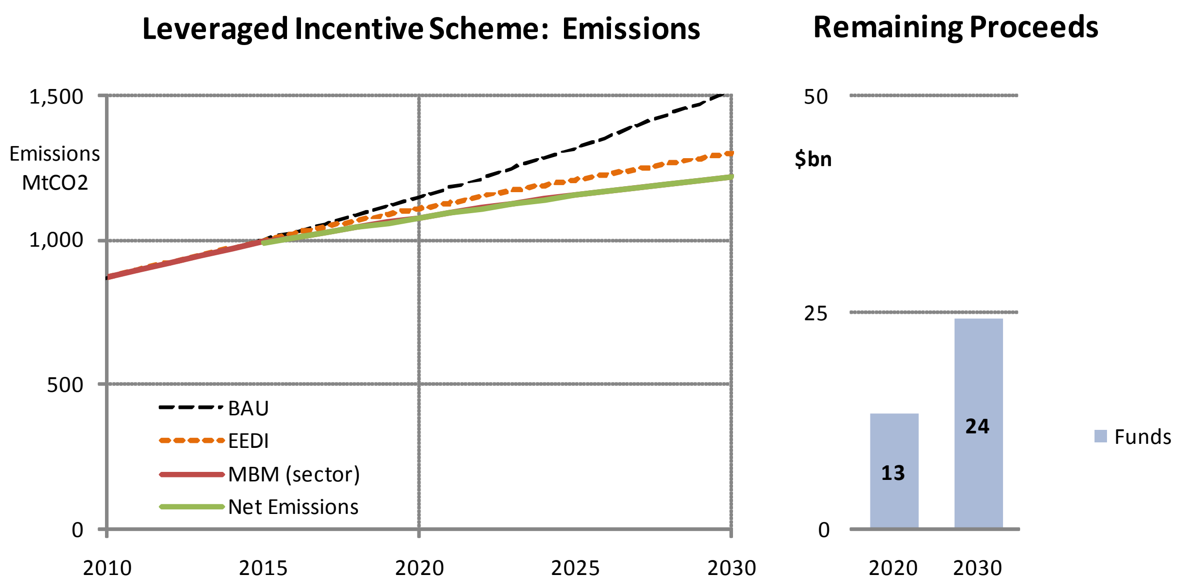


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Figure 10-2: Modelled emissions and remaining proceeds under the Leveraged Incentive Scheme with 50 per cent of revenue refunded under the A1B growth scenario with a medium carbon price and a reference fuel price

10.24 In the modelled reference scenarios for the LIS, the MBM reduced emissions below BAU by 2 per cent in 2020 and 5 per cent in 2030. These relative reductions below BAU were the same for both growth scenarios. The remaining proceeds after paying refunds could deliver additional mitigation as noted in the captions to the graphs above and table below.

10.25 Key results for the modelling of the LIS reference scenarios are also shown in Table 10-2.

Table 10-2: Modelled emissions and emission reductions under the Leveraged Incentive Scheme with 50 per cent of revenue refunded under B2 and A1B growth scenarios with medium carbon price and reference fuel price

	Year	B2	A1B
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	969	1,079
	2030	991	1,219
MBM in-sector reductions (Mt)	2020	24	26
	2030	63	76
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	2%	2%
	2030	5%	5%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Potential for supplementary out-of-sector reductions (Mt)	2020	485	539
	2030	495	610

The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D**.** Remaining proceeds collected under the LIS are funds which are not provided as refunds and are proposed to be used for the abovementioned purposes. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation is shown.

10.26 Decreasing or increasing the revenues used for refunds (down to 25 per cent and up to 75 per cent, while holding the levy rate at the medium level) increased or decreased the reductions achieved below BAU by around one per cent (not shown). Applying the higher levy rate (equivalent to $300 per tonne of fuel in 2030) with a 50 per cent refund rate, reduced emissions to around 9 per cent below BAU in 2030 (not shown). These relative effects are indicative of what could be expected, but how much the LIS would reduce emissions below the BAU in reality is less certain.

10.27 How ships would respond to a refund is difficult to predict as this response would be voluntary, and influenced by the costs and benefits to ships of obtaining a refund. Nevertheless, the relative size of the in-sector response observed for the LIS, compared to MBMs that employ a contribution, levy or carbon charge at a similar rate (e.g.: RM, PSL and ETS) gives an indication of the additional in-sector reductions that could be achieved through the leveraged mechanism.

10.28 Higher fuel prices could have a slightly different effect on in-sector reductions under the LIS compared to other proposals that use price as an incentive. As discussed in common concept 12, Fuel costs, high fuel prices could result in a relatively smaller effect to a given price incentive due to the uptake of relatively low cost measures in response to the fuel price. Under the LIS high fuel prices could stimulate ships to move in the direction of qualifying as good performing ships, meaning fewer measures would need to be implemented in order to qualify for a refund. Modelling this effect was beyond the limits of the model.

10.29 The impact of the LIS on bringing forward technology was also not considered in the modelling. Technology effects were not modelled due to the inherent uncertainty associated with predicting the development and commercialization path for technologies. Nevertheless, the use of remaining proceeds generated from the LIS for R&D as well as the financial incentives provided by the LIS refund mechanism to build more energy efficient ships could result in increased in-sector reductions through technology development and accelerated deployment.

10.30 The range of responses observed under all modelled scenarios is shown in Table 10-3. The term 'remaining proceeds' is explained in the caption to Table 10-2.

Table 10-3: Ranges for emission reductions observed when modelling the LIS in 2030

Key elements	Leverage incentive scheme	
	High	Low
MBM in-sector reductions (Mt)	153	32
MBM out-of-sector reductions (Mt)	0	40
MBM reductions (% of BAU)	10%	3%
MBM in-sector reductions (% of MBM reductions)	100%	100%
Remaining proceeds ($billion)	87	10

Certainty of reductions

10.31 The LIS does not set a target line for emissions from international shipping and nor does it set a goal for efficiency improvements under the leveraging element of the scheme (although the LIS envisions operating alongside a mandatory EEDI which would prescribe efficiency targets for new ships). It would simply establish a system of incentives for reducing emissions within international shipping and the reductions achieved would be those resulting from shipping's own response to the incentives.

10.32 The LIS provides an enhanced incentive for implementing emissions saving measures within the shipping sector, compared to the basic GHG Fund proposal. However, the implementation of such measures remains a commercial decision for shipowners or operators, and there is still therefore uncertainty over the degree of uptake that would be driven by the proposal. Put another way, the LIS increases the market incentive, but does not directly address all non-price barriers, since no standards are mandatory (beyond those that the proposal assumes will be established by a mandatory EEDI regime in MARPOL Annex VI). However, some informational barriers could be addressed by the LIS by setting out what ships would need to do to be classified as good performers and the financial reward from implementing those actions. Monitoring, reporting and verification of, in particular, the EEOI standards would be complex. Operators could be tempted to manipulate data in order to claim higher refunds than they deserve, leading to the scheme appearing to have achieved greater reductions than in reality.

10.33 The certainty of out-of-sector reductions would depend on the funds available for this purpose, the split between adaptation and mitigation activities, and the quality of the mitigation activities funded.

10.34 There is an inverse relationship in the proposal between in- and out-of-sector reductions, in that more generous refunds would lead more operators to implement emissions saving measures, but this would leave less money in the LIS fund for funding out-of-sectors initiatives.

Cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development

The cost-effectiveness of the proposed MBM

10.35 Table 10.4 shows gross costs under the reference scenarios for the Leveraged Incentive Scheme. Since under the reference scenarios for the LIS, it was assumed that 50 per cent of revenues from the contribution would be refunded to good performing ships, the remaining 50 per cent would represent net revenues. Gross costs would be equal to the sum of net revenues and refunds.

Table 10-4: Modelled costs under the Leveraged Incentive Scheme with 50 per cent of revenue refunded under B2 and A1B growth scenarios with medium carbon price and reference fuel

	Year	B2	A1B
Financial: gross costs ($billion)	2020	24	27
	2030	40	49
Refunds to ships($billion)	2020	12	13
	2030	20	24
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	12	13
	2030	20	24
MBM in-sector reductions (Mt)	2020	24	26
	2030	63	76
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
Cost of reductions ($/tonne CO_2 abated)	2030	316	319
Maximum cost-effectiveness potential ($/tonne CO_2)	2030	36	36

10.36 The total direct cost for the industry in the A1B scenario is estimated to be $49 billion[20] in year 2030 with $24 billion being refunded back to the industry rewarding good (e.g., energy efficient) performance.

10.37 Indirect cost consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in port State control organizations and not least in operation of the GHG Fund mechanism.

10.38 The administrative costs of LIS are likely to be higher relative to the GHG Fund, as an additional, complex layer of refunds has been introduced, which would require robust monitoring, reporting and verification. However, the direct costs to any operator who achieves a refund would, of course, be lower due to receipt of the refund.

20 A1B, Reference fuel price, Medium carbon price

10.39 In the Leveraged Incentive Scheme proposal the use of funds to offset emissions out-of-sector is not defined.

A1B: Reference fuel price, 2030, medium carbon price

The cost-of reductions is estimated to be 319 \$/tonne CO_2 abated.

The amount of funds generated for other purposes is \$24 billion

The maximum cost-effectiveness potential of the proposal is 36 \$/tonne CO_2

Administrative Costs (including any central administrative requirements)

10.40 This proposal will require the establishment of a mechanism to compute and verify periodically EEOI values for existing ships (ships in operation).

10.41 It will require a number of administrative tasks to be undertaken by the parties involved, *inter alia*:

Step 1: Collection of contribution (mandatory)

.1 Fuel supplier: Provide Bunker Delivery Note (as already required by MARPOL Annex VI);

.2 Ship: Keep Bunker Delivery Note (as already required by MARPOL Annex VI); report on amount of fuel used; pay GHG contributions to International GHG Fund;

.3 Flag State: issue International EEDI Certificate; monitor and enforce compliance for ships flying its flag;

.4 Port State: Monitor and inspect compliance for ships in its ports; check Bunker Delivery Notes, oil record-book and other related documents to establish if the ship has been provided with fuel deliveries in non-contracting States; and

.5 International GHG Fund: Maintain register of payments; receive payments from individual ships based on fuel use; set refund rates and process refund applications and grant refunds; disburse remaining revenues.

Step 2: Data collection by individual ships (not mandatory; only by any ship which believes its hardware potential and/or operational performance satisfy the criteria for refund from the International GHG Fund);

.1 Ship: monitor and record EEOI performance over a sufficient time span (case of criterion No. 2 (EEOI)); apply for refund from GHG Fund;

.2 Flag State: Monitor and enforce compliance for ships flying its flag; check account (electronic) for any ship that applies for a refund, i.e. verify status of performance (compliance with EEOI);

.3 Port State: Monitor and inspect compliance for ships in its ports; and

.4 International GHG Fund: Set refund rates and possibly adapt to future situations; compare to criteria; and distribute funds.

10.42 In particular regarding the above tasks, it will have to be determined which ships should be eligible to claim the refund and the establishment of the baseline and procedures for documenting and verifying the ship's improvement. Furthermore, the level of refund to individual ships needs to be decided. Also a decision about the shares of the fund has to be taken to cover refunding of good performance ships, mitigation and adaptation. These are all decisions that will have a significant policy element to them and that will have to be taken on a regular basis to ensure that the system keeps pace with technological and market development.

10.43 In general, the administrative costs would be related to three key elements: (1) costs attributed to contribution collection, as outlined for the GHG Fund 'direct collection of contribution' proposal (though it may have to keep accounts for the charterers, owners and operators of a particular ship given that it is possible that the ship would change charterers/operators/owners during the assessment period); (2) costs related to evaluating as well as measuring, reporting and verifying (MRV) performance of ships and labelling them as "good performance ships"; and (3) issuing and managing refunds to such labelled ships (though the associated administrative costs will depend on the degree of automation and whether they are managed centrally or locally). There would also be additional costs related to data collection by each individual ship.

10.44 The additional MRV costs relate to two performance appraisal (PA) criteria proposed. The first PA criterion relates to superior EEDI values in excess of the required EEDI. For PA of EEDI, the refund application with EEDI should be accompanied by relevant international certificate which is to be issued in accordance with the regulations on EEDI which are now under development. The second PA criterion relates to values of an Energy Efficiency Operational Indicator (EEOI). Operational data has to be monitored and recorded by a ship to determine its EEOI value for it to be able to apply for a refund later.

10.45 The additional costs would depend on the complexity of PA criteria as well as their stringencies. Given that any application for a refund will be voluntary, the MRV costs will be somewhat reduced as only ships for which refund gains would be expected to exceed the administration costs would collect the necessary data and apply for the refund. However, it may be difficult for the International Body to predict the number of applications for refunds.

10.46 A possibility also exists that smaller ships may decide to ignore the potential refund when it is relatively small, as their data collection and the refund costs may be disproportionally higher when compared with larger ships. This may happen when the variable benefits, which depend on the amount of transport work, would be comparable with the relatively fixed administration costs. This may lead to a lower effectiveness of the leveraged incentive scheme for smaller ships.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

10.47 Cost predictability for the GHG Fund proposal involved two main aspects; namely the inherent stability of fixing the price for a given time period, and the need to adjust the price between periods to compensate for any over/under collection in the period compared with the CDM market fluctuations within the same period.

10.48 The Leveraged Incentive scheme is an add-on to the GHG Fund and as such shares some of the GHG Funds basic characteristics – one being a relative high predictability in terms of cost. The Japanese scheme does however add the element of a refund which both is a driver for predictability (for excellent ships which will receive the refund) as well as an element of uncertainty (the terms for getting the refund are not well established at this point).

10.49 The assessment of these two added mutual diverging factors were rated by the Group with a small preference to the refunds ability to serve as an element that stabilizes the proposal. For these reasons the Leveraged Incentive scheme is rated medium-high on cost predictability.

10.50 An added benefit for the shipowner would be that the contribution is paid when the ship bunkers fuel while the refund would be paid out at a later stage. The refund is thus not directly linked to each individual payment to the fund.

Credit for early action

10.51 Ships built prior to entry into force of a mandatory EEDI regime may benefit from this proposal by improving their EEOI. Having a high starting point is potentially more beneficial if the system is based on benchmarking but not if relative improvement is measured. Efficient ships may benefit from the proposal as long as they remain operationally efficient. However, the opportunity to benefit from improving performance would be limited.

10.52 Change of trading pattern may influence the EEOI of a ship and thus render it ineligible to receive refunds.

10.53 Ships built after entry into force of a mandatory EEDI regime can take advantage of being built more efficient than required for a limited time until they are caught up by the EEDI stringency. The EEDI will not cover all ships in its first phase(s).

10.54 In the assessment of credits for early action the Group has put more emphasis on the effects on new ships being built in the years to come than the more temporary phasing in of the scheme involving existing ships. The rating of the Leveraged Incentive scheme is thus relatively high.

Availability of technological and operational measures for CO_2 emission reduction

10.55 The Leveraged Incentive scheme proposal recognizes all technical and operational measures that can limit the fuel consumption of a ship.

10.56 It further amplifies the operational measures via the EEOI incentive and technical measures via the EEDI incentive.

10.57 This proposal drives a relative large additional in-sector emission reduction which would be in excess of that required by a mandatory EEDI. Availability of measures is thus an issue and may limit the extent to which the incentives can in fact be utilized in the industry. In this context it is important to realize that the Leveraged incentive scheme defaults to the GHG Fund proposal in the event the incentives cannot be utilized and refunds back to industry not be paid out.

Practical feasibility of implementing the proposed MBM

Development time for new IMO Instrument

10.58 Assuming there is a political will to start substantive work on the development of this proposal in the near future, the text of a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

10.59 Discussions would also be needed to address the question of setting the level of the contribution, as well as the levels for the two proposed performance appraisal (PA) criteria. Given that the PA criteria would effectively identify and reward good performance ships, it may take some time to decide on relevant values, for both EEOI and EEDI. It seems that the contribution level may not depend on the market carbon prices but rather on how effective it may be to stimulate or incentivize energy efficiency. As such this process may need careful and lengthy consideration.

10.60 It is noted that this proposal will not require an emission reduction goal or emission cap to be established, nor does it require an emission baseline for starting up the scheme. However, the development time would not be 'independent'; it would be linked to finalization of the EEDI. Its application as a measure to financially reward new ships in operation has not been considered.

10.61 Given that this proposal is in fact a hybrid instrument, based on energy efficiency measures and price signal (contribution), the development time is not easy to assess, at this time, as on one hand it will increase the scheme's complexity while on the other hand it avoids certain policy issues.

Experience from similar schemes

10.62 The proposal makes reference to another scheme called 'ECOPOINT' as a possible model for the refund scheme. In the ECOPOINT scheme, consumers who have purchased environment friendly products, such as electric goods, houses and house components, receive ECO-POINTS that can be used to purchase something else. However, it is noted that ECOPOINT is a national scheme and its relevance in terms of developing an international scheme will need careful consideration and evaluation. It is also noted that this national system applies only when an item is purchased, not when it is operated throughout its lifetime. It may therefore be seen as providing a one-off discount rather than a continuous refund.

10.63 It is noted that this proposal is a complement to the current effort within the IMO to develop efficiency index standards for new ships through the EEDI, the experience being gained from this ongoing work could be beneficial in the further consideration of this proposal – though recognizing that this proposal includes financially rewarding the operations of more efficient new ships.

10.64 Examples of similar schemes where an efficiency benchmark is used to continually refund parts of revenue raised by market-based measures or to differentiate the level of levy can be found at the domestic level[21]. Although there are mechanisms in place to reward

[21] In the UK's Climate Change Levy (CCL) applied to the industrial and commercial supply of taxable commodities for lighting, heating and power, firms in energy intensive industries are able to enter into climate change agreement which allows them to receive up to an 80 per cent discount from the CCL in return for meeting energy efficiency or carbon-saving targets. Relevant information can be found at http://www.decc.gov.uk/ or http://customs.hmrc.gov.uk/

environmentally friendly ships, there appears to be no experience at the international level regarding another element of this proposal, i.e. a money transfer to ships meeting certain criteria.

Ease of implementation and potential for phased implementation

10.65 It is noted that the proposal makes no mention of a phased implementation.

10.66 To the extent that efficiency schemes keep funds within the sector, this proposal may appear to be politically simpler to implement.

10.67 The proposal aims to offer flexibility in rewarding ships for increased efficiency, but this may make the implementation more challenging, as various mechanisms would be needed for flexibility. In particular, monitoring, recording, verifying and ensuring accuracy of the EEOI values and improvement rates will need particular attention and may prove challenging for flag States. According to the proposal, "Japan has examined the actual EEOI on a series of 90 ships over a three year period to check the feasibility of evaluation by the EEOI. Based on this analysis, Japan is of the view that it is possible to use the EEOI as an evaluation tool to label "good performance ships". However, to what extent the evaluation of the EEOI is feasible on the global scale will need careful consideration and is difficult to assess at this time.

10.68 Additionally, for the "linearly progressing refund rates" model, the determination of the ship's relative position of its attained EEDI against the benchmarks will need careful consideration. It can be argued that the determination of baselines for EEOI and EEDI for individual ships which are sufficiently differentiated to distinguish between various ship types and sizes is not a straightforward matter.

10.69 It is noted that exemption for small ships is mentioned in the proposal but not described in any details. In this regard, it is noted that small ships and companies may consider carefully any additional effort to monitor certain operational data, calculate EEOI (if used), and apply for refund using EEDI or EEOI performance appraisal option, versus the refund that may be achieved. They might decide not to use the refund mechanism, if administrative costs are higher than the refund. The system may therefore provide fewer incentives for small ships to participate.

Enforcement, potential for evasion and avoidance of carbon leakage

10.70 If the refund is claimed in accordance with the EEDI element, it may initially appear that implementation will be relatively straightforward, with little scope for fraud, since the EEDI will be 'pre-verified' by the flag State/RO. Also, the proposal is intended to apply equally to all ships engaged in international trade. On this basis, there should not be any significant carbon leakage.

10.71 The common concept 13, Modal carbon leak, describes a relevant concern of the Expert Group in this section.

10.72 The proposal is based on the principle that the EEOI, as currently being developed, will not be used for the comparison of ship performance between different ships. Therefore, the evaluation using EEOI for refund purposes is to assess the relative improvement of efficiency of a particular ship. This means that older and younger ships have the same chance to be rated as "good performance ships". However, as the proposal is efficiency based, it will still need to be carefully considered if the proposal can, in any way, create distortion of competition between older and younger ships, especially noting that a single performance criterion can be used for an existing ship (EEOI) and one of two performance criteria for a new ship (EEDI or EEOI). Applications based on EEDI and EEOI would require thorough verification in order to avoid fraud, noting that the correct application of the EEOI will need particularly careful consideration, since it will rely more on information provided by the ship. In general, if the verification process is not sufficiently rigorous, there would be scope for fraud/carbon leakage.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

10.73 As noted above, in the case a ship applying for a refund on the basis of the EEOI standard, the flag State administration would need to verify the EEOI data collected by the shipowner. While this may be delegated to a Recognized Organization, the flag State would have the responsibility to ensure the work has been done correctly. This could require additional training in the verification process for staff. If the EEDI becomes mandatory and is implemented before any market-based measure is implemented, then the incremental requirements for this assessment would mostly likely have already been covered (see also MEPC 61/5).

10.74 While a number of measures or technologies that could be used to meet the efficiency standards would also result in fuel saving for ships, there may be hurdles to adopting such measures or technologies, including long payback periods. There could be a need for technology transfer to help improve ship design and operational efficiencies.

10.75 The proposal would raise revenues. Some would be needed for the refund part of the proposal; any remaining revenues could be used for other purposes, including mitigation and adaptation activities in developing countries.

	Year	**B2**	**A1B**
Funds ($bn)	2020	**12**	**13**
	2030	**20**	**24**

10.76 Potential climate financing for developing countries comprise funds as shown in the table above.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC

10.77 Common concept 14, UNFCCC 1 and UNFCCC REVENUE, describe the Expert Group's views on general compatibility with the UNFCCC for this proposal.

Compatibility with Kyoto Protocol

10.78 The common concept 15, Kyoto Protocol, describes the Expert Group's views on general compatibility with the Kyoto Protocol for this proposal.

Compatibility with WTO

10.79 Common concept 16, WTO, describes the Expert Group's views on general compatibility with the WTO for this proposal.

Compatibility with UNCLOS

10.80 No compatibility problems with UNCLOS have been identified.

Relations with other climate finance institutions or initiatives

10.81 In comparison to proposals to establish a GHG Fund without a Leveraged Incentive Scheme, less of the revenues collected in this scheme can be used to finance other climate mitigation initiatives, because a significant share of the revenues are refunded to efficient ships.

10.82 This is an in-sector efficiency scheme, which implies that no net outflows from the sector would be used in other sectors, except for mitigation and adaptation projects in developing countries.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

10.83 As is usual with IMO mandatory instruments, domestic law would have to be enacted – especially to impose sanctions in the event of non-compliance. In States where there operates a two tier system of legislation (primary and secondary), it is likely that due to the innovative nature of the GHG Fund that new primary legislation will be needed, which will require significant resource and parliamentary time to progress. In this regard, it is also relevant to note that some States have internal procedures that require extensive consultation procedures with affected stakeholders to be undertaken before new legislation is enacted and that this national legal process may have to be completed, or significantly progressed, before the IMO Convention can be ratified or acceded to.

10.84 While it is noted that obtaining of the refund is voluntary, which will be reflected in the overall level of administrative burden to all involved parties, the points highlighted in the ensuing paragraphs, relevant to the activities of the International GHG Fund, will need particular consideration.

10.85 There would be a need to manage the refunds from the GHG Funds once the EEDI and EEOI data had been verified. At this time it is unclear if the International GHG Fund needs to verify the results in addition to the verification by flag States. If the "linearly progressive refund rates" scheme is adopted, it will add to the administrative burden for the International GHG Fund to determine the amount of refunds that each ship would be entitled to. Given that the total refund amount is proposed to be fixed, the International GHG Fund will need to balance its books carefully to ensure that each ship is refunded to the amount it is entitled to.

10.86 According to the proposal, the ship will pay the GHG contribution when purchasing fuel, direct to the International GHG Fund. The proposal indicates that any refund will be made annually, at the beginning of the year after the contributions have been made. In this respect, it needs to be considered, if the refund should be made on a periodical basis, the International GHG Fund may have to keep track of the different purchasers (ship may change charterers/flag during assessment period) so that the proper refund can, if applicable, be given to the correct party.

Additional workload for flag State per ship

10.87 Flag state control will be required to verify all ships which apply for refunds. These ships have to be verified on EEOI and EEDI performance.

10.88 The administrative burden for flag States will also need careful consideration in the context of verification and approval of the EEOI improvement rates for ships utilizing this criteria. These improvement rates would have to be reviewed periodically given that they are likely to change over time noting, in particular, that a ship's operation may not necessarily follow a fixed pattern. The accuracy of the EEOI improvement rates would be crucial as the refund rates are based on them. In general, the verification of the EEOI reports is an issue that will require careful consideration, as fuel, and route data (and possibly also cargo data) will need to be verified.

10.89 An issue that will need to be taken into account is that flag States will not know how many ships are likely to claim refund and so will have challenges in assessing the associated workload.

10.90 On the basis of liaison with the International GHG Fund, the flag State in the event of suspected fraud/inaccurate amounts contributed to/refunded from the GHG Fund, would have to undertake investigation in relation to possible enforcement actions being taken. In particular, to investigate possible fraud some detailed checks of Bunker Delivery Notes against the Oil Record Book will need to be undertaken, which will require appropriate training of flag State surveyors and additional survey time to undertake.

Impacts on port State inspections and additional workload per call or inspected ship

10.91 Port State Control would have to carry out documentation checks in a different way to that currently undertaken. Some of the relevant documents are already subject to PSC inspection and such basic verification of compliance with the scheme does not seem to imply a significant supplementary workload for PSC inspectors.

10.92 However, to detect more complicated fraud some detailed checks of Bunker Delivery Notes against the Oil Record Book will need to be undertaken, which may require additional appropriate training for Port State Control Officers and additional inspection time to undertake.

10.93 Further consideration will need to be given to how ships from non-contracting States will be considered if they trade to the ports of Parties.

Availability of skilled human resources

10.94 In some cases the additional workload might necessitate – at least in the administrations of States with very large fleets – to increase the level of the work force. On board ships, some additional training may be necessary for the calculation and verification of EEOI, though voyage distance and fuel consumption devices are already commercially available and widespread, and the amount of cargo can be based on draft surveys, which is already a standard industry practice.

10.95 Appropriate controllers or auditors to monitor/enforce the scheme and limit fraud are also likely to be needed, given the financial benefit to be derived from a ship being eligible for a refund.

Compatibility with national law

10.96 In some jurisdictions a variable fee related to the efficiency of existing means of transportation (in this case ships) may be against national law, as it may be construed as discriminating older, less efficient vessels against newer ones. Even though some countries may have implemented a fixed fee that relates to vehicle efficiency, such as engine size with respect to road vehicles, this would not imply that the same treatment would follow for a system that may vary its impact based on a ship's varying efficiency over time.

10.97 It appears that some States would have challenges with the principle of the collection of 'international' contributions being inconsistent with national law. Inherent in such concerns is the challenge Nations may have in collecting private funds out of local commercial enterprises on behalf of international funds.

10.98 In some jurisdictions a contribution collected within its national borders may normally be subject to a tax, and/or an annual budget decision, or other constraints. Therefore, some changes in national law, or even in a national constitution, may be required.

10.99 It is also noted that the proposal defines the 'ship' as the legal entity to make the GHG contributions. The parties responsible for the GHG contributions are not explicitly defined, as the 'ship' could be chartered to different charterers during the period of assessment, which may or may not make the GHG contributions. As such, it may be problematic for flag States to take actions in cases of non-compliance, as the charterers or incidences of non-compliance could be outside the flag State's jurisdiction.

Sovereignty implications

10.100 Agreeing efficiency standards that are used to calculate financial contributions to a GHG Fund – or refunds from the GHG Fund – may be challenged on sovereignty grounds and therefore need to be accepted internationally.

10.101 Revenue collected within a country may be subject to sovereign decision(s) on its appropriation/hypothecation. Decisions on the level on the fees charged and transferred to the GHG Fund could be seen as infringing sovereignty. This issue needs to be discussed and resolved internationally.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

10.102 Ships are already required by MARPOL Annex I to carry onboard an Oil Record Book where amounts of fuel bunkered must be recorded. In addition to this, MARPOL Annex VI requires ships keep onboard for 3 years the Bunker Delivery Notes issued by bunker suppliers.

10.103 In addition to this the Leveraged Incentive Scheme proposal requires a ship to carry onboard proof that payments to the GHG Fund has taken place for the amount of bunker oil the ship has been taken onboard.

10.104 The refunds back to the industry will hinge on individual ships ability to monitor and demonstrate either year-on-year improvements of the EEOI – which in itself is a significant additional administrative burden onboard, or that the individual ship maintains a better than required EEDI certified value.

10.105 In this respect the EEOI element is by far the most cumbersome.

10.106 The Leveraged Incentive Scheme proposal will thus to some extent expand the requirements already placed on ships to maintain records of fuel bunkered and carry appropriate related documentation – but the refund mechanism more than pays for this additional effort.

10.107 The administrative burden onboard is thus considered medium-high.

10.108 The legal requirement is placed on the ship. Shipowners, operators and charterers will thus have to develop the necessary commercial agreements to ensure the contributions are paid-in timely to avoid any potential disturbance of ships operations by PSC.

Additional workload onboard

10.109 In the assessment of the Leveraged Incentive Scheme the Expert Group found that it is likely to be a stronger driver for uptake of emission reduction technologies due to its built-in incentives and that it in the reference scenario drives 76 million tonnes of in-sector emission reductions. This represents an additional workload compared to what is being generated by a mandatory EEDI (extra 35% reductions) but the uptake would not be evenly distributed and the total workload onboard individual ships were not quantified.

10.110 For the industry as a whole the Expert Group estimated the additional onboard workload to amount to some $0.9 billion or about 2% of the gross cost, of the proposal. It shall be emphasized that this value is a gross estimation.

Additional economic impact for individual ships and the shipping industry

10.111 Industry has established well functioning practices to make sure that the appropriate parties in the transport chain pays for the fuel.

10.112 Similarly to the GHG Fund proposal this proposal places an additional price element on each tonne of fuel used onboard ships and it is reasonable safe to assume that industry will adopt appropriate contractual agreements to ensure that additional cost will be borne by those parties already responsible for paying the fuel billion.

10.113 Additional tonnage to counter for any uptake of slowing the fleet down may well be needed as the Leveraged Incentive Scheme is likely to spark an additional in-sector reduction on top of what would be driven by a mandatory medium EEDI standard of some 35%. The associated mechanisms to drive this reduction are a combination of operational and technical measures, of which slowing down ships is one element that may be chosen.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for a new IMO instrument

10.114 A new IMO Convention will be required. Assuming there is a political will to start substantive work on the development of this proposal in the near future it indicates that the new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

10.115 The International GHG Fund will need to be established and maintained. Its tasks will include: receive, record and monitor information from ships; acknowledge receipt of payments into the GHG Fund; maintain and allocate revenue on a continuous basis; maintain a ship-specific registry; monitor ships' payments of GHG contributions and notify parties of specific ships in case of any suspected non–compliance; and submit an annual report.

10.116 There are some particular issues that need careful consideration, including the maintenance of a large database, as every ship will have to be treated and refunds calculated individually. However, there may be a possibility that refunds are retained as credits. If so, this scenario would need careful consideration.

Role of flag State

10.117 In implementing this proposal, verifying and ensuring the accuracy of the EEOI improvement rates by flag States would need further and careful consideration, including application of the "linearly progressing refund rates" model, which will be based on the rate of deviation from the agreed benchmark.

10.118 It appears that there would be additional work for a flag State in liaising with the International GHG Fund if investigation/enforcement actions are required to be taken in cases of evasion/fraud by "non-compliant" ships flying its flag.

Role of port State

10.119 In many respects port States will enforce this scheme in the same manner as many other IMO instruments, though these activities will largely be restricted to documentation checks.

10.120 However, it appears that there will be additional work for the port State in liaising with flag States and/or the International GHG Fund in the event that enforcement actions are required to be taken regarding any non-compliance on ships within their jurisdiction.

Role of Recognized Organizations

10.121 It is anticipated that recognized organizations will be authorized to act on behalf of Administrations in verifying the data collected in the refund application process, in similar way as allowed for other IMO Conventions.

Survey, Certification and other means of control

10.122 An additional certificate will need to be issued to ships to demonstrate their EEOI improvement rates. It is noted that in the context of the "linearly progressing refund rate", the refund rate would be decided automatically by the preset function where the deviation of the ship's EEDI from the 'required' EEDI level is an independent variable. The format of Bunker Delivery Notes may need modifying and new standardized refund application and verification frameworks will probably need to be developed.

Involvement of other authorities (e.g., Treasury)

10.123 Possible involvement of many other national authorities other than maritime Administrations (e.g., Government treasury, finance, anti-fraud and environment departments) appears to be very likely.

11 ACHIEVING REDUCTION IN GREENHOUSE GAS EMISSIONS FROM SHIPS THROUGH PORT STATE ARRANGEMENTS UTILIZING THE SHIP TRAFFIC, ENERGY AND ENVIRONMENT MODEL, STEEM – JAMAICA (MEPC 60/4/40)

FOCAL POINT SUMMARY OF THE PROPOSAL

11.1 Jamaica's proposal (MEPC 60/4/40) sets out an option for consideration that builds upon previous submissions aimed at reducing GHG emissions from ships. Environmental economists have proven that in situations where a pollutant exhibits constant marginal damage and where the marginal abatement cost is unknown, a price control mechanism such as an emission levy may be advantageous to a quantity control mechanism, e.g., a cap and trade scheme. Such a situation exists with the CO_2 emissions from shipping. Recently produced reports show marginal abatement cost curves for shipping generated CO_2 that are far from definitive – and need to be further assessed by the Group of Experts. Moreover, recent studies, such as the Second IMO GHG Study 2009 are only able to estimate CO_2 inventories within a 20% margin of error that would create opportunities for leakages through any cap based on those inventories. Therefore, as expanded in our submission, Jamaica concludes that economic policy conditions exist that makes an emission levy more feasible than a cap and trade system.

11.2 Jamaica proposes in its submission that through an IMO global agreement, member States participate in levying a uniform emissions charge on all vessels calling at their respective ports based on the amount of fuel consumed by the respective vessel on that voyage (not bunker suppliers). The submission is directly aimed at reducing maritime emissions of CO_2 without regard to design, operations, or energy source. The amount of fuel consumed onboard ships is routinely monitored and recorded. Larger vessels have fuel flow meters than can record fuel consumption with an accuracy of ± 0.2% with other vessels relying on sounding tanks with a lower level of accuracy. Jamaica's proposal would be a refinement of previous international compensation fund proposals in other MEPC submissions (MEPC 56/4/9, MEPC 57/4/4, MEPC 57/INF.13, GHG-WG 1/5/1; MEPC 58/4/22). Jamaica also endorses the plan to use the funds raised for mitigation and adaptation measures to aid countries such as SIDS.

11.3 The fee would be structured to achieve global reduction targets for GHG and could be leveraged in a manner as proposed by Japan to reward vessels exceeding efficiency targets. Jamaica's proposal is particularly well suited to address the multi-jurisdictional nature of shipping that would be problematic for an emission-trading scheme. The Ship itself would be targeted with an emission levy as it arrives in port, irrespective of the owner, operator or charterer, and Jamaica proposes an easily administered institutional mechanism.

11.4 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 is not strictly applied, 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.

11.5 Additionally, technology exists that is able to audit the fuel consumption each ship would be asked to declare at the end of every voyage. The amount of CO_2 emitted during the relevant voyage may be determined by applying emission conversion factors (see MEPC 60/WP.6) for bunker fuels. Data captured in this way may possibly form the basis of an accurate target level for some future ETS.

11.6 Voyage models, such as the Ship Traffic Energy and Emission Model (STEEM), could audit fuel consumption and efficiency improvements declared by vessels. Such an auditing mechanism would also support the EEDI and EEOI efforts.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

11.7 The Jamaican proposal would establish a price based mechanism to reduce emissions from international shipping. The proposal suggests that a price based mechanism offers advantages for international shipping over a quantity based mechanism such as a cap and trade emissions trading scheme.

11.8 The mechanism would be in the form of a Port State Levy (PSL) that all countries would be authorized to charge on all vessels calling at their ports. The PSL would be based on the emissions produced from fuel consumption on the voyage to the port. The proposal sets forth that the "fee would be staggered, higher for heavier and dirtier fuels and lower for cleaner fuels such as natural gas". The proposal also indicates that the fee would be 'structured to achieve the global reduction targets for GHG".

11.9 Each ship arriving at a port would therefore need to declare the amount of fuel consumed on each port to port segment of a voyage and pay the applicable PSL.

11.10 The PSL would apply to every ship above a particular size, to be determined by IMO, to all fossil fuels and be enforced in every port of each IMO Member State.

11.11 MEPC 60/4/40 provides few details on the PSL itself, but sets out an argument in favour of a price mechanism for CO_2 emissions. It indicates that by applying a fixed fee for every tonne of CO_2 emitted from international shipping a monetary incentive would be created to reduce emissions. On this basis it appears that the primary purpose of the proposal is to deliver in-sector reductions through a carbon price. The Focal Point indicated that "the emissions charge would be set just above the marginal abatement cost of one tonne of CO_2 for shipping. Assuming an efficient carbon market, the marginal abatement cost of one tonne of CO_2 for shipping would be a function of the carbon price. This function is to be determined".

11.12 The rate of the PSL (that is; the amount paid per tonne of fuel) would determine the extent to which an incentive would be created to reduce emissions from international shipping, as the number of cost-effective emissions reduction opportunities for international shipping would be higher if emissions attract a carbon price.

11.13 MEPC 60/4/40 does not enter into detailed discussion about how the rate of the PSL would be set in practice, other than to suggest that it would be "structured to achieve the global reduction targets for GHG". However, if one considers the general arguments in MEPC 60/4/40 to be representative of the PSL, it may be reasonable to conclude that the proposal advocates for the rate to be tied in some way to a broader global carbon price.

11.14 Based on middle range carbon and fuel prices assumptions used by this Expert Group, this price would represent a modest percentage of total fuel costs (6 per cent in 2020 and 9 per cent in 2030).

11.15 Since the PSL is a price based mechanism the uptake of cost-effective emissions reductions opportunities will be subject to considerations about non-price barriers (see common concept 3, Non-price barriers).

11.16 One aspect of the PSL influencing one particular non-price barrier is that the PSL is charged separately to the cost of fuel. Therefore, the price signal would be more obvious to those ships where the carrier pays for the cost of the fuel. This may in some circumstances enhance the uptake of technical and operational measures to increase energy efficiency and reduce emissions.

11.17 The mechanism for setting the rate of the PSL is not described in MEPC 60/4/40, and this could also influence how actors in the sector respond to the carbon price in practice, as the price setting mechanism could influence expectations of future prices. In general, if the process for setting the price promotes expectations of a permanent and stable and/or increasing carbon price over time this could enhance the uptake of some cost-effective measures, for example, because it would provide certainty over the payback period for investments in emission reduction opportunities. Conversely, if actors in the sector perceive the price to be unpredictable and/or transient, the response would be diminished.

11.18 Although not explicitly stated or explained, the Focal Point has indicated that the PSL would achieve both in-sector and out-of-sector reductions. The in-sector reductions would be achieved by the operators opting to avoid some of the costs arising from the PSL by employing appropriate abatement measures when it is economical. Out-of-sector reductions would be achieved by using the remaining proceeds generated by the PSL. MEPC 60/4/40 could be interpreted to lend support for some of the remaining proceeds to be used for adaptation activities where the proposal notes a general preference at MEPC 59 for using a greater portion of any revenue from a MBM for climate change financing in developing countries. MEPC 60/4/40 also proposes that remaining proceeds could additionally be used to support research in mitigating other (non-GHG) environmental impacts of shipping. In general the proposal does not provide any detail on how remaining proceeds would be managed at the institutional level or whether that institutional level is at port State or IMO or at any level in between.

11.19 Mitigation achieved through the use of any remaining proceeds would be more easily quantified if it involved the purchase of CERs or other regulated carbon market units. It would be harder to quantify, but still beneficial, if it occurred through non-market mitigation actions. Similarly, research in mitigating non greenhouse environmental effects of shipping could be beneficial and may be possible to quantity. Funds spent on adaptation would deliver an important social benefit to developing countries even though no 'emissions equivalence' would be calculated and credited to the shipping sector for such activities.

In-sector and out-of-sector reductions

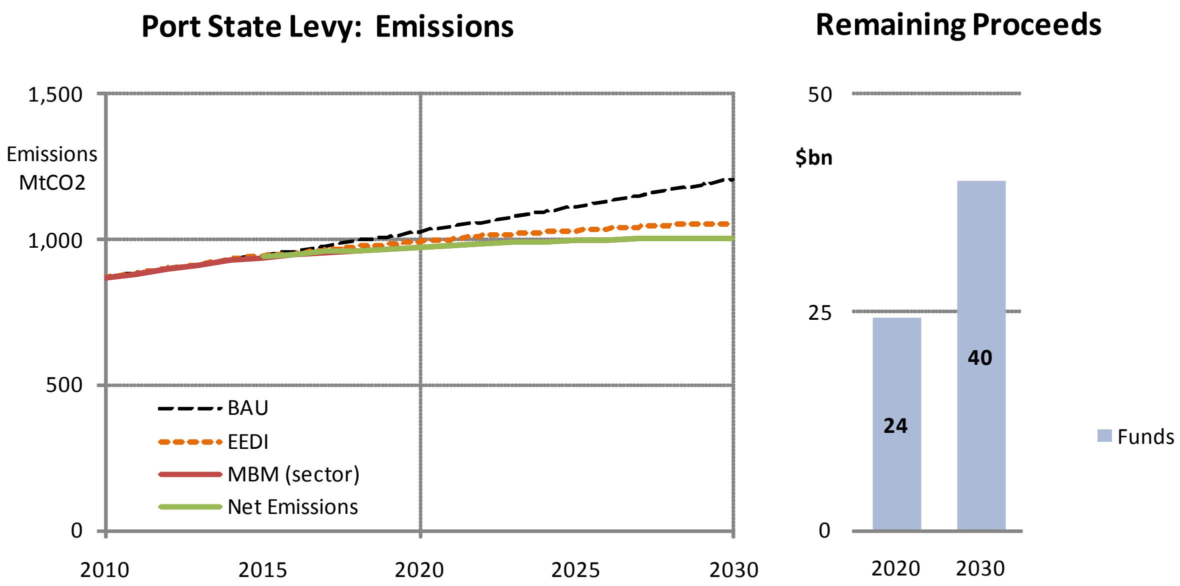
11.20 In-sector and out-of-sector GHG emissions reductions and costs, as well as the remaining proceeds from the PSL were modelled for the PSL under different growth rates, carbon prices and fuel prices, as set out below.

11.21 Further information about the model, the assumptions that underpin it, and the model limitations are explained in annex 5.

11.22 Figure 11-1 and Figure 11-2 illustrate modelled emissions under the PSL for each growth scenario assuming a medium carbon price, and a reference fuel. These scenarios are referred to below as the B2 and A1B reference scenarios for the PSL.

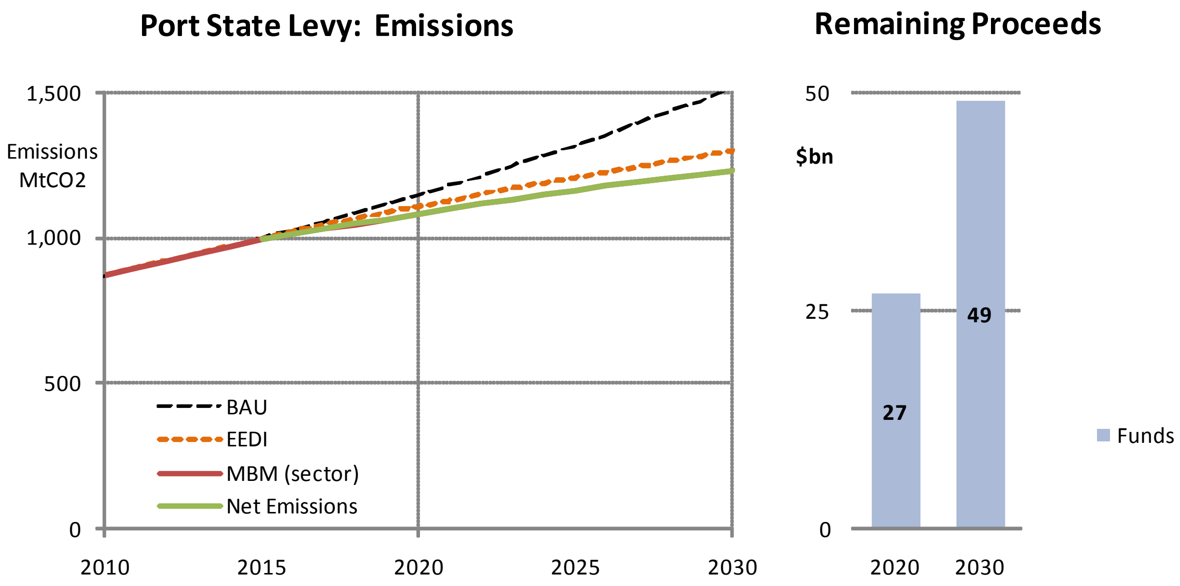
11.23 The line graphs show, emissions under a business as usual baseline (black line), and for illustrative purposes, the expected emissions trajectory if a mandatory EEDI was implemented at a medium stringency are also shown (orange dashed line). It is important to note that the relative reduction in emissions from the EEDI is not to be attributed to the PSL and would only occur if the EEDI is implemented as mandatory. Net emissions under the PSL are equal to emissions resulting in response to the MBM and are represented by the green line below the dashed EEDI line.

11.24 The bar graphs show remaining proceeds of the PSL, with all revenue generated by the MBM appearing as funds. How these funds would be distributed is not prescribed by the MBM and would be subject to policy considerations, but as explained in the captions to the graphs and tables below, could be used for mitigation through out-of-sector emission reductions, adaptation, R&D and other purposes.



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. The PSL proposal appears to lend support for using the bulk of remaining proceeds generated under the PSL for climate change financing in developing countries. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated and found to be **973 Mt in 2020 and 1001 Mt 2030**.

Figure 11-1: Modelled emissions and remaining proceeds under the Port State Levy under B2 growth scenario with medium carbon price and reference fuel price



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D**.** The PSL proposal appears to lend support for using the bulk of remaining proceeds generated under the PSL for climate change financing in developing countries. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated and found to be **1083 Mt in 2020 and 1232 Mt 2030**.

Figure 11-2: Modelled emissions and remaining proceeds under the Port State Levy under A1B growth scenario with medium carbon price and reference fuel price

11.25 Under the modelled PSL reference scenarios, the PSL displayed similar behaviour as the LIS, but with a lower impact on in-sector reductions due to the absence of the refund scheme. Modelled reductions were 2 per cent below business as usual in 2020 rising to 4 per cent below business as usual in 2030 for both B2 and A1B scenarios.

11.26 As there are no rebates under the PSL, remaining proceeds are approximately double those of the LIS. Key modelling results for these reference scenarios are also shown in Table 11-1.

Table 11-1: Modelled emissions and emission reductions under the Port State Levy under the B2 and A1B and growth scenarios with medium carbon price and reference fuel price

	Year	B2	A1B
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	973	1,083
	2030	1,001	1,232
MBM in-sector reductions (Mt)	2020	20	22
	2030	53	64
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	2%	2%
	2030	4%	4%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Potential for supplementary out-of-sector reductions (Mt)	2020	973	1,083
	2030	1,001	1,232

The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. The PSL proposal appears to lend support for using the bulk of remaining proceeds generated under the PSL for climate change financing in developing countries. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation is shown.

11.27 In the modelled scenarios higher carbon prices resulted in greater reductions, particularly in 2030 where the carbon price was assumed to reach $100 per tonne of CO_2. Under these conditions the reductions in 2020 were 3 per cent below BAU instead of 2 per cent (under the PSL reference scenarios) and reductions in 2030 were 8 per cent below BAU instead of 4 per cent (under the PSL reference scenarios).

11.28 The range of responses observed under all modelled scenarios is shown in Table 11.2. The term 'remaining proceeds' is explained in the caption to Table 11-1.

Table 11-2: Ranges for emission reductions observed when modelling the PSL in 2030

Key elements	Port State Levy	
	High	**Low**
MBM in-sector reductions (Mt)	119	29
MBM out-of-sector reductions (Mt)	0	0
MBM reductions (% of BAU)	8%	2%
MBM in-sector reductions (% of MBM reductions)	100%	100%
Remaining proceeds ($billion)	118	40

Certainty of reductions

11.29 The PSL is not designed to achieve certainty over a specific reduction target or efficiency target. Being purely a priced based mechanism, reductions achieved under the PSL would be those resulting from the shipping industry's own response to the incentive provided by the carbon price or the level of the PSL (if the PSL is not linked to the carbon price). While estimates for possible resulting reductions have been provided above, it is important to note that these reductions are difficult to predict given uncertainty around future carbon and fuel prices and the role that non-price barriers and uptake of reduction measures would play in response to the PSL. Indeed the general argument for a price based mechanism put forward in MEPC 60/4/40 notes that strict annual limits are not required to manage global GHG emissions as what matters is the total atmospheric concentration over the longer term.

11.30 MEPC 60/4/40 does however state that the PSL would be structured to support the global reduction targets for GHG emissions. It is not entirely clear what the implication of this would be for the rate of the PSL and the use of revenues.

11.31 On one hand, the proposal appears to be advocating implementing a carbon price on international shipping which is consistent with a global carbon price. The amount of revenue raised would be enough to offset a large portion of emissions from international shipping. In this context the PSL could achieve a more certain outcome in terms of delivering a particular net emissions target.

11.32 On the other hand, the proposal could also give the impression of arguing for a uniform global carbon price across all sectors, set at a rate consistent with the goal of achieving the global reduction targets for GHG. In this context there is also greater certainty that the PSL would deliver the reductions necessary to support the overall environmental goal, however an appropriate global framework would be required to deliver this certainty.

11.33 As is the case with other proposals, the PSL will require monitoring and reporting of activity data. The accuracy of this data, and its verifiability, will be critical to the environmental integrity of the scheme. In the case of the PSL, monitoring and reporting is proposed to occur on every voyage and is based on the fuel consumed between two ports.

11.34 The proposal suggests that one advantage of the PSL is the collection of the PSL at the end of each voyage, which provides an opportunity for regulators to verify data at the time of payment, potentially using the STEEM model to provide an estimate of fuel consumed on the voyage. It is not clear that these arrangements present any more or less risk of fraud than other proposals currently under consideration. While making ships discharge obligations for each voyage would help to promote compliance with the PSL, opportunities for underreporting would still exist and fuel measurement error may be higher if done per-voyage due to some ship's inability to accurately monitor fuel consumption, particularly on short voyages.

11.35 Should this proposal or any other of the proposals be developed further, it would be necessary to develop procedures and mechanisms designed to minimize the risk of evasion and fraud.

Cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development

The cost-effectiveness of the proposed MBM

11.36 Table 11.3 shows gross costs under the reference scenarios for the Port Levied Emission Fee. Under the proposal gross costs are equal to revenues raised from collecting the fee. Revenues are not originally allocated to any particular purpose; hence they are shown as net revenues. It is also important to note that net funds are not allocated to any particular administrative body or bodies.

Table 11-3: Modelled costs under the Port State Levy under the B2 and A1B and growth scenarios with a medium carbon price and a reference fuel price

	Year	B2	A1B
Financial: gross costs ($billion)	2020	24	27
	2030	40	49
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	24	27
	2030	40	49
MBM in-sector reductions (Mt)	2020	20	22
	2030	53	64
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
Cost of reductions ($/tonne CO_2 abated)	2030	762	770
Maximum cost-effectiveness potential ($/tonne CO_2)	2030	38	38

11.37 The Port State Levy appears to rely on an externally derived carbon price; therefore the estimates of costs are subject to uncertainty about the future carbon price (see common concept 4, Carbon price) which is also the case for several other proposals.

A1B: Reference fuel price, 2030, medium carbon price

The cost-of reductions is estimated to be 770 $/tonne CO_2 abated.

The amount of funds generated for other purposes is $49 billion.

The maximum cost-effectiveness potential of the proposal is 38 $/tonne CO_2

Administrative costs (including any central administrative requirements)

11.38 Indirect cost consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in Port State Organizations and not least in operation of the Fund mechanism. These costs are elaborated below.

11.39 Apparently a simple price-based MBM which may potentially deliver control of GHG emissions with low administrative costs, and practical feasibility. However, it must be realized that the proposal calls for the reporting and calculation of fees upon every leg of a voyage, all to be done within the time that the object vessel is in port.

11.40 In essence, the proposal calls for ships to report fuel consumed with a consequent calculation and payment of fees due upon each and every voyage segment (port-to-port). The requirement for voyage specific reporting, fee calculations and payment to multiple port State authorities increases the administrative burden associated with the scheme as the reporting and collection process would not be centralized or limited to periodic quarterly, semi-annual, or annual reports of activity. Instead, the administrative functions must be replicated on every voyage segment and with different port State authorities.

11.41 Collection of fees by individual port State governments raises a concern about fiscal reliability of the proposed system as numerous states may be under pressure to utilize the collected funds for other purposes. Collection of the funds and consequent actions by the fund administrator would be limited to political and diplomatic channels rather than commercial and financial pressures applied in the case of some other MBMs under consideration.

11.42 In addition, this proposal would require the establishment of an international administrative body to receive, process and audit the charges collected by the port States.

11.43 The principal activities that will incur administrative costs are identified in common concept 11, Administrative body, Record keeping, and Audit of international body. The additional activities specific to this proposal are:

.1 reporting of fuel consumed to the port State for each voyage segment and payment of the respective fees to the competent body of the respective port State;

.2 reporting mechanisms between parties (principally the ships, port States and the international administrative body);

.3 Fund management (investments) and allocation;

.4 Annual reporting by, and independent audit of, port States to/by the international administrative body (to be paid for by the charges collected);

.5 Annual reporting by, and independent audit of, port States to/by the international administrative body (to be paid for by the charges collected); and

.6 development of the necessary national legislation regarding implementation of the proposal (flag and port States), collection of charges and enforcement by port States (costs to be borne by the Parties themselves).

11.44 The transfer of consolidated contributions to the international administrative body is not discussed in detail in the proposal. Any consequence of such consolidation may need further consideration in terms of the administrative burden to all parties. In this regard, it is noted that as each port-to-port voyage is to be calculated and charged separately, the number of transactions that the port State and Fund Administrator would have to manage would be very significant.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

11.45 Cost predictability for the Port State Levy proposal involves two aspects; namely the inherent stability of basing the price on the global carbon price, and the volatility of the carbon price.

11.46 It is not clear how the emission fee will be set with regard to possibly capturing the day-to-day carbon market price fluctuations.

11.47 Another uncertainty associated with this proposal is the payment of the fee to port State in local currency. Rate of Exchange is known to be an unpredictable factor with a wide spread of uncertainty between economies.

11.48 With this in mind the proposal is rated medium on cost predictability.

Credit for early action

11.49 As the Port State Levy proposal hinges directly on the amount of fuel consumed, any investments in efficiency improvements done prior or after entry into force of the proposal will thus result in similar emission reductions and hence impact the fee to be paid similarly.

11.50 The proposal is thus rated "neutral" with regard to credit for early action in the sense that it would not provide any particular enhanced benefits or drawbacks for early birds.

Availability of technological and operational measures for CO_2 emission reduction

11.51 The Port State Levy proposal recognizes all technical and operational measures that can limit the fuel consumption of a ship.

11.52 The proposal acts as a relatively high driver for uptake of in-sector measures due to the high carbon price tag on every tonne of fuel consumed. This factor will trigger more advanced abatement technologies applied – especially if in combination with a stringent mandatory EEDI regulation.

11.53 The interface to out-of-sector offsetting in the proposal ensures however that only cost-effective measures are being applied.

Practical feasibility of implementing the proposed MBM

Development time for new IMO instrument

11.54 Assuming there is a political will to start substantive work on the development of this proposal in the near future it appears possible that a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

11.55 A significant number of issues will need further consideration in the development of the new instrument. In particular, the relationship between the port State levying the charge and the administrative body collecting it; the establishment and governance arrangements of the supranational Administrative body and the use of the funds collected.

11.56 Discussions would also be needed to address the question of setting the level of the emission charge, globally. However, this proposal does not require an emission reduction goal or emission cap, nor does it require an emission baseline for starting up the scheme.

Experience from similar schemes

11.57 It is noted that many price-based systems exist both in the shipping sector and elsewhere. However, these systems either charge based on actual emissions or on engine or fuel characteristics. A system that requires modelled emissions estimates as a basis for a charge appears to lack precedent.

11.58 Also, the proposal requires collecting the emission charge worldwide from every ship arriving at a port, based on fuel used at the latest voyage segment (port-to-port). Although, port authorities routinely collect harbour and similar fees, the proposed emission charge would be variable and the funds transferred to an international fund and not retained in the port State. This is therefore a much more complex situation. In this regard also, the scheme, as proposed, appears to lack precedent.

Ease of implementation and potential for phased implementation

11.59 Phased implementation is not discussed in the proposal.

11.60 The comments made in common concept 13, Modal carbon leak, would apply to this proposal. The additional views specific to this proposal are:

.1 Given that ships are expected to report on the fuel consumed prior to entry into port, the verification of the amount of fuel used, on which the emissions charge will be based, will need to be examined. A robust and reliable means will need to be available to do this, which may have to include an element of estimation for the emissions still to be made depending on when the reporting is made by the ship. The high level of accuracy in recording of emissions, even if based on calculations based on fuel consumption, may be particularly difficult and burdensome on smaller, less sophisticated vessels operating in the short-sea shipping trades (where a great many port calls are made).

.2 In addition, as proposed, the system will require implementation in practically all ports worldwide for each arriving ship. Without either some significant simplification of the system or clarification how this could work, the proposal would appear to present substantial challenges in its effective and efficient implementation. In particular, the communication protocols that will be needed between the Fund, the paying agents, the designated receiving agents and the port authority will need careful consideration. In addition, the audit requirements for, and arrangements between, all these parties will need to be carefully considered to ensure they are not unduly complex or burdensome.

Enforcement, potential for evasion and avoidance of carbon leakage

11.61 Under this proposal "all countries would be authorized to allow their ports to levy a globally uniform emissions charge on all vessels calling at their respective ports." If countries are only *authorized*, but not *obliged* to levy charges, this could lead to avoidance.

11.62 As only shipping between ports in contracting States would be included in the scheme, there would be a potential for carbon leakage for routes ending in non-contracting States. CE Delft *et al*., 2009, shows that a regional scheme of emissions charges in the EU would trigger avoidance of ships by making additional port calls or re-routing to countries outside the scheme. Non-Party States, or port States that lack proper monitoring and enforcement mechanisms, run the risk of evolving into "mega hubs" of shipping traffic, for the sole purpose of avoiding the scheme. Other than carbon leakage, this would create competitive distortion, distortion in trade flows and a non-level playing field among both shipping companies and ports.

11.63 Emissions within port may not be accounted for, and this may represent a significant carbon leakage.

11.64 It may be very difficult to verify **all** the figures on fuel consumption without significant additional port State resources. This may not be practically feasible and therefore result in significant evasion and carbon leakage.

11.65 It may be agreed that port States could impose a fee to recover the costs of collecting and forwarding the emissions charges collected, as well as the costs of the resources that would be required to ensure that visiting ships duly pay the correct emissions charge. This would result in possibly significant leakage of Fs collected, which otherwise could be used for mitigation or adaptation purposes.

11.66 The scheme would need to include a very robust and extensive independent audit mechanism (presumably a function carried out by the international administrative body) regarding all the ports, terminals and anchorages that would be within its scope, in order to mitigate leakage or incorrect charging.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

11.67 The incremental requirements for implementation and enforcement under this proposal are expected to be minimal. As a result, the need for capacity building is also expected to be minimal.

11.68 For some States, the legislative implementation process could give rise to a need for capacity building and technical assistance with the relevant international organization.

11.69 There are no direct technology transfer needs required under this proposal. Shipowners may wish to improve their ship's technical or operational efficiencies in order to reduce the emission levy they have to pay. While a number of measures or technologies could result in fuel saving for ships, there may be hurdles to adopting such measures or technologies, including long payback periods. There could be a need for technology transfer to help improve ship and operational efficiencies in developing countries.

11.70 Funds would be raised under this proposal. The proposal suggests that the funds could be used for mitigation and adaptation measures in developing countries, but does not elaborate further.

	Year	B2	A1B
Funds ($bn)	2020	**24**	**27**
	2030	**40**	**49**

11.71 Potential climate financing for developing countries comprise funds as shown in the table above.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC

11.72 The common concept 14, UNFCCC 1 and UNFCCC REVENUE, describe the Expert Group's views on general compatibility with the UNFCCC for this proposal.

Compatibility with Kyoto Protocol

11.73 The common concept 15, Kyoto Protocol, describes the Expert Group's views on general compatibility with the Kyoto Protocol for this proposal.

Compatibility with WTO

11.74 The common concept 16, WTO, describes the Expert Group's views on general compatibility with the WTO for this proposal.

Compatibility with UNCLOS

11.75 No compatibility problems with UNCLOS have been identified, as the proposal will apply in a uniform manner globally.

Relations with other climate finance institutions or initiatives

11.76 Insufficient information has been provided to date to make an assessment of this proposal against this criterion. In particular, the proposal is silent on how the emission charges paid to the international administrative body are to be redistributed.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

11.77 Most of the burden for both implementation and enforcement will fall on port States and ships.

11.78 The proposal is understood to be that States have the freedom to levy emission charges of ships in their ports. The level of the charge would reflect the CO_2 emissions factor of the fuel. The submission does not specify whether the charge would be levied on all emissions of the vessel, on emissions during a certain time period prior to arrival in the port or on emissions associated with the entire voyage to the port. It is further understood that only emissions on the last voyage prior to entry in the port are subjected to the emissions charge.

11.79 Under these assumptions, the administrative requirements for port States would comprise:

.1 for each ship in port, collect data on the carbon content of the fuel it used, the last port of call, engine size, service speed and possibly other relevant characteristics;

.2 modelling emissions per voyage for each ship in port;

.3 calculating the charge for each visiting ship;

.4 collecting the charges; and

.5 control and inspection as to whether the requirements have been met.

Additional workload for flag States per ship

11.80 It appears that unlike other IMO instruments, the flag State will have a minimal role to play in this proposed scheme.

11.81 It is clear that some auditing function would be required, but it is unclear whether the flag State would have any role to play in this regard. Presumably flag States will have some responsibility for dealing with non-compliant vessels.

Impacts on port State inspections and additional workload per call or inspected ship

11.82 Unlike other IMO instruments, the burden for both the implementation and enforcement of this proposed scheme is placed on the port State. The tasks to be undertaken by the port State will not be like the traditional activities of providing a secondary (to those undertaken by the flag State) level of enforcement. In particular:

.1 port States would have to verify the ship's specifications, the port-to-port distance, the amount and type (required as the scheme proposes that different charges be imposed for different fuel grades) of bunker fuel being used on the ship's voyage, and to determine the amount of emissions charge to be levied on the ship. This would incur very significant resources to reduce the likelihood of fraud and carbon leakage;

.2 port States would have to develop mechanisms to transfer the collected emissions charges to the international administrative body; and

.3 in the event of discrepancies or fraud, port States would have to conduct investigations as well as take necessary enforcement actions.

Availability of skilled human resources

11.83 There would be a need for trained persons able to run the STEEM (or other) model in every port and/or port State. There would also be a need for specialized staff at each port or port-responsible area to liaise with the Fund and with ships and ships' payment agents.

11.84 In general, it is considered that further examination will need to be given regarding the need for qualified, skilled and experienced professional accountants and auditors in order to verify the scheme is being globally, consistently and properly implemented, e.g., to provide reports, monitor contributions collected & transferred to the international administrative body.

Compatibility with national law

11.85 If the new IMO instrument that implements this scheme were to include a definition of CO_2 as a pollutant, for some States, according to some definitions and national provisions, this may result in significant domestic legal challenges in transposing the treaty provisions into domestic law.

11.86 Similarly it appears that some States would have challenges with the principle of the collection of 'international' contributions being inconsistent with national law. Inherent in such concerns is the challenge nations may have in collecting private funds out of local commercial enterprises on behalf of an international fund.

11.87 In some jurisdictions a contribution collected within its national borders may normally be subject to a tax, and/or an annual budget decision, or other constraints. Therefore, some changes in national law, or even in a national constitution, may be required.

Sovereignty implications

11.88 Revenue collected within a country may be subject to sovereign decision(s) on its appropriation/hypothecation. Decisions on the level of the scale of charges could be seen as infringing sovereignty and could be challenging if regional considerations need to be taken into account. These issues will need to be discussed and resolved in the global context.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

11.89 Ships are already required by MARPOL Annex I to carry onboard an Oil Record Book where amounts of fuel bunkered must be recorded. In addition to this, MARPOL Annex VI requires ships to keep onboard for 3 years the Bunker Delivery Notes issued by bunker suppliers.

11.90 In addition to this, the Port State Levy proposal requires a ship to maintain accurate and up to date records upon arrival at each port of the actual fuel consumption since its last port. Requirements for such records are in addition to any existing legal requirement and detail on how this should be accomplished onboard is absent from the proposal.

11.91 The absence of any such existing requirements for recording/monitoring consumption onboard makes it difficult to envisage how it should be implemented. It is however clear that a legal requirement would be burdensome as the records would be subject to scrutiny in each port as the basis for collecting the monies.

11.92 It shall also be noted that some ship types have frequent port calls, often more than one per day, and that this proposal in such cases would substantially increase the workload of the crew in completing the consumption accounts.

11.93 The administrative workload onboard has been considered medium-high.

11.94 Detail on actual implementation at national level is absent in the proposal and depending on the regime implemented, which may vary from port State to port State, the administrative burden on the ship may be higher than that assumed.

11.95 The legal requirement is placed on the ship. Shipowners, operators and charterers would have to develop the necessary commercial agreements between themselves to ensure the fee is paid-in at each port stay – possibly as part of the harbour fee – to avoid any potential disturbance of ships operations by PSC.

Additional workload onboard

11.96 In the assessment of the Port State Levy the Expert Group found that it is likely to be a stronger driver for uptake of emission reduction technologies due to its price tag on every tonne of CO_2 emitted. In the reference scenario the proposal drives 64 million tonnes of in-sector emission reductions. This represents an additional workload compared to what is being generated by a mandatory EEDI (extra 30% reductions) but the uptake will not be evenly distributed and in relation to the total workload onboard we cannot quantify it for the individual ship.

11.97 For the industry as a whole the Expert Group estimated the additional onboard workload to amount to some $0.8 billion or about 1.5% of the gross cost of the proposal. It shall be emphasized that this value is a gross estimation.

Additional economic impact for individual ships and the shipping industry

11.98 Industry has established well functioning practices to make sure that the appropriate parties in the transport chain pays for the fuel.

11.99 Similarly to the GHG Fund proposal this proposal places an additional price element on each tonne of fuel used onboard ships and it is reasonable safe to assume that industry would adopt appropriate contractual agreements to ensure the additional cost would be borne by those parties already responsible for paying the fuel billion.

11.100 Additional tonnage to counter for any uptake of slowing the fleet down may well be needed as the Port State Levy is likely to spark an additional in-sector reduction on top of what is driven by a mandatory medium EEDI standard of some 30%. The associated mechanisms to drive this reduction are a combination of operational and technical measures, of which slowing down ships is one element that may be chosen.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for new IMO instrument

11.101 Assuming there is a political will to start substantive work on the development of this proposal in the near future it appears possible that a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

11.102 An international administrative body would need to be established and maintained. Its tasks would include: receive, record and monitor charges collected from ships by ports/port States; acknowledge receipt of charges; maintain and allocate revenue; maintain a ship-specific registry; monitor the scheme at the global level and notify parties of specific ships in case of any suspected non–compliance; and submit an annual report.

Role of flag State

11.103 It appears that unlike other IMO instruments, the flag State would have a minimal role to play in this proposed scheme.

11.104 It is clear that some auditing function would be required, but it is unclear whether the flag State would have any role to play in this regard. Presumably flag States would have some responsibility for dealing with non-compliant vessels.

Role of port State

11.105 See paragraph 11.88 for discussion of the role of the port State.

Role of recognized organizations

11.106 The proposal makes no reference to recognized organizations and it does not appear that a role exists for ROs in the implementation of this scheme.

Survey, Certification and other means of control

11.107 Insufficient information has been provided to date to make an assessment of this proposal against this criterion. However, the format of Bunker Delivery Notes may need to be adjusted so necessary calculations can be made and evidence provided. It also appears that a detailed log will be required to record at least the voyage length, fuel type and fuel consumption for each voyage port-to-port.

Involvement of other authorities (e.g., Treasury)

11.108 The possible involvement of many other national authorities other than maritime Administrations (e.g., Government treasury, finance, anti-fraud and environment departments) appears to be very likely.

12 FURTHER DETAILS ON THE UNITED STATES PROPOSAL TO REDUCE GREENHOUSE GAS EMISSIONS FROM INTERNATIONAL SHIPPING – THE UNITED STATES (MEPC 60/4/12)

FOCAL POINT SUMMARY OF THE PROPOSAL

12.1 The United States proposal for a Ship Efficiency and Credit Trading (SECT) programme builds on the traditional strengths of the IMO by employing technical standards to create a simple, pragmatic and cost-effective solution to reduce GHG emissions from ships. The world fleet, both new and existing ships, can and should be made more efficient and in many cases the technology already exists to achieve this goal at no cost. This proposal focuses on how best to address emissions from existing ships and it complements the current effort within IMO to develop efficiency design standards for new ships through the Energy Efficiency Design Index (EEDI).

12.2 Under SECT, all ships, including those in the existing fleet, would be subject to mandatory energy efficiency standards, rather than a cap on emissions or a surcharge on fuel. The stringency level of these efficiency standards would be based on energy efficiency technology and methods available to ships in the fleet. These standards would become more stringent over time, as new technology and methods are introduced. Similar to the EEDI, these efficiency standards would be based on a reduction from an established baseline (reference line). The United States believes these efficiency standards are necessary because the Second IMO GHG Study 2009 notes there is significant potential to reduce emissions (10-30 per cent in 2020), but significant non-financial barriers exist.

12.3 Despite the number of no-cost or low cost efficiency improvements that exist today, not all ships will be able to meet the standards. In order to allow ships to meet the standards at the lowest possible cost, SECT also creates an efficiency credit trading programme for ships. Simply put, ships operating more efficiently than required for the compliance period could earn efficiency credits based on current ship efficiency rate and activity, which could be sold for use in the maritime sector. Ships operating less efficiently than required would have the option of purchasing these efficiency credits, as one method of achieving compliance with the efficiency standards. The United States believes that the trading programme can be structured in a way to ensure that there is an appropriate amount of credits to trade.

12.4 SECT provides incentives, beyond the business as usual case, for shipowners, operators and charterers to maximize the efficiency of their ships. This programme is intended to maximize in-sector efficiency improvements and does not attempt to cap net emissions through the use of offsetting credits from outside the maritime sector. Therefore, the costs associated with this programme are directed at technologies and methodologies that would improve the efficiency of the international maritime sector. These efficiency improvements are expected to result in cost savings due to lower fuel consumption, with commensurate decreases in vulnerability to fuel price volatility. In addition to fuel savings, the ability to sell efficiency credits will likely lead to increased value for more efficient ships.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

12.5 The United States proposal to reduce GHG emissions from international shipping, Ship Efficiency and Credit Trading (SECT) would establish efficiency standards for both new and existing ships. The SECT is designed to achieve relative reductions, i.e. reductions in emissions per tonne mile. It does not attempt to set a cap on, or target line for overall GHG emissions from the sector. It is important to note that SECT is designed to achieve efficiency improvements and emission reductions within the maritime sector. It does not attempt to provide a mechanism for out-of-sector reductions.

12.6 Efficiency standards would apply to all ships, both new and existing, for which an EEDI can be established with a *de minimis* threshold and different requirements for newbuildings and "existing ships". The stringency of standards for newbuildings would increase over time as required by the EEDI regulation (for example X % by 20XX and Y % by 20XY). As the newbuilding standard in SECT would be mandatory, the in-sector emissions reductions achieved from new builds are largely a function of the stringency of the standards over time and the penetration of newbuildings into the global fleet. The stringency of a standard will ultimately be a function of technical and operational considerations, additional costs in the sector, and policy considerations that are common to most of the proposals. Penetration of newbuildings into the fleet is a function of scrapping rates as well as sectoral growth driven by economic activity (new capacity).

12.7 "Existing ships" would either be required to meet the standard (although this would be less stringent than those required for newbuildings) or as a second means to comply with the efficiency standard, SECT calls for the creation of an efficiency-credit trading programme enabling ships that are more efficient than the required existing ship standards to generate efficiency credits and provides the opportunity for these credits to be transferred, banked, or sold. Under SECT "existing ships" include ships built prior to the entry into force of the MBM but also those ships built after the MBM enters into force since the SECT consider any newly built ship to be an "existing ship" once launched. The efficiency credit programme is therefore intended to provide a financial incentive for shipowners to go beyond "existing ship" standards. In addition, use of such credits may provide a lower cost option for certain ships where the compliance cost of the "existing ship" standards are higher than average.

12.8 Defining "existing ships" to include new builds once launched is important because under SECT a new build is subject to a defined standard at the time of building (more stringent than the standard applicable to "existing ships" at that time), and also subject to increasingly stringent existing ship standards throughout its life.

12.9 A ship will therefore exceed the "existing ship" standard when first built, but the ship may fall short of the applicable "existing ship" standard later in its life, thereby requiring action on its part to come into compliance under the scheme.

12.10 This provision for "existing ships" should encourage the construction of ships exceeding the applicable new build efficiency standards. It also provides an incentive for the shipowners to maintain, and even improve the energy efficiency of the ship throughout its life.

12.11 Ships will have a range of efficiencies. For any given level of standard, with the exception of particularly high standards, the efficiency of some ships will be higher than the standard and others below the standard.

12.12 "Existing ships" falling short of the applicable standard would therefore have three options:

.1 undertake technical modifications (as feasible) to meet or approach the applicable existing ship standard which would eliminate or reduce their need for credits;

.2 implement operational measures to demonstrate improved efficiency on a tonne mile basis; and/or

.3 obtain efficiency credits necessary to meet the applicable existing ship standard.

12.13 The current proposal does not provide a fourth option that could be used in a situation where a vessel is unable or unwilling to meet the applicable standard through technical or operational measures, and is unable to obtain the necessary efficiency credits. This could be of concern if a potential standard is set too stringent, and therefore the aggregate amount of credits available across the fleet may be limited.

12.14 The standards for new builds and "existing ships", and the ship efficiency credit trading programme extend beyond international shipping to cover ships used in domestic trade but may not initially apply to all ship types. For the purpose of this study, only emission reductions related to international shipping are considered. It should be noted, however, that the SECT proposal suggests it would produce emission reductions and efficiency improvements across all maritime transportation, including vessels operating in domestic trades, which represented 17% of GHG emissions from shipping in 2007.

12.15 The ability to trade efficiency credits is an important element of SECT because it provides an alternative compliance mechanism and potential incentive for some ships to exceed both the newbuild standard and the "existing ship" standard.

12.16 The number of credits generated in aggregate would be determined primarily by the stringency of the standards adopted. In essence, a less stringent standard means more ships generate credits and more stringent standards result in a smaller pool of credits in the fleet. The market price of efficiency credits will be affected by both the number of credits available and the cost of meeting the standard. Shipowners will make economic decisions on whether efficiency improvement measures, changes to fleet utilization, or credit purchases are the better option.

12.17 With respect to company behaviour, it is uncertain if shipping companies would trade any excess credits generated or bank them. Banked credits may be held for future use or simply withheld from the market. In either case, the credits would have value and there would be an economic incentive to use those credits in a way that maximizes the financial benefit to the holder. SECT is designed to promote trading through the use of a credit trading platform. With such a platform, the sale and purchase of credits would be much more efficient than if shipowners had to initiate trades with individual companies, especially where competitive interests may exist. In addition, trading can be encouraged by limiting the number of years that credits may be banked. If market efficiency is realized through these means, credits should flow to the highest value use.

12.18 Also relevant would be industry behaviour in the new build market in response to the system. Owners must consider when ordering new ships, if they should target a ship efficiency that exceeds the applicable new build standard so to generate credits and to improve the probability that the ship will meet or exceed future "existing ship" standards that may apply later in the ship's life. In addition, the existence of "existing ship" standards and the potential for earning credits would provide an incentive to maximize the use of "on-off" efficiency technologies such as those represented by the P_{eff} component in the EEDI formula.

In-sector and out-of-sector reductions

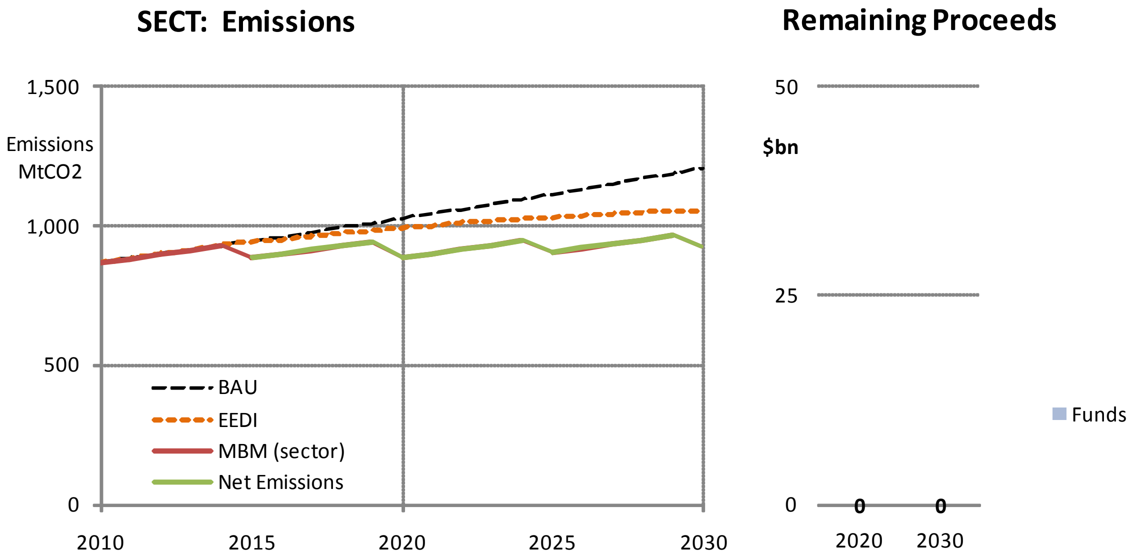
12.19 In-sector GHG emissions reductions were modelled for the SECT under different growth rates and at three levels of stringency. Different absolute stringencies were applied for the mandatory new build standard compared to the existing ship standard that can be met through efficiency trading. Costs could not be readily estimated for SECT proposal using the applied model.

12.20 The modelling considered the scenarios outlined in annex 5. The effect of underlying fuel price (reference and high) was not considered due to the method used in the modelling.

12.21 Figure 12-1 and Figure 12-2 illustrate modelled emissions for each growth scenarios assuming a medium level of stringency for both the new build standard and the existing ship standard. These scenarios are referred to below as the B2 and A1B reference scenarios for SECT.

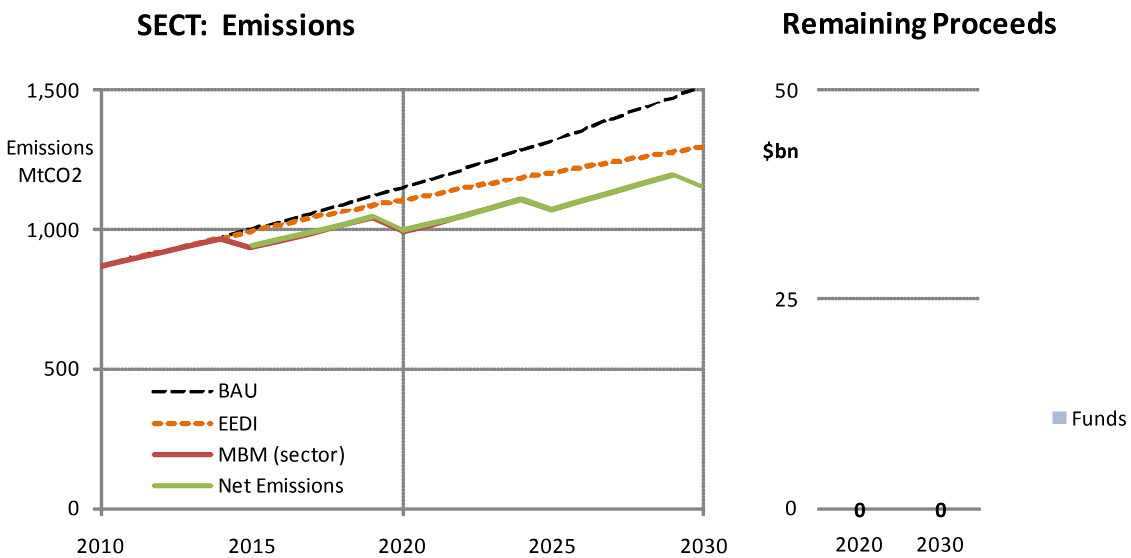
12.22 The line graphs show, emissions under a business as usual scenario (black line), and the expected decrease in emissions with a mandatory EEDI implemented at a medium stringency level (dashed orange line). It is important to note that the EEDI is part of the SECT proposal and emission reductions from the EEDI are therefore attributed to the proposal. The green line below the dashed EEDI line represents emissions from shipping after reductions from the efficiency trading scheme have been taken into consideration.

12.23 The SECT would not generate any funds as it does not contain a mechanism to do this. As a result, no remaining proceeds are shown.



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Since SECT would not generate any funds these are shown as zero.

Figure 12-1: Modelled emission and remaining proceeds under the SECT proposal under the B2 growth scenario with medium stringency efficiency standards



The term 'remaining proceeds' is used by the Expert Group to refer revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Since SECT would not generate any funds these are shown as zero.

Figure 12-2: Modelled emission and remaining proceeds under the SECT proposal under the A1B growth scenario with medium stringency efficiency standards

12.24 The reduction in emissions below BAU observed in modelling the reference scenarios for SECT were similar for both the B2 and A1B reference scenarios, with reductions of around 13 per cent below BAU in 2020 and 25% below BAU in 2030. The mandatory EEDI delivered around one third of these reductions in 2020 and at least half of the reductions in 2030.

12.25 Key model results for these reference scenarios are also shown in Table 12-1.

12.26 Under the schedule of standards put forward for the low stringency scenario, combined reductions from the mandatory EEDI for now and existing ship standards were 9 per cent below business as usual in 2020 and 19 per cent below business as usual in 2030, for both growth scenarios. Higher stringency standards reduced emissions by 18 per cent below business as usual in 2020 and 28 per cent below business as usual in 2030, for both growth scenarios.

Table 12-1: Modelled emissions and emission reductions from the United States proposal (SECT) under B2 and A1B growth scenarios with medium stringency

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	887	992
	2030	922	1,154
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	106	113
	2030	132	142
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
EEDI reductions (% of BAU)	2020	3%	4%
	2030	15%	14%
MBM reductions (% of BAU)	2020	10%	10%
	2030	11%	9%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Total reductions (% of BAU)	2020	13%	14%
	2030	26%	23%
Potential for supplementary out-of-sector reductions (Mt)	2020	0	0
	2030	0	0

The term 'remaining proceeds' is used by the Expert Group to refer revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Since SECT would not generate any funds there is no potential for supplementary out-of-sector reductions.

12.27 The range of responses in terms of MBM reductions observed under all scenarios modelled for SECT are shown in Table 12-2. The term 'remaining proceeds' is explained in the caption to Table 12-1.

Table 12-2 Ranges for emission reductions observed when modelling SECT in 2030

Key elements	SECT	
	High	**Low**
EEDI reductions (Mt)	299	123
MBM in-sector reductions (Mt)	142	106
MBM out-of-sector reductions (Mt)	0	0
MBM reductions (% of BAU)	13%	8%
Total reductions (% of BAU)	31%	19%
MBM in-sector reductions (% of MBM reductions)	100%	100%
Remaining proceeds ($billion)	0	0

12.28 Higher fuel prices would not change the reductions from the mandatory EEDI but would however stimulate the uptake of some additional cost effective EEDI measures meaning shipping companies would benefit from the mandatory new build standard by forcing the uptake of measures that are currently cost-effective but not being implemented because of non-price barriers. A similar effect would be observed for the existing ship standard.

Certainty of reductions

12.29 There is a high degree of certainty that mandatory efficiency standards for newbuilding under the SECT proposal will be met. It is also designed to motivate the building of new ships that exceed the applicable standard. While it is difficult to predict how many owners would elect to build ships above the standards, and to what degree above the standards, it is reasonable to assume that some building in excess of the applicable standards is likely to occur.

12.30 The new build standards would improve average energy efficiency of the fleet and deliver reductions in emissions from international shipping below business as usual at that point of time. The magnitude of these reductions depends on the stringency of the standards over time and fleet turnover.

12.31 The "existing ship" standard proposed by the SECT seeks to deliver quantitative improvements in vessel efficiency for the existing fleet. This includes not only ships in operation today, but also ships built in the future. Similar to the new build standards, the reductions that would result in the existing fleet are a function of the stringency of the standards. There is a high degree of certainty that, if enforced, the existing ship standards would deliver the stipulated increase in average efficiency required under the scheme. In addition, the efficiency credit trading mechanism may enable the efficiency improvements to be achieved at lower cost.

12.32 There is uncertainty around the extent of reductions associated with the "existing ship" standards due to the following two factors:

.1 The first is the stringency of the standards to be applied to the existing fleet. Like the new build standards, the stringency level of these standards must still be decided upon. Modest standards may produce little, if any improvement given the ability of ships to trade credits between ships above and below the standard. More aggressive standards would likely generate significant improvements because compliance must be demonstrated through one of the available options. Multiple options for compliance are proposed or contemplated (e.g., alternative operational efficiency formula), but there is a reasonable certainty that the stipulated standards would mainly be obtained through one of the mechanisms available in the proposal.

.2 The second could arise in the scenario where "too stringent" standards apply to the existing fleet. In this scenario, fewer credits would be generated and there is the potential for a situation where the standard is technically not attainable for a portion (larger or smaller depending on the stringency of the standard) of the fleet. In the case, where credits are unavailable the question arises as to what occurs when an inefficient ship is unable to achieve compliance via trading and it is not practical to make sufficient improvements to the vessel's efficiency to meet the existing ship efficiency standard. How this scenario would be addressed would affect how effective the system would be and how attractive the proposed trading element is. In short, the system could be extremely effective, or much less so, depending on the likelihood of this scenario and the resolution of this concern.

12.33 Evasion or potential fraud issues could occur with verification of the respective efficiency standards and the trading of credits. Should this proposal or any other of the proposals be developed further, it will be necessary to develop procedures and mechanisms designed to minimize the risk of evasion. SECT does not appear to present any more risk of evasion than other proposals currently under consideration. However, it can be verified using methods similar for other standards.

Cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development

The cost-effectiveness of the proposed MBM

12.34 This proposal is for efficiency standards for both new and existing ships. Each vessel's efficiency would be measured against a relevant baseline for the specific vessel class and size; however different requirements would apply to newbuildings and existing ships. As one means to comply with the efficiency standard, SECT calls for the creation of an efficiency-credit trading programme for the maritime sector that enables ships that are more efficient than the required existing ship's standards to generate efficiency credits and provides the opportunity for these credits to be transferred, banked, or sold.

12.35 It should be noted that, depending on the stringency of the standard and on future fuel prices, the use of efficiency measures could result in net cost savings for the industry due to fuel savings.

Table 12-3: Modelled costs under the Ship Efficiency and Credit Trading proposal under B2 and A1B growth scenarios with medium carbon price and reference fuel

	Year	B2	A1B
Financial: gross costs ($billion)	2020	Unknown	Unknown
	2030	Unknown	Unknown
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	0	0
	2030	0	0
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	106	113
	2030	132	142
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0

12.36 Because the SECT proposal is not designed to raise funds for purchase of out-of-sector emission credits to offset marine GHG emissions, the gross revenues raised are equal to zero.

12.37 Indirect cost consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in Port State Control Organizations and not least in operation of the trading mechanism. These costs are elaborated below.

Due to the modelling approach used in the assessment, the cost-effectiveness could not be calculated as the gross cost for the scheme could not be determined.

Administrative costs (including any central administrative requirements)

12.38 Not all of the administrative tasks related to the Ship Efficiency Credit Trading are fully developed at this time, but it is considered that they will include:

.1 determining and certifying/recertifying the attained energy efficiency index (EI_A), for all ships, based on ship actual performance;

.2 verifying ship records, including EI_A certificate, activities, and efficiency credit (EC) balance, and certifying ship compliance with SECT;

.3 issuing SECT ECs to efficient ships and registering these with central registry for trading;

.4 retiring SECT ECs from inefficient ships used for compliance purposes;

.5 operating a trading platform for ECs, including transaction settlement, and integrity mechanism against retired or false ECs entering the market;

.6 verification and auditing of certifiers; and

.7 SECT reporting.

12.39 While, at this time, the roles and responsibilities of the Party States and the Central Administrative Entity in implementing the proposal are not fully developed (but will need to be fully evaluated), it is understood that in order to undertake the above tasks the following administrative functions will be required:

.1 Administrative Body, as noted in common concept 11, to administer SECT.

.2 A secure, probably electronic, global register would need to be developed and maintained to monitor ship's EI_R and EI_A and to capture the EC transactions (noting that it remains to be confirmed whether the ECs will be issued by a central Authority or by flag States).

.3 An on-line trading platform will be needed, given the scope of the SECT. Although not described, a secure system and processes to issue ECs and subsequently retire them would be needed.

.4 Record keeping, as noted in common concept 11.

.5 Audit of International Body, as noted in common concept 11.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

12.40 New Ships will be built to achieve the mandatory EEDI standards and therefore both comply with the less stringent existing ship efficiency index standards, and be eligible to earn credits. The ability to earn credits and the increased stringency of the long term efficiency standards would provide an incentive to building new ships that exceed the applicable standard. While it is difficult to predict how many owners would elect to build above the standards and to what degree above the standards, it is reasonable to assume that some building in excess of the applicable standards is likely to occur.

12.41 The Ship Efficiency and Credit Trading proposal has been difficult to assess due to uncertainty associated with market behaviour related to the generation and exchange of efficiency credits.

12.42 How many credits are generated in aggregate is determined primarily by the stringency of the standards adopted. In essence, a less stringent standard means more ships generate credits and more stringent standards result in a smaller pool of credits in the fleet. Shipowners/operators would make economic decisions on whether efficiency improvement measures, changes to fleet utilization, or credit purchases are the better option. The availability of credits will be influenced by the stringency of the applicable standards (i.e. more stringent standards result in less credits available to the fleet) and industry behaviour (i.e. do companies with excess credits make them available for sale or do they hold them in reserve).

12.43 It is noted that if a standard is potentially set too stringent, the aggregate amount of credits available across the fleet may be limited. Even in the case where a substantial number of credits are generated in the fleet, a concern is that it cannot be guaranteed that those companies holding the credits will offer them for sale in the market, with a potential distortion of the market.

12.44 Consequently, any future development of SECT should consider the issue of how the most inefficient existing ships would be treated in the proposed system if they are unable to meet the applicable standard through technical or operational measures, and also unable to obtain the required efficiency credits.

12.45 The Group has assessed the certainty level for investments in new ships to be rather high, whereas the investment certainty in improvements to existing ships is low due to the uncertainty on credit availability to fill any gap. Overall, the system does not significantly change status of certainty for new ships, wherefore the overall certainty rating for SECT has been assessed to be middle – low, although with a relative large spread in the rating. This adequately reflects the issues discussed above.

Credit for early action

12.46 The Ship Efficiency and Credit Trading proposal are favourable to early action. Prior investment in efficiency improvements is fully recognized in the system and the rating for this is considered "high".

Availability of technological and operational measures for CO_2 emission reduction

12.47 The SECT proposal recognizes all technical and operational measures that can limit the fuel consumption of a ship.

12.48 The proposal builds primarily on the EEDI value for ships. It is based on similar efficiency measures that are used to establish the level of the EEDI requirement.

12.49 One measure stands out as a significant lever for controlling the EEDI value of a ship. That is the power of the propulsion engine which because of the speed/power correlation for ships may significantly lower a ship's EEDI. A 10% lower speed triggers at least 27% lower CO_2 emissions – which translates into an approximate 20% lower EEDI value.

12.50 Three different approaches to quantifying the operational aspect of ships are discussed in the SECT proposal for the purposes of credit calculations. Only one of these approaches would be used in the final programme. The SECT proposal singles out actual activity in terms of tonne miles as the preferred approach to represent operating profiles.

Practical feasibility of implementing the proposed MBM

12.51 Development time for this proposal will be linked to finalization of the EEDI (noting that it would also be used for existing ships via this MBM mechanism). As it is linked to the EEDI it is expected development of some elements of this proposal will be somewhat simplified. The proposal suggests that SECT could be institutionalized within MARPOL Annex VI, which, compared to the development of a new Convention or a further Annex to MARPOL, will reduce the amount of time necessary for the proposal to enter into force.

12.52 Before the proposal is finalized, discussions will be needed on such issues as:

.1 how a ship will calculate its EIA;

.2 period of time for updates to EIA;

.3 how to calculate efficiency credits;

.4 design of the credit trading mechanism;

.5 length of compliance period; and

.6 the market and trading place for trading credits will also have to be developed and established.

12.53 It is noted that during the proposed phase-in period, when new and existing ships would have to begin reporting their attained efficiency (EI_A) values, it is not expected that any 'trading' will be undertaken. Consequently, the trading instrument could continue to be developed during this reporting period, which may facilitate an earlier entry into force of SECT. This approach is consistent with that taken during the start-up of some other trading regimes intended to address environmental concerns.

Experience from similar schemes

12.54 This SECT proposal is modelled in part on the United States in-sector Averaging, Banking and Trading (ABT) schemes. ABT schemes have been used over the past two decades in the United States but are still relatively unknown in IMO and in many countries. It is also noted that these systems typically do not operate on an international basis (although they do cover manufacturers from other countries that sell their products in the United States). Rather, they apply typically to manufacturers of product portfolios subject to standards, for instance manufacturers of new vehicles and new engines[22] – a limited number of 'parties' compared to the tens of thousands of ships trading internationally.

12.55 To address this, SECT includes two provisions to facilitate trading that are not included in United States national ABT programmes. The first is a limited credit life, which provides an incentive for these credits to be traded to those who desire to use the credits in the near term. The second provision is the use of a trading platform so that credits could be sold on an open market rather than requiring ship operators to make transactions directly with competitors. In addition, as noted in the previous paragraph, existing ABT schemes have covered a smaller set of parties compared to the number of ships trading internationally. SECT will apply to a far greater number of 'parties' (ships in this case) – thereby increasing the diversity and cost of compliance options for ships. This may improve the prospects for using trading in order to meet standards in the most cost-effective manner.

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22 PEW Center for Global Climate Change (2003), Emissions Trading in the U.S.,
"The acronym ABT refers to the specific uses for the credits, namely, (1) "averaging" emissions over engine families produced by the manufacturer in the same model year, (2) "banking" credits to offset emissions from the same or other engine families produced by the manufacturer in future years, or (3) "trading" credits by sale to another firm to offset emissions from that firm's engine families. Instead of requiring manufacturers to meet the same emission standard for all of their engine families within a particular category, such as heavy-duty trucks or lawn mowers, the ABT programmes grant manufacturers credit for engine families with emissions rates below the emission rate standard. Credits can then be used to offset emissions from other engine families that are above the standard."
Available at: http://www.pewclimate.org/docUploads/emissions_trading.pdf:

12.56 Given that for this SECT proposal the trading of ECs will be one significant element in achieving compliance, it will be beneficial in any possible further development of this proposal to take account of any transferable experiences from ABT schemes. Examples of using ABT scheme for owners of 'existing vehicles', as is being proposed for 'existing' ships, have not been identified, not only in the international but also the domestic context.

12.57 However, it is noted that this proposal is a complement to the current effort within IMO to develop efficiency index standards for new ships through the Energy Efficiency Design Index (EEDI), the experience being gained from this ongoing work could be beneficial in the further consideration of this proposal – though recognizing the need to extend its application to all ships as discussed above.

12.58 Also, while there is no globally harmonized agreement from a sector on a goal to address its GHG emissions, it is noted that ICAO has agreed on a global annual average fuel efficiency improvement of 2 per cent for the medium-term (up to 2020) and an aspirational global annual fuel efficiency improvement of 2 per cent for the long term (up to 2050). This kind of approach based on energy efficiency presents similarities with this proposal.

12.59 It has also been mentioned in discussions that efficiency is a less politically difficult approach as many countries have created national efficiency goals as part of their contribution to the global efforts to combat climate change.

Ease of implementation and potential for phased implementation

12.60 It is noted that it is proposed that the primary approach would be for the calculations of EI_R and EI_A to be based on the same methodology as for the EEDI. The use of the EEOI – an 'operational' index – is discussed in the proposal for consideration as an alternative to using the EEDI. Since these 'design' and 'operational' indices represent two different concepts, further careful consideration will need to be given if they are combined in any way in the implementation of the SECT.

12.61 It is noted that within the proposal the credit calculation includes a capacity term so that larger ships will earn higher credits, all else being equal. Thus, an efficiency improvement in a larger ship would yield a higher emission reduction, in absolute terms, than an efficiency improvement in a smaller ship.

12.62 To the extent that efficiency schemes do not touch redistributive agendas, they may prove politically simpler to enact. In addition, establishing the EI_R for ships appears relatively easy as it is based on the ongoing discussions regarding the EEDI formula at the IMO. However, to determine the EI_A for existing ships may require the conduct of formal sea trials or in service at sea tests. In both cases, the results would need to be verified by the competent authority or recognized organization acting on its behalf. In this event, there would be additional work for both the Administration (in verifying the results) and the ship (conducting the tests/trials), though the amount of this effort could be mitigated if these activities were undertaken in conjunction with other existing statutory survey and certification work.

12.63 As acknowledged by the proponent of this proposal, if the efficiency standards were developed using an EEOI approach, they would need to take into account periodic operational measures (e.g., voyage planning) that could improve efficiency but which are not captured in the EEDI. Such use of operational measures would need to be carefully considered at an early stage in any further development of this proposal.

12.64 Flag States would have to develop and maintain registries and documentation to cover the requirements of EEDI ratings and modifications, which would have to be monitored and audited on a ship-by-ship basis. The implementation of this scheme may take time in order to ensure completeness and accuracy.

12.65 The SECT market will also require some confidence-building.

12.66 Based on an analysis of the age distribution of the world merchant fleet (Figure 12-3), the total number of ships that are 10 years of age or more is nearly 80% of all ships in 2009 by ship numbers, and circa 50% all ships measured by DWT. Only for container ships, is the number of ships over 10 years lower than the number of ships less than 10 years of age. It is noted that the EEDI baseline is being developed with reference to ships built in the last decade. While there is no conclusive evidence that this baseline is not representative of older ships and the comparative stringency of the EEDI baseline and the EI_R standard cannot, at this time, be definitively assessed (depending on the final way in which it is agreed the EI_R will be determined). It may be a challenge in terms of 'ease of implementation' if, as a consequence of it being determined that $EI_A > EI_R$, a significant number of ships might be subject to full compliance checks annually.

12.67 Regarding the potential for phased implementation, it is noted that it is proposed only ship types with an approved EEDI baselines (reference line) would be required to comply initially. This implies a phasing in of other ship and propulsion types as those values are determined and adopted by IMO. In addition, the EI_R could be progressively tightened.

Enforcement, potential for evasion and avoidance of carbon leakage

12.68 Further information would be needed to explain the compliance mechanism when the ship is in operation. Activity data is the basis for the trading of the system. Verification of activity data will be needed, and such verification is not described in great detail.

12.69 The recording of a ship's activity levels/efficiency performance is to be done by the ship. Safeguards will need to be developed to ensure accurate self-reporting by ships.

12.70 Common concept 13, as Modal carbon leak, describes a relevant concern of the Expert Group in this section.

12.71 While verification by Port State Control will need further development, it will probably not be simple. The scheme will probably require compliance activities similar to Port State Control activities and record keeping, as well as verification of compliance with existing NOx and fuel sulphur standards, plus some sort of a periodic EIA audit, as this is the principal check that the system is indeed working the way it should. These records must continue throughout the life of the vessel and across flags, and must be accessible to whatever body undertaking the review of the EEDI targets for shipping, so that sufficient data can be pooled when studying the evolution of the fleet.

12.72 Given that all future applications of new technologies will to some extent experiment in unknown variables, all ratings will also need verification over time so it can be verified whether the projected GHG-reductions are actually happening in practice.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

12.73 While a number of measures or technologies exist that could be used to meet the efficiency standards would also result in fuel saving for the ships, there may be hurdles to adopting such measures or technologies, including long payback periods. There could be a need for technology transfer to help improve ship and operational efficiencies.

12.74 There are no revenues raised under this proposal.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC

12.75 Common concept 14, UNFCCC 1 and UNFCCC EFFICIENCY, describe the Expert Group's views on general compatibility with the UNFCCC for this proposal.

Compatibility with Kyoto Protocol

12.76 Common concept 15, Kyoto Protocol, describes the Expert Group's views on general compatibility with the Kyoto Protocol for this proposal.

Compatibility with WTO

12.77 Common concept 16, WTO, describes the Expert Group's views on general compatibility with the WTO for this proposal.

Compatibility with UNCLOS

12.78 No compatibility problems with UNCLOS have been identified.

Relations with other climate finance institutions or initiatives

12.79 This is an in-sector efficiency scheme, which implies that no revenues generated from the sector will be used in other sectors.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

12.80 As is usual with IMO mandatory instruments, domestic law will have to be enacted – especially to impose sanctions in the event of non-compliance. In States where there operates a two tier system of legislation (primary and secondary), depending on how this proposal is prescribed in the IMO regulatory framework (see comments in paragraph 12.103) and national assessments as to the innovative nature of this SECT proposal, new primary legislation may be needed, which will require significant resource and parliamentary time to progress. In this regard, it is also relevant to note that some States have internal procedures that require extensive consultation procedures with affected stakeholders to be undertaken before new legislation is enacted and that this national legal process may have to be completed, or significantly progressed, before the IMO instrument that implements this proposal can be ratified or acceded to.

12.81 It would be necessary to devise the necessary mechanisms to regulate the trading market to ensure that it is transparent and fraud free, and to ensure that no single 'player' could dominate the EC market.

12.82 It is noted that using trading units, an efficiency unit just below the required energy efficiency index would be financially and administratively advantageous to any ship. Consequently, the certification officers would need to be subject to fraud control. The larger the number of certification officers, and countries they operate in, the larger this challenge would be.

Additional workload for flag States per ship

12.83 Flag States would have to verify and approve the EI_A value for every ship – new and existing. Subsequently, any changes to this value through technical improvements would need approval by the flag State. They would also have to issue "Energy Efficiency Index" certificates to compliant ships.

12.84 Flag States would also have to conduct inspections and ensure that the necessary compliance proof is obtained for a given compliance period, and surrendered if required. Effective and efficient 'connectivity' arrangements between the flag State and the Central Agency's register would be necessary. Flag States would also be responsible for taking timely and effective enforcement actions in the event of non-compliance.

Impacts on port State inspections and additional workload per call or inspected ship

12.85 This issue needs further examination. However, it appears that additional tasks would be required to be undertaken by Port State Control Officers (PSCOs) during inspections of visiting ships to verify that they are compliant with the requirements of the scheme. However, it appears likely that this will mostly involve documentation checks, for which no additional skill sets would be required. While the proposal says that action should be consistent with no more favourable treatment, it is considered that further analysis will be required as to what happens if a non-Party ship arrives in a Party port State, which may require the establishment of new and appropriate Port State Control financial and control processes.

Availability of skilled human resources

12.86 Additional human resources may be required by flag States to perform the tasks of verifying and approving ships' EI_A. The skill sets required would be similar to those required for the mandatory application of the EEDI and SEEMP through MARPOL Annex VI.

12.87 Appropriately qualified and trained controllers or auditors to audit the flag States' certifiers and limit fraud are also likely to be needed, given the significant financial value of a ship being certified as an efficient ship (i.e. with EI_A below the EI_R).

12.88 Improved or adaptive EEDI monitoring will require new skills and audits which will take time to implement world-wide. This may be complicated to ensure consistent standards everywhere and it may take longer to put into place than the implementation of the scheme alone.

Compatibility with national law

12.89 While in this proposal there is no collection of funds by Administrations for any central body, and the proponent considers that all the new processes inherent in the scheme could fall under the national implementation of MARPOL Annex VI, i.e. authorities already empowered to deal with the regulation of shipping; consideration may need to be given as to whether the financial aspects of the proposal might require the 'active' involvement of other public authorities.

12.90 In some jurisdictions a variable fee related to the efficiency of existing means of transportation (in this case ships) may be against national law, as it may be construed as discriminating older, less efficient vessels against newer ones. Even though some countries may have implemented a fixed fee that relates to vehicle efficiency, such as engine size with respect to road vehicles, this would not imply that the same treatment would follow for a system which may vary its impact based on a ship's varying efficiency over time.

12.91 In some jurisdictions, a legislation that would effectively charge consumers efficiency-dependent fees on goods they have purchased in the past, may not be allowed on the grounds of the legislation being retrospective (i.e. that this type of fee was not in place when they purchased the goods). However, some will consider that taking such a position assumes that prices would significantly increase, which would not necessarily be the case.

Sovereignty implications

12.92 While the trading of ECs is likely to be done under free market principles, agreeing a global efficiency standard and implementing credits, fees or charges related to it may be challenged on sovereignty grounds and, therefore, they will need to be accepted internationally. However, acceptance by IMO may overcome this challenge.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

12.93 The recommended approach in the SECT proposal can introduce a higher onboard burden as detailed activity records must be maintained at all times.

12.94 Ship operators would need to verify and document the operation and performance of their fleet to ensure necessary efficiency credits are available to match the need of their fleet.

12.95 Ship operators shall also decide whether to retain or market any generated credits. The first option could be used as a means to restrict competition. Retaining credits could also be used to exercise price influence on the credit market. SECT is designed to promote trading through the use of a credit trading platform. With such a platform, the sale and purchase of credits would be much more efficient than if shipowners had to initiate trades with individual companies.

Additional workload onboard

12.96 The Ship Efficiency and Credit Trading proposal would require ships (existing as well as new) to regularly repeat sea-trials to re-assess their EEDI values. Such repeated sea-trials could be performed back-to-back with dry dockings where the hull performance has been optimized with re-coating, etc.

12.97 Depending on the price level in this system and intervals for re-assessment of ships' EEDI, this proposal may influence the intervals of dry dockings of ships.

12.98 It can be assumed that some level of introduction of additional equipment in ships will take place to obtain lower EEDI values for ships over time. Price level and availability of credits in the market could drive such uptake of technology. Additional equipment would require maintenance and supervision by ship's crew, which will influence costs.

Additional economic impact for individual ships and the shipping industry

12.99 The introduction of verifiable sea-trials at intervals during a ship's life time will incur additional costs, including loss of hire and the cost of undertaking the trial. The anticipated need for additional dry dockings to ensure optimum trial conditions would further increase the cost under this proposal.

12.100 The proposal may initiate introduction of technologies to enhance efficiency that from a cost-effectiveness perspective may seem little attractive. The risk of rendering non-compliant ships non-operational due to shortage of credits may impact such decisions.

12.101 As mentioned above no effort was made to estimate costs and fuel savings associated with the application of efficiency improvements measures due to SECT or any other MBM.

12.102 As the credit price level in this proposal is difficult to model the Expert Group was unable to quantify its economic impact.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for new IMO instrument

12.103 The proponent of the proposal states that it "could potentially be accomplished with an amendment to MARPOL Annex VI, which would be faster and less burdensome than developing a new annex or a new Convention." However, further detailed review is considered necessary to assess whether or not there exists sufficient legal basis in the Articles of MARPOL for an amendment of Annex VI to mandate this system, in particular as to whether a trading platform can be introduced into Annex VI. A new instrument could also therefore be necessary for this system.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

12.104 Dedicated central administrative systems would be required comprising at least: one or more registries (the EEDI and EI_A registries will need to be accessible, as well as a review of historical adjustments to vessels' EI_A, for research and analysis purposes); an efficiency trading system (which will be a closed market place, for international shipping only); and comprehensive verification and certification processes.

12.105 The proponents of the SECT recognize that further discussion will be required regarding the most appropriate administrative entities needed to regulate and oversee the Scheme.

Role of flag State

12.106 A flag State would have to verify that ships flying its flag meet the requirements of SECT before issuing the Energy Efficiency Index certificate. For ships whose EI_A is below the required EI_R, the flag State will need to verify that the ships had either incorporated needed technologies or operational measures or acquired the necessary ECs to make up for the short falls, before issuing the certificate. They would need to ensure that the ECs used for compliance do not re-enter the programme, for instance by cancelling or retiring them or similar. Flag States would also be expected to implement any enforcement measures required to be taken regarding any non-compliance on ships flying its flag.

Role of port State

12.107 In many respects port States would enforce SECT in the same manner as many other IMO instruments, though these activities would largely be restricted to documentation checks. However, in this proposal port States would have a responsibility to verify any EC trading in which a ship is required to be involved. Consequently, it would be necessary to consider carefully the role of the Port State Control Officer in any further discussion on the most appropriate administrative entities to regulate and oversee SECT.

12.108 As discussed above, details of enforcing compliance for ships flying the flags of non-Parties need further discussion in order to address the issue of scheme avoidance.

Role of recognized organizations

12.109 The proposal does not discuss in detail a role for Recognized Organizations. However, the proposal states that the ship's flag State, or its authorized recognized organizations, will validate reporting and certify compliance with the efficiency credit requirement. In this regard, it is noted that these recognized organizations would probably have to acquire new skill sets and additional training would have to be undertaken. More detailed consideration of the proposal may identify further ways in which Recognized Organizations might be authorized to act on behalf of Administrations in a similar way as for other IMO Conventions.

Survey, Certification and other means of control

12.110 This proposal will require the development and issuance of a new certificate – "Energy Efficiency Index". This will indicate that the ship had met its obligations for SECT and will facilitate port State control checks. This will have to be re-issued in the event that any measures are implemented on board the ship that affects the EI_A.

12.111 The issue of EC documentation will need to be further discussed.

12.112 There will presumably be a need to undertake spot checking of a representative proportion of the tonnage to access overall compliance and operation of the overall emissions-reduction aims of the scheme.

Involvement of other authorities (e.g., Treasury)

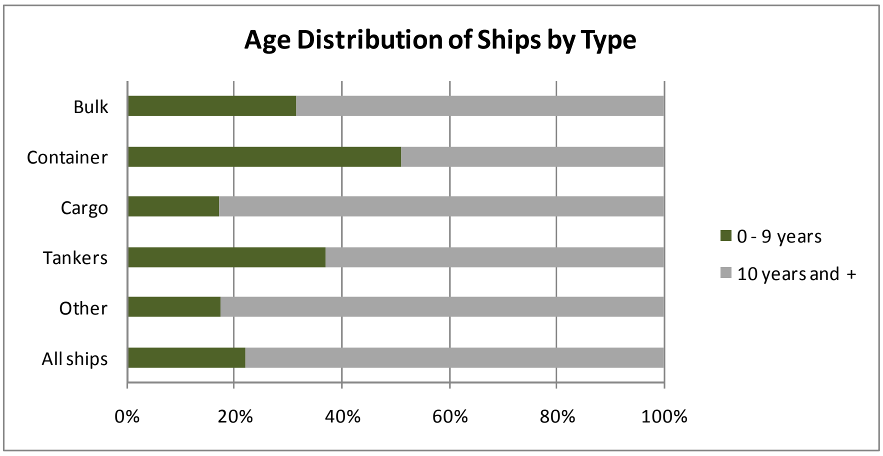
12.113 While it is recognized that no funds are being collected and transferred to a central agency under the SECT, under the system which suggests that it is unlikely that there will be additional requirements to involve authorities other than national maritime Administrations; the involvement of Finance/Treasury and anti-fraud authorities may be needed in some jurisdictions, for instance in relation to the issuing of EC documentation, their trading and financial control.

Figure 12-3: Age distribution of ships relevant to schemes relying on the EEDI

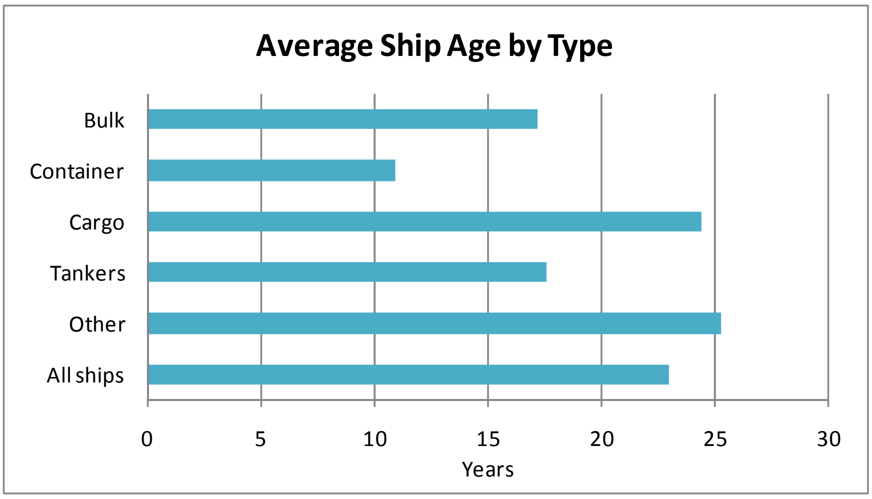
The table is for two age groups: under 10 years of age and of 10 years of age and above (+). Source data for the table is from a more detailed analysis of age distribution of the world merchant fleet, by vessel type, as of January 2009 provided in the Review of Maritime Transport 2009 (UNCTAD; Table 11, page 41).

Vessel Type		0 – 9 years	10 years and +	Average age (years)
Bulk carriers	*Ships*	31.6	68.4	17.22
	DWT	41.6	58.4	14.27
Container ships	***Ships***	**51.0**	**49.0**	**10.92**
	DWT	63.3	36.7	9.01
General cargo	*Ships*	17.1	82.9	24.44
	DWT	23.6	76.4	22.12
Oil tankers	*Ships*	36.9	63.1	17.55
	DWT	58.2	41.8	10.72
Other types	*Ships*	17.5	82.5	25.26
	DWT	40.3	59.7	18.24
All ships	***Ships***	**22.0**	**78.0**	**23.00**
	DWT	48.6	51.4	13.97

The age distribution of ships by type is shown graphically below:



The average ship age by type is shown graphically below:



Source: UNCTAD, Review of Maritime Transport 2009

13 PROPOSAL TO ESTABLISH A VESSEL EFFICIENCY SYSTEM (VES) – WORLD SHIPPING COUNCIL (WSC) (MEPC 60/4/39)

FOCAL POINT SUMMARY OF THE PROPOSAL

Primary Objectives of the Proposal:

.1 reduce carbon emissions from the world's merchant fleet;

.2 focus industry carbon expenditures on improving the efficiency of fleet assets with a return on investment for the life of the vessel;

.3 reward investment in efficiency gains and discourage operation of the most inefficient ships; and

.4 create a relatively simple system, which is equitable among ship types and will provide a high degree of certainty of reduced ship emissions.

How Does the VES Work?

.1 establish mandatory efficiency standards for both new and existing ships;

.2 each vessel would be judged against a requirement to improve its efficiency by X% below the average efficiency (the baseline) for the specific vessel class and size;

.3 standards are tiered over time with increasing stringency;

.4 new builds must meet the specified standards or they may not operate. New builds, once completed, are not defined as existing ships. Hence, the system applicable to existing ships sunsets when today's fleet turns over;

.5 existing ships may comply by improving their efficiency scores through technical modifications that have been inspected and certified by the Administration or recognized organizations;

.6 existing ships failing to meet the required standard through technical modifications are subject to a fee applied to each tonne of fuel consumed. The total fee applied (non-compliant ships only) would vary depending upon how far the vessel's efficiency (as measured by the EEDI) falls short of the applicable standard. A more-efficient ship pays a smaller fee than a less-efficient ship that falls short of the standard by a wider margin;

.7 the total cost applied is calculated as follows:

For illustration purposes, assume that the standard applicable to a particular ship class and size is 16 grams per tonne mile and that a given ship is 25% less efficient than the standard, $50 is the base fee established by the parties, and the vessel consumes 50,000 tonnes of fuel.

The fee would be calculated as follows:

((20 grams per tonne mile ÷ 16 grams per tonne mile)-1) x $50 x 50,000 = = $625,000

For a vessel that is 50% less efficient than the standard:

((24 grams per tonne mile ÷ 16 grams per tonne mile)-1) x $50 x 50,000 = = $1,250,000
For a vessel that meets or surpasses the applicable standard - No fees apply.

.8 fees collected are available for R&D, out-of-sector CO_2 reductions, and other purposes as the parties may deem appropriate;

.9 a Fund Administrator must be established to manage funds received;

.10 Port State Control is largely limited to verification of certificates, record books, and Bunker Delivery Notes (in the case of an existing ship failing to meet the required standard); and

.11 fees required of ships failing to meet the standard are paid on a regular interval through the fuel supplier or directly by the ship.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

13.1 The Vessel Efficiency System (VES) would establish efficiency standards for both new and existing ships. The proposal is designed to achieve efficiency improvements and emission reductions within the maritime sector by setting a target for relative reductions, i.e. reductions in emissions per tonne mile. It does not attempt to set a cap on, or target line for, overall emissions from the sector.

13.2 Efficiency standards would apply to all ships, both new and existing, for which an Energy Efficiency Design Index (EEDI) can be established with a *de minimis* threshold) with different requirements applying to newbuildings and "existing ships".

13.3 The standards for new builds and existing ships, and the charge for existing ships that fail to meet the standard extend beyond international shipping to also cover ships used in domestic trade but may not initially apply to all ship types.

13.4 For the purpose of this study, only GHG emission reductions related to international shipping are considered. It should be noted, however, that the VES proposal would produce emission reductions and efficiency improvements across all maritime transportation and would contribute to improving emissions from vessels operating in domestic trades which represented 17% of GHG emissions from shipping in 2007.

13.5 Newbuildings (ships built after the VES enters into force) would be required to meet the newbuilding efficiency standard or the ship would not be permitted to operate. Existing ships (ships built prior to the VES entering into force) would have the option of meeting an existing ship efficiency standard through technical modifications or paying a charge on each tonne of fuel purchased.

13.6 The proposal envisages that the stringency of standard for newbuildings would increase over time (for example X % by 20XX and Y % by 20XY). Moreover, as the newbuilding standard in VES is mandatory, the in-sector emissions reductions achieved through this aspect of the VES are largely a function of the stringency of the standard over time and the penetration of newbuildings into the global fleet. The stringency of a standard will ultimately be a function of technical and operational considerations, additional costs on the sector, and policy considerations that are common to most of the proposals. Penetration of newbuildings into the fleet is a function of scrapping rates as well as sectoral growth driven by economic activity (new capacity).

13.7 The efficiency standard for existing ships would also be tightened over time but would be less stringent than those required for newbuildings. Note while the term 'standard' is used it is recognized that for both newbuilding and existing ships there will be more than one standard reflecting ship types as well as time periods.

13.8 While the SECT and VES proposals both establish vessel efficiency standards to reduce emissions, it is important to recognize that the proposed structure to accomplish this objective for existing ships is quite different. As discussed below, the two main differences are the definition of existing ships and the mechanism to minimize compliance cost for these ships.

13.9 Existing ships under the VES proposal include ships built prior to the MBM entering into force but exclude those ships built after the MBM entering into force. Existing ships may meet the stipulated standard through certified technical modifications or alternatively, if the ship fails to comply with the relevant standard, the ship would be subject to a charge on each tonne of fuel purchased throughout its operation.

13.10 The charge applied to existing ships falling short of the stipulated existing ship standard would be scaled. Ship that falls short of the standard by a small margin would pay a relatively small amount per tonne of fuel consumed. Ships that fall short of the standard by a wider margin would pay more through a defined formula. Ships that meet the standard would not be subject to any charge.

13.11 An important element with respect to the VES is that the portion of the fleet to which the new build and existing ship requirements would apply would change over time. While the efficiency standard for newbuildings would increase in scope to eventually apply to all ships, the existing ship requirements would sunset as this portion of the fleet progressively retires. Assuming an average ship life of 25 years, the existing ship requirements under the VES would be expected to apply to some portion of the fleet for approximately 20 to 30 years.

13.12 Within any ship sector to which the existing ship standard would apply, ships would have a range of efficiencies. For any given level of standard, with the exception of particularly high standards, the efficiency of some ships would be higher than the standard and some below the standard.

13.13 A portion of ships would therefore meet the standard and will have no further incentive under the VES to reduce emissions, beyond reduced fuel consumption and its consequent savings.

13.14 For those ships that fall short of the standard, the incentive to undertake technical modifications to comply would be largest for ships that fall well short of the existing ship standard compared with ships marginally below the standard, due to the scaling of the fee. Moreover, it may be technically difficult for some ships falling well short of the standard to meet the standard through technical modifications. Existing ships falling short of the standard would therefore have three options under the VES:

.1 undertake technical modifications (if feasible and cost effective) to meet or approach the existing ship standard which could eliminate or reduce their exposure to the charge by reducing the rate of the charge (to zero if the standard is attained) as well as the amount of fuel to which the charge would be associated (a natural consequence of efficiency improvements);

.2 implement operational and other non-EEDI technical measures (which would not count towards the efficiency rating of the ship) to conserve fuel thereby reducing the amount of fuel to which the charge would apply; and

.3 pay the applicable charge on each tonne of fuel consumed.

13.15 Ships could reasonably be expected to respond to the incentive structure provided by the VES by implementing the suite of actions from .1-.3 above based on which alternative is deemed most cost effective for a specific vessel. However the non-price barriers discussed in common concept 3, Non-price barriers, also apply in this situation.

13.16 Price incentives provided by the charge may overcome some of these non-price barriers, particularly if the price is predicable, perceived as permanent and results in significant competitive pressures.

13.17 Decisions to implement different types of measures will also be weighed against the choice of paying the fee, with the higher operating costs this entails, or a decision not to operate the vessel in a given trade – an option most applicable to the least efficient vessels or ships with the lowest technical capacity to improve their efficiency.

13.18 The effectiveness of the VES system as it applies to the existing fleet is dependent upon three key variables:

.1 the stringency of the standards applied;

.2 the level of the base fee used in the formula applied to ships failing to meet the standards; and

.3 the use of the fee.

13.19 A critical driver for the uptake of the standard would be the fee a particular ship would be required to pay on each tonne of fuel relative to the marginal costs of achieving the standard for that ship by technical improvements.

13.20 Broadly speaking, ships would comply with the standard if the marginal costs of implementing measures to achieve the standard are less than the rate of the fee. The greater this difference, the greater the incentive to comply. The charge is therefore a critical price component of the proposal. The proposal indicates that the base fee would be set at a level to encourage compliance with the applicable standard and to discourage operation of the least efficient vessels. The considerations on barriers to up take of emission improvement measures in common concept 3, Non-price barriers; therefore apply to the price based component of the VES.

13.21 The base fee may comprise a significant fraction of fuel costs, for example, 20 to 40 per cent depending on the stringency of the standard. Based on the assumptions used by the Expert Group this would correspond to a fee of between $240 and $480 per tonne of fuel in 2020 which, for the purpose of comparison with other price based MBMs, corresponds to a carbon price of $80 to $160. However, it is important to note that under the VES proposal, while paid on all fuel consumed, the fee is prorated by the per cent difference between the vessel efficiency index and the standard. Thus, a vessel operating 10 per cent above the standard would pay a fee in the order of $24 to $48 per tonne of fuel consumed, on average (equating to a carbon price of $8 to $16). A vessel operating 40 per cent above the standard would pay a fee in the order of $72 to $144 per tonne (equating to a carbon price of $24 to $48). As such, the fee is designed to discourage operation of the most inefficient ships and to motivate improvements in energy efficiency.

13.22 To the extent that the vessel owner is unable to transfer fees assessed under the VES scheme to the charterer as a result of competitive pressures from more efficient vessels not subject to a fee, the vessel owner and operator would share the expense associated with operation of an existing vessel failing to meet the applicable standard. In this case, a portion of the operating expense would be absorbed by the vessel operator, thereby creating a direct incentive to improve the vessel's operational efficiency and thereby avoid the costs associated with non-compliance.

13.23 The VES may therefore trigger a competitive pressure between some actors in the same shipping market which could lead to a positive environmental result.

13.24 The VES proposal does not propose to deliver out-of-sector reductions. However, the VES proposal does indicate that remaining proceeds collected from the fuel charge applied to existing ships failing to meet the standard *'could be used for a range of purposes determined by the parties'*. The VES proposal expresses a preference for directing a significant portion of the funds to R&D projects targeted at increasing the energy efficiency of the world's merchant fleet. R&D projects delivered through this fund may reduce the cost of existing technologies or bring forward new ones, leading to additional in-sector reductions. A portion of funds could also be directed to offsetting emissions by purchasing out-of-sector project emission reductions.

In-sector and out-of-sector reductions

13.25 In-sector GHG emissions reductions and costs, as well as the amount of remaining proceeds delivered by the VES, were modelled under different growth rates and stringencies of standards.

13.26 In-sector reductions were modelled for the VES at three levels of stringency. Different absolute stringencies were applied for the mandatory new build standard compared with the existing ship standard. The base fee for existing ships failing to meet the specified standard was assumed to be 20%, 30% and 40% of the fuel price for low, medium and high stringencies.

13.27 Further information about the model, the assumptions that underpin it, and the model limitations are explained in annex 5.

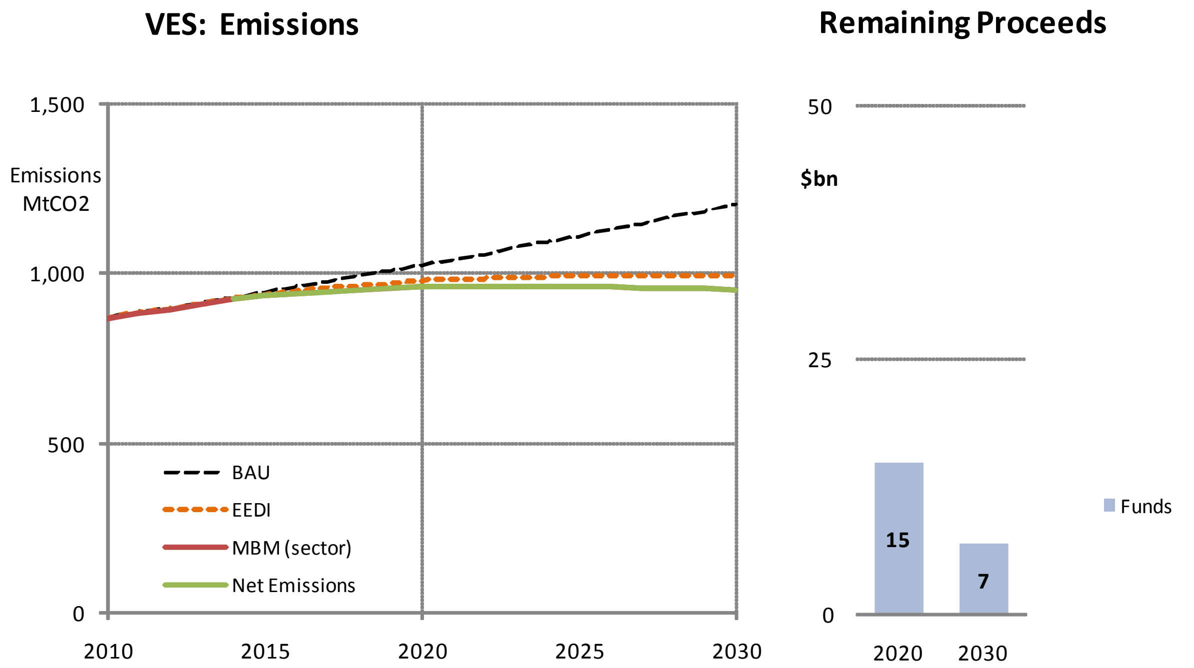
13.28 The modelling did not include a cap or target line as they are not variable in the VES proposal and a carbon price was only used in the context of calculating the potential supplementary out-of-sector reductions from the use of remaining proceeds.

13.29 Figure 13-1 and Figure 13-2 illustrate modelled emissions for each growth scenarios assuming a medium level of stringency for both the new build standard and the existing ship standard. These scenarios are referred to below as the B2 and A1B reference scenarios for the VES.

13.30 The line graphs show, emissions under a business as usual scenario (black line), and the expected decrease in emissions with the mandatory EEDI implemented at a medium stringency (dashed orange line). It is important to note that the EEDI is part of the VES proposal and emission reductions from EEDI are therefore attributed to the proposal.

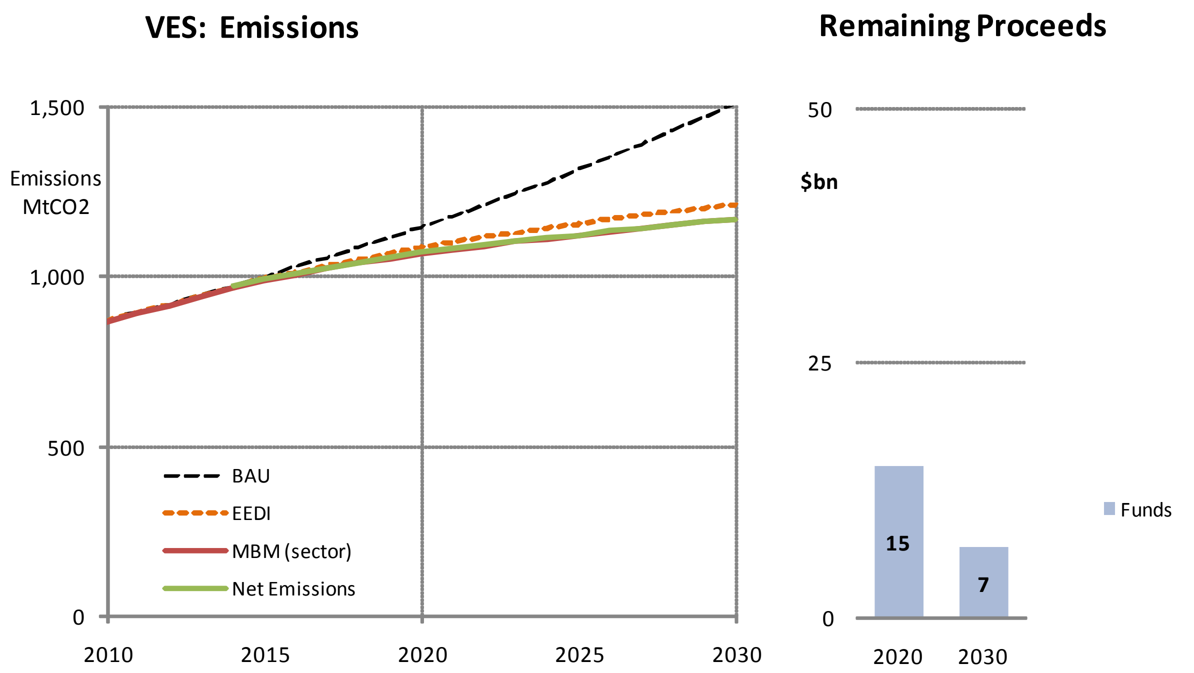
The green line below the dashed EEDI line represents emissions from shipping after reductions from the existing ship standard have been taken into consideration.

13.31 The remaining proceeds of the VES are also shown, with all revenue generated by the MBM appearing as 'Funds. How such remaining proceeds would be spent are not prescribed by the MBM and would be subject to policy considerations, and could include mitigation through the purchase of project credits, adaptation, R&D or other purposes.



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. The VES proposal expresses a preference for directing a significant portion of remaining proceeds to R&D projects targeted at increasing the energy efficiency of the world's merchant fleet. Remaining proceeds could, however, also be used for mitigation and adaptation in developing countries. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated to be 596 Mt in 2020 and 182 Mt 2030 assuming a medium carbon price.

Figure 13-1: Modelled emissions and remaining proceeds under the Vessel Efficiency System with medium stringency standards, B2 growth scenario with a reference fuel price



The term 'remaining proceeds' is used by the Expert Group to refer revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. The VES proposal expresses a preference for directing a significant portion of the remaining proceeds to R&D projects targeted at increasing the energy efficiency of the world's merchant fleet. Remaining proceeds could, however, also be used for mitigation and adaptation in developing countries. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated and found to be 572 Mt in 2020 and 184 Mt 2030 assuming a medium carbon price.

Figure 13-2: Modelled emissions and remaining proceeds under the Vessel Efficiency System with medium stringency standards, A1B growth scenario with a reference fuel price

13.32 The reduction in emissions below BAU observed in modelling the VES reference scenarios, were similar for both the B2 and A1B scenarios, with reductions of around four to five per cent below business as usual in 2020 and 16-17 per cent below business as usual in 2030. The mandatory EEDI delivered around 75-80 per cent of these reductions in 2020 and over 85 per cent of the reductions in 2030.

13.33 As the mechanism is designed to stimulate emission reductions from international shipping and does not access reductions out-of-sector, these reductions represent in-sector emissions reductions from the fleet only.

13.34 Key model results for these reference scenarios are also shown in Table 13-1.

Table 13-1: Modelled emissions and emission reductions from the Vessel Efficiency System (VES) under B2 and A1B growth scenarios with medium stringency

	Year	B2	A1B
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	982	1,093
	2030	1,027	1,266
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	11	11
	2030	26	30
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
EEDI reductions (% of BAU)	2020	3%	4%
	2030	15%	14%
MBM reductions (% of BAU)	2020	1%	1%
	2030	2%	2%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Total reductions (% of BAU)	2020	4%	5%
	2030	17%	16%
Potential for supplementary out-of-sector reductions (Mt)	2020	596	572
	2030	182	184

The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. The VES proposal expresses a preference for directing a significant portion of remaining proceeds to R&D projects targeted at increasing the energy efficiency of the world's merchant fleet. Remaining proceeds could, however, also be used for mitigation and adaptation. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation is shown assuming a medium carbon price.

13.35 Modelled emissions under the low stringency scenario were around three to four per cent below business as usual in 2020 and around 12 to13 per cent below business as usual in 2030, for both growth scenarios. Higher stringency standards reduced emissions by around six to seven per cent below business as usual in 2020 and around 21 to 23 per cent below business as usual in 2030, for both growth scenarios.

13.36 For the above scenarios modelled for the VES, the average fee experienced by ships falling short of the standard was assumed to be 17%, 21%, or 24% of the base fee (which was assumed to be 20%, 30% and 40% by the Expert Group) depending on the stringency, to reflect the distribution of ship efficiencies below the standard.

13.37 To examine the consequence of a higher base fee on compliance, base fees of 60% and 90% of the fuel price were modelled for the medium stringency standard for the A1B growth scenario. These model runs are shown in annex 9. With a base fee of 90 per cent of the fuel price, full compliance with the existing ship standards was observed in 2030 in the modelling, which represents six per cent of BAU emissions.

13.38 Fuel prices would not change the reductions achieved under the mandatory EEDI component of the VES similar to the situation for SECT. Higher fuel prices would however stimulate the uptake of some cost effective technical measures meaning shipping companies would benefit from the mandatory new build standard by forcing the uptake of additional cost-effective measures that are not implemented because of non-price barriers.

13.39 Higher fuel prices would also be expected to move some ships towards meeting the existing ship efficiency standard, independent of the charge applied to ships failing to meet the standard. This affect was not modelled as a reduction in emissions attributable to the VES, but was included in the baseline for all MBM.

13.40 While the reduced level of emissions from the mandatory new build standard could be reasonably expected to occur, it is important to note that reductions from the VES existing ship standard are indicative only, due to uncertainty about how ships would respond to the price signal provided by the VES. The range of responses in terms of reductions observed under all scenarios modelled for VES (excluding the 60% and 90% base fee scenarios for medium stringency) and remaining proceeds are shown in Table 13-2. The term 'remaining proceeds' is explained in the caption to Table 13-1.

Table 13-2: Ranges for emission reductions observed when modelling the VES in 2030

Key elements	VES	
	High	**Low**
EEDI reductions (Mt)	299	123
MBM in-sector reductions (Mt)	45	14
MBM out-of-sector reductions (Mt)	0	0
MBM reductions (% of BAU)	3%	1%
Total reductions (% of BAU)	23%	13%
MBM in-sector reductions (% of MBM reductions)	100%	100%
Remaining proceeds ($billion)	41	5

13.41 The VES would deliver remaining proceeds through payment of emission fees by ships failing to meet the standard. The proponents of the scheme express a preference for using a significant portion of these revenues for R&D for shipping. The effects of this investment on bringing forward technology was not considered in the modelling due to the inherent uncertainty associated with predicting the development and commercialization path for technologies. Such investment could help to address market failures associated with lack of investment in technology, R&D and demonstration, thereby increasing emission reduction from shipping in the longer term.

Certainty of reduction

13.42 There is a high degree of certainty that mandatory efficiency standards for newbuilding under the VES proposal will be met. These standards would improve average efficiency of the fleet and deliver reductions in emissions from both domestic and international shipping below business as usual. The magnitude of these reductions would of course depend on the stringency of the standard over time and fleet turnover. The stringency of the standards as with the other MBM are subject to policy considerations.

13.43 The existing ship standard proposed by the VES seeks to deliver quantitative improvements in vessel efficiency for a portion of the existing fleet. The maximum efficiency improvements that could result in the existing fleet from the existing ship standards are a function of the stringency of the standards. However, efficiency improvements would also be a function of how many shipowners make efficiency improvements to their ships versus simply paying a fee. How shipowners would respond to the proposed incentives is uncertain.

13.44 There is uncertainty around the extent of reductions associated with the existing ship standards due to the following two factors:

.1 The stringency of the standards to be applied to the existing fleet. Like the new build standards, the stringency level of these standards must still be decided upon. Modest standards would, by definition, offer limited improvements over BAU.

.2 The scenario where the fee is not seen by shipowners as a sufficient incentive to meet the existing ship standard. In this scenario, shipowners may become more likely to pay the proposed fee rather than meeting the standards through the use of efficiency measures. Therefore, the question arises as to what in-sector and/or out-of-sector efficiency improvements would be achieved from the remaining proceeds raised.

13.45 In response to any regulatory intervention it can be expected that some affected entities will seek ways to comply with a measure 'on paper' but in reality will not comply. Any such evasion would proportionally reduce the environmentally effectiveness of a MBM as such behaviour will lead to less ships covered and hence less reductions in emissions.

13.46 Under the VES proposal revenue generated from a fuel fee on those vessels that fails to meet the existing ship standard would be collected in the same manner as proposed under the GHG Fund proposal.

13.47 The accuracy and transparency of bunker fuel delivery is critical to ensuring that the financial incentives for existing ships to reduce emissions remain in place. The VES would apply different fee rates to existing ships depending on how far they fall short of the applicable standard. This adds a further element of complexity not present in the GHG Fund proposal which could create additional avenues for fraud. Provided that effective monitoring, reporting and verification processes can be designed and implemented the potential for fraudulent behaviour to impact the environmental effectiveness of the MBM will be minimized.

Cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development

The cost-effectiveness of the proposed MBM

13.48 Table 13-3 shows gross costs under the reference scenarios for the efficiency trading element of the VES, only. Under the VES gross costs are equal to revenues raised from collecting the charge (from to those vessels that fail to achieve the existing ships standard). The proposal does not propose specific allocation of how revenues are to be applied.

Table 13-3: Modelled costs under the Vessel Efficiency System (VES) under B2 and A1B growth scenarios with medium stringency

	Year	**B2**	**A1B**
Financial: gross costs ($billion)	2020	14.9	14.3
	2030	7.3	7.4
Rebates/refunds ($billion)	2020	0	0
	2030	0	0
Emission credits ($billion)	2020	0	0
	2030	0	0
Net funds ($billion)	2020	14.9	14.3
	2030	7.3	7.4
Cost of reductions ($/tonne CO_2 abated)	2030	275	247
Maximum cost-effectiveness potential ($/tonne CO_2)	2030	35	34

13.49 For purposes of modelling, the base fee for the VES was assumed to be a fraction of the assumed fuel price. These fuel price assumptions were agreed by the Expert Group but it should be noted that, as with all proposals, future fuel prices are uncertain and therefore costs of the VES could be higher or lower than shown here. EEDI uptake on existing ships is driven by the charge applied to non-compliant ships. As the charge would be applied to the total amount of fuel used while above a certain efficiency threshold, the incentive to drive efficiency improvements would be large.

13.50 Obviously, some sort of equilibrium would be reached for each individual ship which is a function of the marginal abatement cost (MAC) for the next measure to be considered and the cost incurred as a function of how distant the ship's efficiency is from the standard. Higher MAC values will entail higher costs and thus limit the uptake of more advanced abatement technologies. Also relevant are the business costs and profits associated with a given trade as well as the remaining life expectancy of the vessel as each of these considerations would contribute to determining whether a shipowner would choose to improve the vessel's efficiency rating in the VES or operate the vessel subject to the applicable charge. As noted in the environment analysis, the magnitude of the charge and the stringency of the applicable standard, are critical variables as these factors greatly influence behaviour in the VES. Namely, a higher base fee for non-compliance motivates efficiency improvements for existing vessels. Modest standards are more easily attained technically. In this case the total funds can be expected to be less, given that the charge would be calculated as a function of activity and the difference between the standard and the ship's attained EEDI value.

13.51 As the VES proposal allows for the option of payments which thereby avoids the uptake of non cost-effective technologies in ships, it promotes a stable equilibrium where MAC meets the cost to be avoided for each individual existing ship.

13.52 The VES, as it applies to ships built before entry-into-force of the scheme (i.e. existing ships as defined in the VES), will mean a transition to a system that relies solely on the EEDI standards for new ships. This means that the funds generated in the system will start out high and asymptote towards zero over time.

13.53 Indirect cost consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in Port State Control Organizations and operation of the Fund mechanism. These costs are elaborated below.

A1B: Reference fuel price, 2030, medium carbon price

The cost-of reductions is estimated to be 247 \$/tonne CO_2 abated.

The amount of funds generated for other purposes is \$7.4 billion

The maximum cost-effectiveness potential of the proposal is 34 \$/tonne CO_2

Administrative costs (including any central administrative requirements)

13.54 Regarding the 'efficiency' element of the proposal, the administrative costs would be expected to be lower than for the 'Efficiency Standards, proposal (MEPC 60/4/12) noting that this scheme does not need a trading platform, and does not issue, track or cancel emission certificates.

13.55 Further considering the administrative arrangements relating to the charges that 'inefficient' ships would have to pay, which would then be transferred to an International Fund, the following comments are relevant the options involving bunker suppliers (hereinafter referred to as Option 1) or the shipowners (hereinafter referred to as Option 2).

13.56 For Option 1: bunker suppliers will need to assess the quantum of levy based on the proposed sliding scale to be imposed on individual ships. This will incur additional verification work for the bunker suppliers. Also, a sliding scale for payment may also incur additional work for the Fund Administrator in verifying the payments made by the bunker suppliers against the efficiency of the ships. The GHG Fund Administer would also be likely to require a registry of ships and their respective validated EEDI values to cross check revenues received from fuel suppliers.

13.57 For Option 2: the Fund Administrator would require a registry of ships that reflecting the EEDI value of each ship to determine the amount payable by shipowners for their ships.

13.58 Under either Option, the Fund Administrator needs to receive updated EEDI values for given ships such, as ships seeking to improve these values.

13.59 Overall, the iterative administrative costs need to be considered on the basis of this finite life of the EEDI value inherent in the proposal.

13.60 As noted earlier, the Fund Administrator would need to maintain a register of ships/shipowners and, bunker suppliers so as to track the payments made by "non-compliant" ships. Option 2 would also require the Administrator to initially manage a large number of accounts and ensure the accuracy and timeliness of payments.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

13.61 The Vessel Efficiency System is based on the EEDI only. Investment in any improvement of the EEDI value for an existing ship towards meeting the standard would thus generate a well-defined return in limiting the costs applied to fuel consumption.

13.62 In this context the proposal has been rated high on investment certainty.

Credit for early action

13.63 A ship's EEDI value is an objective measurement of a set of well defined design parameters. Investment in improvement of a ship's EEDI are fully recognized in the proposal irrespective of the point in the life-time of a ship, it is made.

13.64 In this context the proposal has been rated high on credit for early action.

Availability of technological and operational measures for CO_2 emission reduction

13.65 Operational measures are always available to ship operators seeking to limit their CO_2 emissions. That is the fact today and would continue to be so after this proposal had entered into force. Fuel price is the main trigger for such measures and the proposal does not change any barriers for uptake of operational measures in the industry.

13.66 Technical measures that lower fuel consumption, but have no influence on a ship's EEDI are not rewarded in excess of what is the case today – lower fuel cost.

13.67 Technical measures that translate into a lower EEDI value are rewarded in this proposal – in terms of lowering fuel consumption as well as improving a ship's EEDI, thus limiting payments under the VES.

13.68 One measure stands out as a significant lever for controlling the EEDI of an existing ship. That is the power of the propulsion engine which because of the speed/power correlation for ships may significantly lower a ship's EEDI. A 10% lower speed triggers at least 27% lower CO_2 emissions – which translates into approximately a 20% lower EEDI.

13.69 For high powered (high speed, e.g., container ships) ships, a decision to decrease power and speed will be determined by trade demand, fleet capacity, and the business model of a given company and the specific trade in which the vessel is engaged as well as the cargo specifications. For ship's where speed is already low, the potential to reduce power and speed is more constrained because minimum power and speed must be available consistent with the ship's load and design characteristics for safety related reasons and to operate commercially.

13.70 Ensuring that a given proposal does not motivate designs with inadequate power (i.e. minimum safe speed for ships) is something IMO must address both in the context of efficiency based MBM's as well as for a mandatory EEDI in general.

Practical feasibility of implementing the proposed MBM

Development time for new IMO instrument

13.71 Assuming there is a political will to start substantive work on the development of this proposal in the near future it appears possible a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

13.72 When considering this proposal, National implementation concerns (common concept 18) must be borne in mind.

13.73 The time needed to establish efficiency standards for existing ships and determine the average efficiency for existing ships will impact on the development time for the instrument implementing the proposal, however it must be highlighted that this work has been under way at IMO for some time and has made good headway. It is noted that the proposal provides a mechanism (and specific formula) to assess the efficiency individual ships to facilitate the payment via a sliding scale. An objective and standardized mechanism needs to be developed to determine the efficiency of an existing ship after technical improvements are made to the ship.

13.74 Considering Options 1 and 2 the following formulations are presented:

Option 1

There are three elements related to the determination of the time needed for a new instrument, to enter into force:

.1 time to finalize the EEDI formulation[s] (for new and existing ships);

.2 time to reconcile UNFCCC – IMO principles; and

.3 time to develop the text of the 'Fund' element of the proposal (including time for the instrument to achieve its entry into force provisions). While recognizing that bunker suppliers located in non-Party States may register under the Fund system, it is estimated that the pace of ratification may be the most significant element in determining the overall time period before this proposal may enter into force. In this regard the difference in geography of fuel suppliers versus flag States may be a consideration.

Option 2

The same three elements as for Option 1 are also relevant to the time needed to finalize the text of a new instrument that provides the legal framework to implement this option. However, it is estimated that the entry into force time may be shorter in this option than for Option 1, as the enforcement and collection of the contribution would only relate to ships, not fuel suppliers – a scenario more analogous to MARPOL Annex VI.

Experience from similar schemes

13.75 It is noted that this proposal is a complement to current efforts within IMO to develop efficiency index standards for new ships through the Energy Efficiency Design Index (EEDI), the experience being gained from this ongoing work could be beneficial in any further consideration of this proposal – though recognizing the need to extend its application to all ships as discussed above.

13.76 It is noted that this proposal envisages an efficiency standard to implement and enforce a variable fee on non-compliant ships. It appears that relevant practical experiences from similar schemes are limited.

13.77 Any comparison with the existing IOPC Funds mechanism is relevant only in the context of the 'Fund' element of this proposal and it is to be noted that there are some significant differences that will need to be considered. It is also noted that contributions to the IOPC Fund relies on States reporting on legal "persons" that received large amounts of oil (in excess of 150,000 tonnes of crude oil or heavy fuel oil per annum). When considering Option 2, it is considered that operational experiences from the IOPC Funds are not that relevant to this option, as the collection mechanism is fully direct, and does not rely on States to provide information on who should pay.

Ease of implementation and potential for phased implementation

13.78 There is potential for a phased implementation for existing ships, as standards for existing ships could be tightened progressively. However, phased implementation needs to be done on the basis of vessel types, not size, so as to avoid market distortions.

13.79 It is noted that the proponents of this scheme anticipate that the fee system would sunset as the existing fleet is renewed. This may mean that for ship types with rapid fleet turnovers, the fee system may be practically eliminated after approximately 20 to 25 years. Other ship types may operate longer as a result of average vessel life. Resulting in the VES having a diminishing scope, but potentially the same fixed costs. The average age of ship types can provide some estimates on VES's potential lifetime for different ship types (see Figure 12-3).

Enforcement, potential for evasion and avoidance of carbon leakage

13.80 The common concept 13, Modal carbon leak, describes a relevant concern of the Expert Group in this section.

13.81 Within the international shipping industry carbon leakage may occur depending on which option is taken forward, which States become parties to the GHG Fund instrument, and how rigorously the GHG Fund is implemented and enforced.

13.82 As with all proposals, a robust and objective mechanism would be required to deal with "non-compliance" and to reduce the possibility of evasion that could lead to carbon leakage. If the fee is not large enough, then shipowners may likely prefer to simply pay the fee as a cost of doing business, as opposed to undertaking improvements in vessel efficiency – an outcome that would contribute to carbon leakage – however the proposal also allows for the possibility that these funds be used to further reduce in-sector emissions (through R&D) or purchasing out-of-sector reductions.

13.83 There would be a need to verify the amount of bunkers lifted during a given reporting period; as with other systems. There is a possibility that fraud and evasion could take place, so procedures would need to be put in place in order to minimize such fraud and contain the resulting carbon leakage.

13.84 Further information would be needed to explain the compliance mechanism ship's in operation. However, an appropriate flag and Port State control regime would need to be established to verify compliance. A degree of complexity is inherent to the verification procedure because the amount payable by some existing ships would vary depending upon their applicable EEDI score. It should be noted that verification procedures for many existing ships would be very simple as fees only apply to those existing vessels that fail to meet the applicable standard. This variability may also present a higher potential for fraud.

13.85 Regarding Option 2, it is considered that holding a shipowner liable for payment when the fee should have been made by the charterer or operator opens the door to legal disputes which would raise the cost of the system and may leave funds not being collected. Moreover, it is necessary for the fee to be treated as a clear supply to the vessel so that any claim can go against the hull *in rem*.

13.86 In the context of Option 1, the issue of possible bunkering at sea, in both territorial and international waters, will have also to be kept in mind with regard to carbon leakage issues.

13.87 Regarding Option 2, the risk of fees being lost to fraud may be reduced by eliminating the intermediary/collection role of the bunker supplier. However, it could also be considered whether involvement of the fuel supplier in a system that enables cross-verification of records between the fuel supplier and the ship could serve as a deterrent to evasion. The amounts of the fees paid by ships would also generally be much lower than the consolidated payments from the fuel suppliers (who obtain contributions from many ships), reducing the incentive to commit fraud. However, the risk of shipowners being caught not paying the fees will depend very significantly on the Port State Control (PSC) regime, where the benefits to the port State in ensuring the proper functioning of the system may not be as evident as in the case of PSC activities relating to adequacy of the safety, security and environmental protection systems onboard the ship.

13.88 The proposal would not apply to new ships built compliant to the EEDI. As such, the proposal provides certainty to the shipowner and operator that the vessel will be compliant with the VES regime throughout its life. By the same token, improvements in operational or design efficiency among newly-built ships are not formally recognized or awarded in the VES. To the extent that ships do not remain as efficient in-use as they were when new, this could also be considered as a form of carbon leakage.

13.89 Certified improvements in the EEDI score of existing ships is on the other hand recognized under the VES and it is expected that improvements would be undertaken where feasible to eliminate or reduce exposure to the associated fees applicable to ships that fail the stipulated standard. This would lead to reduced emissions from the existing fleet while rewarding those ships that fully meet the applicable standards. Factors that would affect efficiency include:

.1 maintenance of the engine, hull, and propeller;

.2 addition or deletion of installed equipment; and

.3 efficiency improvements in operation of the equipment and ship.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

13.90 While a number of measures or technologies exist that could be used to meet the efficiency standards would also result in fuel saving for the ships, there may be hurdles to adopting such measures or technologies, including long payback periods. There could be a need for technology transfer to help improve ship and operational efficiencies.

13.91 Revenues would be raised by this proposal. The proposal suggests a substantial proportion be spent on energy efficiency R&D in the maritime shipping industry. Funds could also be spent on technology transfer to developing countries and climate change mitigation in developing countries.

	Year	B2	A1B
Funds ($bn)	2020	**15**	**14**
	2030	**7**	**7**

13.92 Potential climate financing for developing countries comprise funds as shown in the table above.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC

13.93 Common concept 14, UNFCCC 1 and UNFCCC efficiency, describe the Expert Group's views on general compatibility with the UNFCCC for this proposal.

Compatibility with Kyoto Protocol

13.94 Common concept 15, Kyoto Protocol, describes the Expert Group's views on general compatibility with the Kyoto Protocol for this proposal.

Compatibility with WTO

13.95 Common concept 16, WTO, describes the Expert Group's views on general compatibility with the WTO for this proposal.

Compatibility with UNCLOS

13.96 No compatibility problems with UNCLOS have been identified.

Relations with other climate finance institutions or initiatives

13.97 It is noted that the funding that will be raised from the scheme can be used within the sector or outside it. The connection with other "climate finance institutions or initiatives" is a policy discussion, touching on redistributive criteria, which is considered beyond the scope of this evaluation.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

13.98 For Option 1, there would be new significant responsibilities for Administrations to closely regulate bunker suppliers. This would involve the verification of the amount of bunkers sold to "non-compliant" ships, ensuring that the bunker suppliers are able to contribute to the Fund, as well as the legal instruments to take action against the bunker suppliers and "non-compliant" ships in the event of non-compliance.

13.99 New procedures and possibly legal/administrative structures may be required to interact with the Fund Administrator, as the Fund Administrators would verify the Fund contributions taking into account the returns from the bunker suppliers and the ship owners/operators. There is also a need to develop procedures for the Fund Administrator in the event that non-compliance/fraud is detected.

13.100 For Option 2, there would also be new responsibilities for Administrations, though probably not as extensive as anticipated for Option 1, including the needs to verify the amount of bunkers lifted by "non-compliant" ships and to ensure that the shipowners make the necessary payments to the GHG Fund.

13.101 With varying fuel charges being applied to individual ships, the fuel supplier or the ship operator will have to be responsible for calculating the exact charge for each ship as well as ensuring that the correct amount is paid. These matters will require further clarification and consideration.

Additional workload for flag States per ship

13.102 Flag States will have to verify and approve the EEDI value of all ships (including existing ships) and making an assessment against the required efficiency standards. Any changes to this EEDI value through technical improvements will need to be verified and approved by the flag State. It also appears that flag States will have to undertake a review of ships, which will place them into categories according to size and type, although it is questionable that this can be assessed as "additional workload" to the extent that the EEDI considerations presently with the Committee include this regardless of the adoption of this proposal.

13.103 Flag States will need to record the correct amount of bunkers lifted by a "non-compliant" ship. Port States would also have a role in verifying that a ship is in compliance with the applicable standards. In the case of ships falling to comply with the applicable standard, this will require checks on the Bunker Delivery Notes against the Oil Record Books, and other information available from the Fund Administrator data base. This information would be available electronically to facilitate up-to-date information. The level of effort required by the Fund Administrator, flag Administration, and active port States could be substantial depending on how extensive such checks are necessary to reduce or deal with evasion and/or fraud.

13.104 Should option 2 be exercised, flag States would also have to ensure that the "non-compliant" ship (that did not meet the set efficiency standards) makes payment promptly to the Fund Administrator. Measures to ensure that flag States and port States be motivated to encourage compliance or due payment in circumstances of non-compliance go beyond the documentation of the proposal and reach to the topic of dealing with non-compliant ships, which has common points to all proposals and which needs careful discussion.

Impacts on port State inspections and additional workload per call or inspected ship

13.105 This issue will need further examination. However, it appears that additional tasks will be required to be undertaken by Port State Control Officers (PSCOs) during inspections of visiting ships to verify that they are compliant with the requirements of the scheme. However, it appears likely that this would mostly involve documentation checks, for which no new unique skill sets will be required. The proposal, like the other proposals reviewed, does not explicitly outline how ships from non-contracting States would be considered if they trade to the ports of Parties. For example, what happens if a ship without an energy efficiency certificate flying a flag of non-Party arrives to a port of a Party? If a no-more favourable treatment clause is applied, the PSCO will need to determine if the ship meets the efficiency standard and if not, determine and collect the necessary fees, and transmit them directly to the GHG Fund. Alternatively, would the PSCO merely report to the flag State for it to take the necessary action? On reflection, it appears that appropriate Port State Control financial and control processes would need to be established; this discussion merely highlights one of the issues common to all proposals with respect to dealing with non-compliant circumstances.

Availability of skilled human resources

13.106 Additional human resources may be required by flag States and recognized organizations to perform the tasks of verifying and approving ships' EEDI values. The skill sets required would be similar to those required for the application of the mandatory EEDI through MARPOL Annex VI.

13.107 Appropriately qualified and trained controllers or auditors to audit the above certifiers and limit fraud are also likely to be needed, given the significant financial value of an existing ship being certified as an efficient ship.

13.108 Improved or adaptive EEDI monitoring will require new skills and audits which will take time to implement world-wide. This may be complicated to ensure consistent standards everywhere and it may take longer to put into place than the simple implementation of the scheme.

Compatibility with national law

13.109 Consideration may need to be given as to whether the financial aspects of the proposal might require the 'active' involvement of public authorities, especially in relation to the correct, timely and proper transfers into and out of the Fund.

13.110 In some jurisdictions a variable fee related to efficiency of existing means of transportation (in this case ships) may be against national law, as it may discriminate older vessels against newer ones. Even though some countries may have implemented a fixed fee that relates to vehicle efficiency, such as engine size with respect to road vehicles, this would not imply that the same treatment would follow for a system that may vary its impact based on a ship's varying energy efficiency over time.

13.111 In some jurisdictions a legislation that would effectively charge consumers efficiency-dependent fees for goods that they purchased in the past, may also not be allowed on the grounds of the legislation being retrospective (i.e. that this type of fee was not in place when they purchased the goods). Again, this is an issue of harmonization for the proposal and this cannot be seen as a unique or special concern for this proposal.

Sovereignty implications

13.112 Revenue collected within a country may be subject to sovereign decision(s) on its appropriation/hypothecation. Decisions on the level on the fees charged and transferred to an international Fund could be seen as infringing sovereignty. Both these issues need to be discussed and resolved internationally in the context of international harmonization, which is necessary for all proposals.

13.113 Agreeing a global efficiency standard and implementing credits, fees or charges related to it may be challenged on sovereignty grounds and therefore they will need to be accepted internationally. However, acceptance by IMO may overcome this challenge.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

13.114 A ships EEDI value is a certified value and thus readily available to ships, flag State administration and PSC. Ships that comply with the stipulated standards would only need to present a valid certificate issued by a qualified authority. Those ships that fail to meet the standards applicable to a given vessel type and size would need to record fuel consumption (and pay the fee). No regulation exists today prescribing how to record fuel consumption.

13.115 Ship operators have to maintain procedures to calculate and control the payment of fees for non-compliant ships. With the inherent stability of the proposal it is considered rather trivial however some sort of auditing ships' consumption values would be required to ensure smooth operation of the fleet.

Additional workload onboard

13.116 Uptake of EEDI-relevant efficiency improvement measures may add to the workload onboard. Depending on the level of uptake and type of measures, maintenance may increase.

13.117 Many EEDI relevant measures are however static in nature – that goes for hull appendages to improve propeller flow as well as lowering of ships' rated propulsion power.

13.118 It is however possible that active efficiency improvement measures would be selected. Such measures would ultimately generate a higher workload onboard.

13.119 Consistent with the assessment of other proposals the Expert Group has estimated the additional workload cost onboard to be $0.4 billion or about five per cent of the gross cost. For this proposal the additional cost element becomes sizeable and may influence the balance of compliance with the standard versus paying the non-compliance fee.

13.120 This proposal does however not drive operational behaviour beyond the natural driver of the fuel price, and there are thus no additional work attributed by such measures.

Additional economic impact for individual ships and the shipping industry

13.121 The proposal ensures that existing ships would be forced to adopt emission reduction technologies or add an additional financial burden to the shipowner. The proposal will thus make sure that a mandatory EEDI scheme for new ships would not allow existing ships to operate under different market conditions in terms of speed and application of efficiency improving technology.

13.122 In that sense the system may be characterized as maintaining a balance in the competitive position between new ships and ships built prior to adoption of the propose scheme.

13.123 The economic impact of the proposal is limited compared to other MBM proposals as it only applies to existing ships. The main impact is more likely to be on investment decisions for new ships by eliminating the distortive element of design restrictions associated with a mandatory EEDI regulation for new ships only.

13.124 In this respect it is also important to note that charges incurred by some ships under the VES are not related to fuel consumption in general, but is limited to ships failing to meet a performance standard. Recognizing that the charge does not apply to all ships it may be difficult for shipowners to pass on the cost to both charterers and cargo owners.

13.125 Furthermore, ships failing to meet a set standard expressed by a certified EEDI may well find its way into charter party contract, adding a further incentive element to shipowners.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for new IMO instrument

13.126 Assuming there is a political will to start substantive work on the development of this proposal in the near future it appears possible that a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

13.127 A GHG Fund Administrator will need to be established and maintained. Its tasks would include:

.1 to receive, record and monitor information from ships and/or bunker suppliers;

.2 acknowledge receipt of paid fees from non-compliant ships;

.3 maintain and allocate revenue;

.4 maintain a ship-specific and/or bunker supplier registry;

.5 monitor ships' purchase of bunker fuel and payment of GHG contributions and notify parties of specific ships in case of any suspected non-compliance; and

.6 submit an annual report.

Role of flag State

13.128 Further discussion will be required regarding the most appropriate administrative entities to regulate and oversee the Scheme.

13.129 However, it appears that there would be additional work for a flag State in liaising with the GHG Fund Administrator if enforcement actions are required to be taken in cases of evasion/fraud by "non-compliant" ships flying its flag.

13.130 Detailed consideration will also need to be given to how the vessel efficiency score will be assigned by the flag State (assuming this task is attributed to this stakeholder).

Role of port State

13.131 In many respects port States will enforce the VES in the same manner as many other IMO instruments, though these activities will largely be restricted to documentation checks.

13.132 It will be necessary to consider carefully the role of the Port State Control Officer in any further discussion on the most appropriate administrative entities to regulate and oversee this scheme. However, there would be a new role for port States if non-compliance ships have to make payment through the port State to meet the scheme's requirements. This would involve the collection, banking and subsequent transfer of collected funds to the Fund Administrator. Accounting and auditing would pose additional control provisions for the port State, which traditionally are functions beyond those undertaken by the port State.

13.133 As discussed above, details of enforcing compliance for ships flying the flags of non-Parties needs further discussion in order to address the issue of scheme avoidance.

Role of recognized organizations

13.134 It is anticipated that Recognized Organizations might be authorized to act on behalf of Administrations, in as similar way as allowed in other IMO Conventions. In this regard, it is noted that most recognized organizations would probably have to acquire new skill sets and additional training would have to be undertaken.

Survey, Certification and other means of control

13.135 New certification would be required for existing ships to denote their efficiency values, and the degree of deviation from the average efficiency of the respective ship type/class.

13.136 Also, changes will be needed to the Bunker Delivery Note to indicate if any fees related to deliveries to "non-compliant" ships had been paid.

Involvement of other authorities (e.g., Treasury)

13.137 Possible involvement of many other national authorities other than maritime Administrations (e.g., Government treasury, finance, anti-fraud and environment departments) appears to be very likely, especially in the case of Option 1.

14 A FURTHER OUTLINE OF A GLOBAL EMISSION TRADING SYSTEM (ETS) FOR INTERNATIONAL SHIPPING – NORWAY (MEPC 60/4/22)

FOCAL POINT SUMMARY OF THE PROPOSAL

Introduction

14.1 The Global Emission Trading System (ETS) for international shipping responds to the need for **precise emission control** through the establishment of a cap on total emissions from the sector, and at the same time provides for access to the most **cost effective emission reduction measures to meet the cap**. Hence, more emission reductions can be achieved with the invested capital. The global system meets the principles of the IMO, as well as it provides **a Fund** which will **assist developing countries** to address their needs in their response to Climate Change. **No allocation of emissions** to Parties, or to individual ships is needed. The proposal will allow shipping to continue to provide energy efficient services for the growing world trade.

Brief outline of the proposal

14.2 It is proposed that States develop the global ETS for international shipping in a **new legal mechanism under the auspices of the IMO**. A Cap on the total emissions of the sector would be part of the system, as well as a target year (commitment period).) **Ships,** to which the system applies, would get **clear and simple requirements**. They need to register and have an account in an international ETS registry and **acquire emission allowances to be periodically surrendered**. The amount of allowances would have to correspond to the ship's CO_2 emissions. Hence an annual emission report needs to be submitted to the Administration/RO for approval.

14.3 The system follows the **traditional and robust way of regulating shipping**. Through a survey and certification regime the Flag Administration/RO will ensure that ships comply at the time when the ship is required to be in a balance. Ships need to **keep record of their bunker consumption**. Port State Control would be able to control both of these elements according to well established procedures.

14.4 The emission allowances would be auctioned (sold), and put on the market by an international entity established by the instrument. **Ships would have easy access to the emission allowances at a market place**. They would in addition have access to other UN emission credits such as those of other regulated sectors and to CDM projects in developing countries. Hence, shipping will always have access to emission allowances. At the same time the system ensures that the requirements for ships can be met through the cheapest reduction measures. While the shipping sector can contribute effectively to combat climate change with a tool that provides for control of the emissions, it can still grow further and take advantage of the most cost effective measures.

14.5 The system includes an **exemption clause** which can be used to exempt voyages to **some developing countries** such as SIDS/LDCs. Such exemptions must be approved by the Organization and not lead to carbon leakage.

14.6 **A Fund** would be established by the auctioning of emission allowances. Since the quotas would be put on the market by an international entity, revenues would go directly to that entity. The GHG Fund would be administered by the International entity which would be under the control of the Parties to the system. The GHG Fund can be used for **climate change mitigation and adaption purposes in developing countries** as well as technical cooperation activities under the IMO framework, but the proposal acknowledge that this topic will need be thoroughly discussed among all Member States at IMO.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

14.7 The Global Emissions Trading System for International Shipping would set a sector-wide cap on net emissions from international shipping and establish a trading mechanism to facilitate the necessary emission reductions, be they in-sector or out-of-sector. In addition the auction revenue (named as 'fund' in MEPC 60/4/22 and in this document referred to as remaining proceeds) would be used to provide for adaptation and mitigation (additional emission reductions) through UNFCCC processes and R&D of clean technologies within the maritime sector.

14.8 The sector-wide cap on net emissions would for the first commitment period be set by the Conference which adopts the (ETS) Convention, and for the succeeding commitment periods would be set by the Parties to the Convention. A number of allowances (Ship Emission Units) corresponding to this cap would be released into the market each year. It is proposed that the units will be released via auctioning processes. Ships would be required to surrender one Ship Emission Unit, or one recognized out-of-sector allowance[23] or one recognized out-of-sector project credit[24] for each tonne of CO_2 they produce.

14.9 Limiting the number of Ship Emissions Units to the level of the net emission cap, while allowing for use of out-of-sector allowances and project credits, would ensure that emissions from international shipping beyond the limit set by the cap are offset using project credits or allowance from other regulated sectors. For example, if the cap was set at 800 million tonnes for a particular year, one of two conditions would need to be met. Either, total emissions from international shipping would need to be lower than the cap, or emissions project credits or allowances generated in other markets would need to be used to offset in-sector emissions exceeding the cap.

14.10 MEPC 60/4/22 envisages that Ship Emissions Units would be partially or fully auctioned, generating a substantial fund referred to in this report as remaining proceeds which could be used for mitigation and adaptation activities under the UNFCCC, and R&D of clean technologies within the maritime sector.

14.11 A variation of the scheme proposed as an interim arrangement would allow ships to surrender only a portion of Shipping Emission Units for example, for 25 % of their emissions. Under this arrangement net emissions from international shipping would be limited to a level higher than in the case of full auctioning. This is discussed in the section on certainty of reductions, below.

14.12 The Norwegian ETS proposal would apply to all CO_2 emissions from the use of fossil fuels by ships engaged in international shipping above a certain size threshold. The proposal also indicates that limited exemptions could be provided for specific voyages to small island developing states.

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23 An out-of-sector allowance is created under an emissions trading scheme and it entitles the holder to emit one tonne of GHG under that scheme. For example, an allowances issued under the EU ETS would be an out-of-sector allowances.

24 An out-of-sector credit represents emissions reductions achieved under a project based mechanism such as the CDM.

14.13 The Norwegian ETS proposal will add a carbon price on top of the base fuel price which would increase the volume of emission reduction opportunities that are cost effective for ships. This may drive some in-sector reductions in response to the carbon price. The uptake of these emission reduction measures in the fleet will be subject to considerations about non-price barriers (see common concept 3, Non-price barriers).

14.14 Under the Norwegian ETS proposal, ships would be required to collate and report data on their CO_2 emissions; it may be the case that the visibility of this emission data to shipowners may provide an additional stimulus to the adoption of measures that are cost-effective. In addition, it is likely that shipowners would pay the cost under the Norwegian ETS proposal, and given their control over investment in the ship, this could increase the likelihood of a response to the carbon price.

14.15 In addition, if remaining proceeds are used for R&D programmes this may reduce the cost of existing technologies or bring forward new ones, leading to additional in-sector reductions.

14.16 Decisions on how the MBM is linked to other emissions trading schemes or crediting mechanisms will have a significant bearing on the carbon price and hence on the volume of emission reduction opportunities that are profitable for ships covered by the MBM.

14.17 MEPC 60/4/22 envisages a fully open ETS with carbon project credits and allowances from other regulated schemes being recognized for compliance in the Norwegian ETS proposal and Ship Emissions Units being made available for compliance in other emissions trading schemes.

14.18 In relation to project credits and allowances from other schemes, linking can occur in a number of ways:

.1 Linking via CDM credits, by allowing the use of CDM project credits for compliance in the Norwegian ETS proposal. Under this arrangement CDM project credits would act as the balancing price mechanism between the Norwegian ETS proposal and any existing and future ETS that accepts CDM project credits. There are no limits in the CDM rules preventing CDM project credits from being used in an open shipping ETS.

.2 A way of linking with other ETS so the Norwegian ETS proposal accepts allowances from other ETSs. An example would be EU ETS which does not restrict the outflow of EU Emission Allowances.

.3 Direct two way linking with other ETS. The Norwegian ETS proposal could allow Ship Emissions Units to be used for compliance in other ETS but a reciprocated direct linking would be contingent upon a decision by the other ETS to accept Ship Emissions Units for compliance. For example, this could involve linking with the EU ETS by allowing the use of EUAs for compliance in the Norwegian ETS proposal and for Ship Emissions Units to be used for compliance in the EU ETS.

.4 No linking, because the Norwegian ETS proposal does not choose to accept other project credits or allowances for compliance. This is not envisaged as an option in the Norwegian ETS proposal.

14.19 Allowing allowance units from other ETS or CDM CERs (one way linking) to be used for compliance purposes in the Norwegian ETS proposal would set an upper limit on the carbon price within the Norwegian ETS proposal as the price of Ship Emission Units would not exceed the price of project credits or allowances purchased from other schemes. The level of 'one way linking' from the CDM through to any international units such as EUA and Sectoral credits as envisaged under the discussion in UNFCCC would affect the Norwegian ETS carbon price. For discussion on carbon price see common concept 4, Carbon Price.

14.20 Providing for fully open linking between schemes (a two way flow of project credits and allowance from other schemes as well as the use of Ship Emission Units in other emissions trading schemes) would result in a uniform carbon price across linked schemes and in general would deliver the cheapest reductions across the schemes involved.

14.21 Since the Norwegian ETS is proposed to be an open scheme the carbon price would be heavily influenced by costs of reducing emissions in other sectors. Based on middle range carbon and fuel prices assumptions used by this Expert Group, this price is likely to represent a moderate percentage of total fuel costs (6 per cent in 2020 and 9 per cent in 2030). Whilst the increase in fuel prices arising from a carbon price would be modest, the extent to which emissions reduction opportunities are cost effective for ships is a function of fuel price.

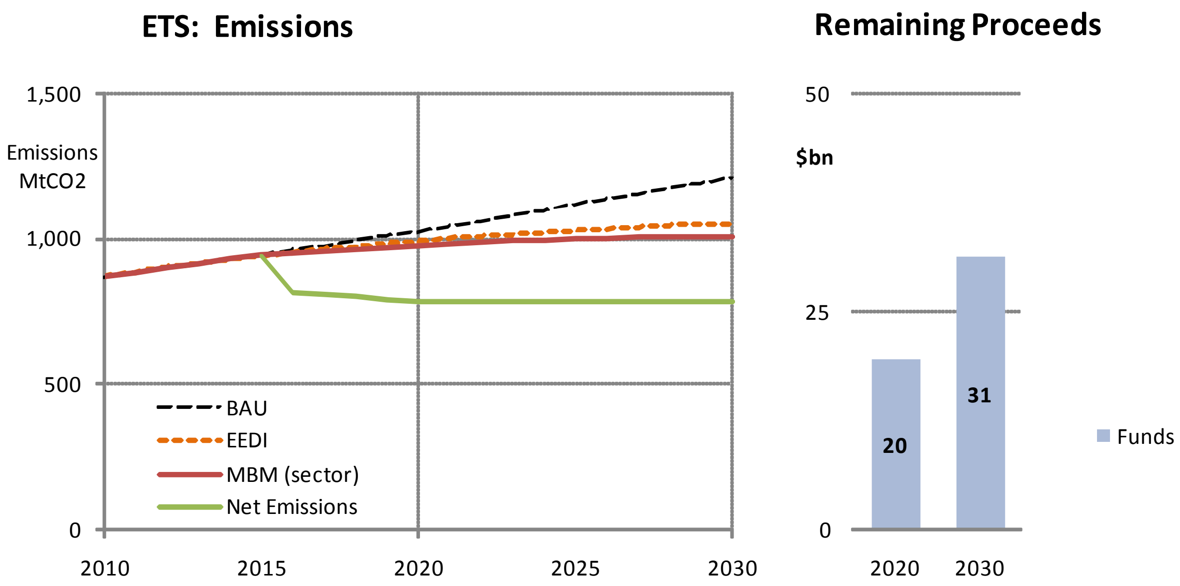
14.22 The Norwegian ETS intends to recognize allowances from other ETS and project credits from UNFCCC mechanisms such as Certified Emission Reductions (CER) generated through the Clean Development Mechanism (CDM). This should provide ships with direct access to out-of-sector reductions to meet compliance obligations and to offset emissions that exceed the net emission cap (in relation to future credit availability see Common concept 5, Future availability of international emission project credits). In general, ships would access out-of-sector reductions where the cost of a project credit or allowance (note in an open linked scheme the price of Ship Emission Units would be the same as allowances from linked schemes) is less than the cost of implementing technical or operational measures to reduce emissions. However, as noted non-price barriers as identified in IMO 2nd GHG study could result in some cost-effective within sector reductions being overlooked in preference for more expensive out-of-sector reductions.

14.23 At the sectoral level, the extent to which ships would need to access out-of-sector reductions would depend on the extent to which emissions from international shipping exceed the cap. Regardless of where the reductions occur, the Norwegian ETS is designed to ensure that each tonne of emissions from international shipping is either accounted for by a Ship Emission Unit, or offset by reductions in other sectors. These out-of-sector reductions could be either project based – in the case where a project credit is surrendered for compliance – or delivered by reducing the number of allowances available in a linked ETS – in the case where an allowance from another ETS is surrendered for compliance, as the surrender of that allowance in the Norwegian ETS means that less GHG can be emitted under the linked scheme.

14.24 The Norwegian ETS has the potential to deliver further out-of-sector reductions (projects, in addition to those associated with project credits or allowance acquired by the industry to achieve the net emission cap) through the use of remaining proceeds on mitigation. For example, a portion of remaining proceeds could be used for purchasing and retiring additional CERs, for REDD+, or for funding mitigation actions in developing countries that are not delivered via the carbon markets. The extent to which these additional out-of-sector reductions are accessed would depend on decisions about how Ship Emission Units are released into the market (i.e.: full auctioning, partial auctioning or free allocation) and decisions taken on the use of auction revenues (remaining proceeds). Remaining proceeds used for adaptation activities would not deliver emissions reductions, but would be of benefit to developing countries by improving their resilience to the impacts of climate change.

In-sector and out-of-sector reductions

14.25 In-sector and out-of-sector GHG emissions reductions and costs, as well as the remaining proceeds from the auction revenue were modelled for the Norwegian ETS under different targets, growth rates, carbon prices and fuel prices.

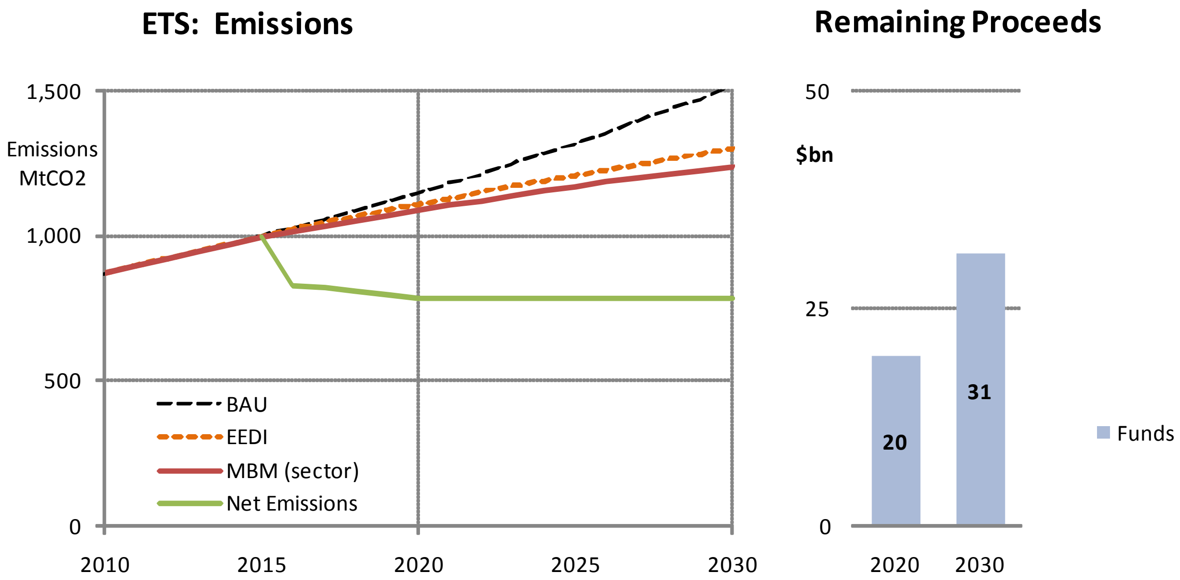


The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. These are referred to as the term 'fund' in MEPC/60/4/22. Remaining proceeds collected from auctioning allowances under the Norwegian ETS are proposed to be available for adaptation, mitigation and R&D. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated to be **783 Mt in 2020 and 2030**.

Figure 14-1: Modelled emissions and remaining proceeds under the Norwegian ETS for the B2 growth scenario with a 10% cap, medium carbon price and reference fuel price

14.26 Figure 14-1 and Figure 14-2 illustrate modelling for each growth scenario assuming a 10 per cent cap on net emission, a reference fuel price, and medium carbon price. These scenarios are referred to below as the B2 and A1B reference scenarios for the Norwegian ETS. The line graphs show business as usual emissions (black line), and for illustrative purposes the expected emissions if a mandatory EEDI were to be implemented at medium stringency are shown by the red dashed line. It is important to note that the reduction in emissions from the EEDI are not to be attributed to the Norwegian ETS and would only occur if the EEDI is implemented on a mandatory basis. In-sector emissions following the effect of the price signal (from having to purchase emission allowances or project credits) is represented by the red line (MBM) and finally the green corresponds to the cap (due to out-of-sector emission reductions).

14.27 The area between the red line and the cap represent out-of-sector emission reductions that must be purchased by international shipping. Auction proceeds (funds) from the Norwegian ETS would not be consumed in delivering these reductions, and could be used for a range of climate related purposes including adaptation, mitigation, R&D and other issues.



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any funds explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. These are referred to as the term 'fund' in MEPC/60/4/22. Remaining proceeds collected from auctioning allowances under the Norwegian ETS are proposed to be available for adaptation, mitigation and R&D. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation, in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation was calculated to be **783 Mt in 2020 and 2030**.

Figure 14-2: Modelled emissions and remaining proceeds under the Norwegian ETS for the A1B growth scenario with a 10% cap, medium carbon price and reference fuel price

14.28 Under the low growth B2 growth scenario achieving a 10 per cent cap requires reductions below BAU of around 20 per cent (210 Mt) in 2020 and 30 per cent (270 Mt) in 2030. Greater reductions are required to meet this target under the higher growth A1B scenario with 322 Mt of reductions required in 2020 and 512 Mt reductions required in 2030.

14.29 The design of the Norwegian ETS means the 10% reduction required on BAU 2007 must be adhered to as there would be a limited number of Ship Emission Units (representing the allowed emissions 'cap') and any emissions beyond the cap would need to be offset through the purchase of project credits or other allowances permitted by the Norwegian ETS, by the shipping industry.

14.30 The scenarios above do not include any phase in period, but if a five year phase in period were implemented whereby ships were initially required to surrender 20 per cent of the agreed 'cap' and this requirement increases by 20 per cent a year, the effect of this phase in period would be to deliver 10 per cent less emission reductions over the period to 2030 than if ships were to surrender 100 per cent of the agreed 'cap' from the offset.

14.31 In meeting the cap, the Norwegian ETS, would deliver some in-sector reductions due to its price signal. Under the modelled reference scenarios for the Norwegian ETS shown above, these represent around six to eight per cent of the MBM reductions in 2020 and 12 to18 per cent in 2030 (depending on the growth scenario).

14.32 Key model results for these reference scenarios are also shown in Table 14-1. The term 'remaining proceeds' is used by the Expert Group to refer funds generated by the MBM that are intended for mitigation, adaptation and R&D.

Table 14-1: Modelled emissions and emission reductions under the Norwegian ETS for the B2 and A1B growth scenario with a 10% cap, medium carbon price and reference fuel price

	Year	B2	A1B
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	783	783
	2030	783	783
MBM in-sector reductions (Mt)	2020	17	19
	2030	49	60
MBM out-of-sector reductions (Mt)	2020	193	303
	2030	221	452
MBM reductions (% of BAU)	2020	20%	28%
	2030	22%	34%
MBM in-sector reductions (% of MBM reductions)	2020	8%	6%
	2030	18%	12%
Potential for supplementary out-of-sector reductions (Mt)	2020	783	783
	2030	783	783

The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated by a proposal to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. The term 'remaining proceeds' refer to the term fund as set out in MEPC/60/4/22. Remaining proceeds collected from auctioning allowances under the Shipping ETS are proposed to be available for adaptation, mitigation and R&D. Whilst it is highly unlikely that 100 per cent of these funds would be used for mitigation in order to compare across distinct proposals the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these funds for mitigation is shown.

14.33 In absolute terms, in-sector reductions under the Norwegian ETS are the same as for other price based MBMs at the equivalent carbon price. A higher carbon price (in the linked carbon market, and hence in the Norwegian ETS) would shift a greater portion of reductions from out of the sector to in-sector. For example, under the modelled scenarios, in-sector reductions would be 50% higher in 2020 and 100 % higher in 2030 for the higher carbon price scenario.

14.34 The modelled in-sector reductions are indicative only, due to the same uncertainties about how ships would respond to a carbon price signal that are discussed above for several of the other MBMs.

14.35 The effect of a higher or lower cap (e.g., of 20 per cent or at 2007 levels, not shown) is not subject to these same uncertainties. Higher or lower caps would be met and would result in no difference in the amount of in-sector reductions, as the carbon price would be independent of the cap if the scheme were linked.

14.36 The underlying fuel price could also affect the portion of reductions achieved in-sector, but would not change the overall reductions achieved by the MBM. Higher fuel prices would mean that some low cost emission reduction opportunities would be taken in response to fuel price, meaning that fewer reductions would be needed to be purchased from outside the sector in order to achieve the cap.

14.37 The range of responses observed under all modelled scenarios is shown in Table 14-2. The term 'remaining proceeds' is explained in the caption to Table 14-1.

Table 14-2: Ranges for emission reductions observed when modelling the Norwegian ETS in 2030

Key elements	ETS	
	High	**Low**
MBM in-sector reductions (Mt)	114	27
MBM out-of-sector reductions (Mt)	539	90
MBM reductions (% of BAU)	40%	13%
MBM in-sector reductions (% of MBM reductions)	51%	7%
Remaining proceeds ($billion)	87	28

Certainty of reductions

14.38 In general, there is a high degree of certainty that the Norwegian ETS proposed by MEPC 60/4/22 would reduce net emissions from international shipping to the level of the cap as the rules of the scheme place a strict quantitative limit on the net emissions from international shipping. The apportionment of reductions between within sector and out-of-sector is generally uncertain as it depends on the price and availability of out-of-sector allowances and project credits. In general, the Norwegian ETS provides for reductions to be achieved where most cost-effective. This is inherent in the design of the scheme as ships would have the choice to reduce their emissions (in-sector) or purchase and surrender project credits or emission allowances for compliance.

14.39 Cost would be a significant factor in this choice, as noted; however, non-price barriers will result in a deviation from this idealized behaviour and are likely to result in more expensive out-of-sector reductions being pursued at the expense of cheaper in-sector option. This would affect the location of reductions and the overall costs of the scheme but not the total quantum of reductions achieved.

14.40 As with the GHG Fund proposal, the Norwegian ETS relies on project credits or allowances from outside the shipping sector and therefore considerations about the future supply of project credits apply to the Norwegian ETS (see common concept 5, Future availability of international emission project credits).

14.41 If ships are required to surrender only a portion of Ship Emission Units, which has been raised as an alternative interim arrangement, effects would be observed on the price of allowances and emissions reductions. Under this formulation there would be a different type of cap on net emissions compared to the case of full auctioning. In this case the cap would guarantee that a target percentage of emissions below business as usual would be offset, and the percentage could be chosen to approximate a cap of absolute emissions but the rules of the scheme would not guarantee that net emissions from international shipping would be limited to any particular level. If a particular level of absolute emissions was the goal, scheme rules and revenue use policies would need to be designed accordingly. These have not been outlined in detail in the Norwegian ETS. For example, if ships were required to account for 25 per cent of their emissions, the carbon price would be approximately 25 per cent of the price of out-of-sector allowances or project credits.

14.42 The integrity of the cap on net emissions under the Norwegian ETS depends on robust monitoring, reporting and verification of both emissions from international shipping and the out-of-sector reductions, as well as on robust processes for managing the additionality of out-of-sector project reductions.

14.43 Under the Norwegian ETS, the accuracy and transparency of emission calculations by ships are critical to ensuring that the cap on net emissions is achieved. Decisions on monitoring, reporting and verification processes have not been outlined in detail in the proposal but will be critical to MBM integrity.

14.44 Out-of-sector emission reductions to be achieved through the Norwegian ETS are intended to occur through internationally regulated markets such as the CDM and national or supranational ETSs such as the EU ETS. Issues relating to monitoring reporting and verification of project credits from CDM or other offsetting schemes have been discussed under the GHG Fund proposal and these same issues apply to the Norwegian ETS. Decisions to link a shipping ETS to national or supranational ETS would need to be made considering the adequacy of monitoring, reporting and verification requirements of those schemes.

Cost-effectiveness of the proposed MBM and its potential impact(s) on trade and sustainable development

The cost-effectiveness of the proposed MBM

14.45 Table 14.3 shows gross costs under the reference scenarios for the Norwegian ETS. This is apportioned into two components. Firstly, costs of emission credits, which in the case of the Norwegian ETS are purchased directly by the shipping industry. Secondly, the net fund represents revenues from auctioning Ship Emission Units. The table shows no rebates or refunds to the shipping industry since there are no such mechanisms proposed for the Norwegian ETS.

Table 14-3: Modelled costs under the Norwegian ETS for the B2 and A1B growth scenario with a 10% cap, medium carbon price and reference fuel price

	Year	B2	A1B
Financial: gross costs ($ billion)	2020	24	27
	2030	40	49
Refunds/rebates ($ billion)	2020	0	0
	2030	0	0
Emission credits, various ($ billion)	2020	5	8
	2030	9	18
Funds ($ billion)	2020	20	20
	2030	31	31
MBM in-sector reductions (Mt)	2020	17	19
	2030	49	60
MBM out-of-sector reductions (Mt)	2020	193	303
	2030	221	452
Cost of reductions ($/tonne CO_2 abated)	2030	148	96
Maximum cost-effectiveness potential ($/tonne CO_2)	2030	38	38

14.46 One significant source of uncertainty associated with costs of achieving reductions relates to the future state of the carbon markets. As noted in common concept 4, Carbon price, the state of the project carbon market will influence the carbon price.

14.47 Similarly, the development of additional cap and trade emissions trading schemes provides opportunities for linking, which increases access to emissions reductions opportunities and may lower the overall cost of achieving reductions. However, carbon market prices are expected to be higher if there is, in general, strong action to tackle climate change particularly amongst the large economy countries.

14.48 Indirect cost consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in Port State Control Organizations and not least in operation of the Fund mechanism and the central auctioning facility. These costs are elaborated below.

14.49 The total direct cost for the industry in the A1B scenario is estimated to be $49 billion in the year 2030 of which $18 billion is used to offset emissions down to the cap and further $31 billion of funds are generated for other purposes.

A1B: Reference fuel price, 2030, medium carbon price

The cost-of reductions is estimated to be 96 $/tonne CO_2 abated.

The amount of funds generated for other purposes is $31 billion

The maximum cost-effectiveness potential of the proposal is 38 $/tonne CO_2

Administrative Costs (including any central administrative requirements)

14.50 Activities that will incur administrative costs include:

.1 Administrative Body, as noted in the common administration and legal concerns;

.2 establishment and maintenance of the ETS registry, including staffing and infrastructure costs;

.3 establishment and administration of an emission trading market (an open system requires setting up rules and procedures to ensure compatibility with emission trading schemes in other sectors);

.4 registration of ships;

.5 selling (auctioning) of emission allowances;

.6 purchase and surrender of emission allowances;

.7 Fund management and disbursement;

.8 Record Keeping, as noted in common concept 11;

.9 Audit of International Body, as noted in common concept 11; and

.10 enforcement (survey, certification, approval of emission reports and inspection) by State Parties.

14.51 The additional administrative costs for ships will stem from reporting fuel use and acquiring and surrendering allowances. As it is only required to surrender the allowances and report emissions once a year, there may be an additional degree of administrative burden for ship managers. Actors may need to closely monitor the market throughout the year and act to secure the best available pricing for their emission credits. For example, the additional costs of keeping an emissions record book are small, since it is essentially the data from the Oil Record Book on fuel consumption combined with the appropriate emissions factors.

14.52 A report on the amount of fuel used is a summation of the Bunker Delivery Notes and requires very little additional work. If such a report needs to be verified by an independent verifier, additional costs would occur.

14.53 The costs may be comparatively higher for smaller operators; however, these higher costs for smaller operators might be mitigated by pooling their allowances. Also, as is clear from experience in the EU ETS, small operators tend to trade less often, thus mitigating their compliance costs. Smaller shipping companies may rely on professional traders. Although such traders are currently not yet operating in the maritime field, it can be assumed that they would once a market is established.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

14.54 In assessing the stability of the system the Expert Group found that the fact that industry players would have to purchase credits at the open market for emissions above the cap added some uncertainty.

14.55 The auctioning of credits to cover emissions below the cap is also subject to a price setting mechanism that may be difficult to predict – although it appears to be close to the prevailing carbon price.

14.56 Carbon prices are known to be volatile. This is the main reason for rating the cost predictability as medium-low.

Credit for early action

14.57 The proposal places an additional price element on the fuel cost. Any measures applied at any time – before or after entering into force – would thus generate a benefit.

14.58 ETS is rated in line with other MBM proposals featuring the same cost-additionality aspect such as the GHG Fund proposal. The rating is neutral.

Availability of technological and operational measures for CO_2 emission reduction

14.59 The ETS proposal recognizes all technical and operational measures that can limit the fuel consumption of a ship.

14.60 The proposal acts as a relatively high driver for uptake of in-sector measures due to the carbon price tag on every tonne of fuel consumed. This factor would trigger more advanced abatement technologies to be applied – especially if in combination with a stringent mandatory EEDI regulation.

14.61 The open nature of the proposal ensures however that only cost-effective measures are being applied.

Practical feasibility of implementing the proposed MBM

Development time for new IMO Instrument

14.62 Assuming there is a political will to start substantive work on the development of this proposal in the near future it appears possible that a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

14.63 Apart from the internal time needed in the development of the IMO-related instrument, time would also be needed to further develop the details of the maritime ETS.

14.64 In further development of the Norwegian ETS proposal, consideration would need to be given, regarding the setting of a cap, as well as considerations common to many of the proposals such as the establishment of the requisite administrative body and linking to other schemes, application to non-party vessels, and other elements, *inter* alia, to considerations outlined in annex 2 of MEPC 60/4/22.

14.65 It is noted that during the proposed phase-in period, that is for the first two years after entry-into-force, only emission reporting would be required, and this could facilitate an acceleration of the implementation schedule, as the trading element could be finalized after the proposed instrument enters into force. However, noting the innovativeness of this proposal in the maritime industry, some States may be reluctant to accede to an instrument that is not fully finalized in all respects at the time they consider ratification (in line with the practice that Some States have the tradition to await the finalization of all relevant guidelines until they ratify a new mandatory IMO instrument). The Focal Point has noted that guidelines could be developed in parallel with the legal text, although obviously finalization would have to be after the legal text is finalized.

Experience from similar schemes

14.66 The United States established SO_X and NO_X emissions trading schemes in the 1990s, e.g., US SO_2 "Acid Rain" Trading began in 1995; California "RECLAIM" SO_2 & NO_X began 1994. It should be noted, however, that the emissions trading systems that have been in place in the U.S. are closed systems with an absolute cap on emissions among regulated entities.

14.67 Several other smaller systems exist or have existed. For example, Denmark and the United Kingdom (2002-2006) have introduced trading systems for CO_2 emissions in anticipation of the EU ETS (see below). The Dutch government implemented NOx emissions trading for large stationary installations in 2005. The Chicago Climate Exchange was started in late 2003 as a voluntary GHG trading system.

14.68 Still within the environmental context, but with a broader scope, more examples are available.[25] [26]

14.69 There is evidence that closed cap-and-trade schemes are effective in reducing emissions and are more cost-effective than direct regulation[27]. Open emission trading systems have greater uncertainty in obtaining the desired reductions due to the fact that out-of-sector projects may fail to produce true additional reductions (i.e. reductions that would not otherwise have occurred). The proposed trading system also relies on obtaining reductions through out-of-sector projects for any emissions above the cap. Reductions generated through out-of-sector projects contribute to reduced emissions globally, however they do not actually reduce emissions generated from shipping, but offset them.

14.70 The issue whether price based or quantity based instruments are more effective and efficient in reducing emissions is still subject to debate in the academic literature. Recently, studies have drawn attention to the fact that quantity-based instruments may be better at inducing innovation (Weber and Neuhoff 2010; Laing and Grubb 2010). Other studies conclude that price instruments can be more efficient than quantity-based instruments for addressing GHG emissions.[28]

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[25] See for example: European Environment Agency, 2006, Using the market for cost-effective environmental policy; Market-based instruments in Europe.

[26] See for example: *Serre, C.* (2008) Tradable permit schemes in environmental management: Evolution patterns of an expanding policy instrument, Öko-Institut e.V.

[27] Tietenberg, 2006, Emissions Trading: Theory and Practice, Washington D.C.

[28][MBM-EG references 2.18, 2.19]

14.71 A current and notable system that does operate on a regional, international basis is the EU ETS. This scheme began operation on 1 January 2005 and currently covers more than 10,000 installations and approximately half of the EU's CO_2 emissions, being the world's largest company-level "cap-and-trade" system for trading in emissions of CO_2. All 27 EU Member States participate fully in the scheme as well as Norway, Iceland and Liechtenstein. It is noted that the EU ETS, while international, is being implemented among a number of countries that are engaged in a broader economic and political co-operation. The system currently covers CO_2 emissions from large emitters in the power and heat generation industries and in selected energy-intensive industrial sectors.

14.72 Experience to date from the EU ETS shows that most companies do not actively engage in trading, but hold their allowances and only sell or buy a limited amount once a year when they have to report emissions and surrender allowances (KfW/ZEW, 2009).[29] This limits their trading costs.

14.73 The number of participating ships in the maritime ETS may reach circa 50,000. However, it should be noted, that in most cases shipping companies would assume the responsibility for acquiring and surrendering allowances, and the number of shipping companies is far smaller than the number of ships.

14.74 The feature of no allocation of emission allowance for individual ships, associated with this maritime ETS proposal, will significantly reduce the complexity of the scheme, as issuing allowances to all ships trading internationally would be a significant administrative challenge.[30]

Ease of implementation and potential for phased implementation

14.75 It is noted that the proponent of this maritime ETS system envisages that it would be the ship that would be regulated, not ports or other entities such as bunker suppliers, and as such, reporting requirements and other obligations would fall upon the shipping company as is normal for IMO instruments.

14.76 The entities which would be allowed to participate in the emissions trading scheme would require careful consideration and debate should the Committee choose to further consider any of the emissions trading proposals. Different players have noted an interest in restricting participation in auctions and the market generally to players within the shipping industry to lessen the risk that large financial institutions and other third parties don't manipulate prices by buying large volumes of available credits. Some have suggested that participation be limited to those operating or owning ships and that credits are limited to some maximum volume derived from ship assets under their ownership or control. These issues require additional consideration and the effectiveness and results of such regulations is a delicate and complex issue. The requirement to ensure that sufficient allowances are available to international shipping so as not to limit its growth would need to be carefully considered as well, and measures developed, given that the proposal calls for an open market.

29 http://www.kfw.de/DE_Home/Service/Download_Center/Allgemeine_Publikationen/Research/PDF_Dokumente_CO2_Barometer/Barometer2009_Internet.pdf_-_Adobe_Acrobat_Professional.pdf

30 The no allocation would avoid all the technical and policy challenges, related to establishing a mechanism to allocate emissions ship by ship. Such a mechanism is typically based on a comprehensive emission reporting and criteria to allocate emissions based on the participant's past emissions, or alternatively on an efficiency index, or a benchmark for the participant.

14.77 The proposal calls for the establishment of a CO_2 emissions baseline, and a procedure to establish the emission baseline is proposed. It is noted that during the proposed phase-in period (i.e. the first two years after entry-into-force), only emission reporting will be required. Thereafter, implementation is proposed through the determination of the total annual amount of Ship Emission Units that can be issued by the ETS Registry. Implementation of this proposal would require, as with other proposals, an effective feedback mechanism on its implementation to maintain the overall aim of lowering emissions.

14.78 An important consideration concerns the availability of carbon credits and CDMs (in existing emissions trading markets and projects) and the question of whether and when other national or regional markets will be established. Indeed, it is possible to view this as a condition precedent to the implementation of the proposal, as it is essential to the fair implementation of the system that there would be sufficient emission credits in a global system, and not purely within the shipping sector itself. Under the existing regulated carbon markets, shipping can readily buy allowances, but those systems are not presently enabled to purchase shipping allowances from the shipping sector; this capacity is not required under this proposal.

14.79 There is uncertainty as to what additional markets may or may not be established, however, there is a relatively long time horizon for the development of these new markets to occur (2020-2050). Having said this, the supply of CDM credits is already very large in principle – in the order of several billions tonnes of CO_2 annually (ECN 2007). This would be more than enough to support an ambitious cap in the shipping sector. However, CDM credits are generated in projects which may have a lead time of a several years. Therefore, care should be taken not to introduce the system too fast. By implementing a phase in a period of two years, and the requirement for a new convention, this condition seems to be met.

14.80 There is also the establishment of the market, especially how a shipping carbon market would operate alongside the open carbon market. The system is described as an open global system, which would allow excess quota to be sold outside the shipping sector.

14.81 Certain known difficulties with quantity instruments appear to have been positively addressed in this proposal, such as establishing a baseline and a target. This is a result of the proposals that the baseline is to be estimated rather than measured, and the target fixed for the entire commitment period (proposed as 10 years) – rather than providing a variable target, e.g., a target that is adjusted annually.

14.82 However, while facilitating the implementation of the system, such an approach may delay the environmental effectiveness when the system is set up. Quantity instruments typically require a reliable emission baseline from which an emission target is established. Consequently, a baseline obtained through estimates may be potentially challenged as not robust enough. However, while not explicitly identified in the proposal, it is noted that the system provides for annual emission reporting once it is established, thus opening a possibility to incorporate adjustments to the baseline and target.

14.83 Therefore, it appears that an appropriate balance needs to be found between the timely implementation of the scheme and the robustness of its emission baseline and the target it relies on.

Enforcement, potential for evasion and avoidance of carbon leakage

14.84 Although the original proposal speaks of 100% auctioning, in discussion and by way of illustration there were considered various models of phasing in increasingly larger amount of auctioning (sale) of SEUs. In the simplest model, it proposes to define a share of the shipping emissions needs to be captured by the system. If it is decided to capture 20% of the shipping emissions in the system, then 20% of the total emissions are put on the market as SEUs, and consequently each individual ship is only required to surrender allowances corresponding to 20% of their emissions. For a phase in period, the remaining 80% of the emissions appears to be simply not included in the system to allow for adjustment by the industry.

14.85 Careful consideration would need to be given to avoid carbon leakage. In particular, the impact of the proposed exemptions would need to be evaluated. Any emissions exempted would not be covered by the scheme, e.g., cargoes destined for LDCs and SIDS.

14.86 The common concept 13, Modal carbon leak, describes a relevant concern of the Expert Group in this section.

14.87 The market for SEUs will have to be set up with similar rules as for existing markets for stocks, futures, commodities, etc. While these rules are designed to prevent illegal actions, they may not prevent all forms of speculation.

14.88 Most MBMs have a relation with the amount of fuel used, bought or sold, and the ETS is no exception. With all these MBMs, fraud is possible in principle by underreporting the amount of fuel and the proposals have to deal with this issue in the next rounds of discussion.[31]

14.89 By way of example, experience from the EU ETS, and other markets, have detected fraud in ETS-type credit trading systems and it is clear that fraud can be experienced in this type of system – as well as in any other. Although it is difficult to draw correlations from examples of fraud in other schemes, it is clear that more complex systems require more complex policing. Effective mechanisms must be in place to prevent, detect and counter attempts of fraud.

14.90 Experiences of fraud or evasion within presently existing credit-trading schemes, or schemes comparable to any MBM being considered, should be taken into account in the development of any proposal, and it may be advantageous to have current examples of anti-fraud measures at hand for the proposal's further development.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

14.91 There are no direct technology transfer needs required under this proposal. Shipowners may wish to improve their ship's technical or operational efficiencies in order to reduce the number of allowances they would need to purchase. While a number of measures or technologies could result in fuel savings for ships, there may be hurdles to adopting such measures or technologies, including long payback periods. There could be a need for technology transfer to help improve ship operational efficiencies.

[31] One way to minimize the scope for fraud would be to require verification of the amounts reported by an independent verifier. CE Delft *et al*. (2009) estimates, on the basis of information from a major RO, that the costs for verification would be less than $10,000 per ship for a system more complex than the system envisaged here.

14.92 The proposal states that Parties would undertake to provide support to other Parties requiring technical assistance to train personnel; to ensure the availability of technology, equipment, and facilities; to initiate joint R&D programmes; and to undertake other actions aimed at the effective implementation of this measure. Parties would also undertake to cooperate in the transfer of management systems and technology for reducing GHG emissions from ships (MEPC 60/4/22, annex 2, article 2).

14.93 The funds raised from the auction of allowances would be used for climate change mitigation projects, programmes, and other activities as a priority, but would also fund R&D activities in the maritime sector to support emission reduction actions in the shipping sector.

14.94 Only Parties to the convention implementing the emissions trading scheme would be entitled to receive funding. Funding could be provided to non-Parties only if there was agreement by all Parties to the Convention.

	Year	B2	A1B
Funds ($bn)	2020	**20**	**20**
	2030	**31**	**31**

14.95 Potential climate financing for developing countries comprise funds as shown in the table above.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC

14.96 Common concept 14, UNFCCC 1 and UNFCCC REVENUE, describe the Expert Group's views on general compatibility with the UNFCCC for this proposal.

Compatibility with Kyoto Protocol

14.97 Common concept 15, Kyoto Protocol, describes the Expert Group's views on general compatibility with the Kyoto Protocol for this proposal.

Compatibility with WTO

14.98 Common concept 16, WTO, describes the Expert Group's views on general compatibility with the WTO for this proposal.

Compatibility with UNCLOS

14.99 Having reviewed UNCLOS no compatibility problems have been identified.

Relations with other climate finance institutions or initiatives

14.100 The relation of the proposal to the Copenhagen Accord is referred to in the proposal. However, from the point of view of developed countries, the proposal does not provide for the payments from or increased costs to their citizens (end-customers) to be recognized. It needs to be further considered if such payments would provide for global action on climate change and could be counted towards the significant funding to be mobilized by developed countries as part of the Copenhagen Accord.

14.101 According to the proposal the returns from auctioning allowances would be diverted to funding projects, programmes, policies and other activities in developing countries related to mitigation including REDD+, adaptation, capacity-building, technology development and transfer, in line with priorities established for funding mechanisms under the UNFCCC.

14.102 The revenue' from auctioning will come from all countries rather than from the developed countries alone. Therefore, careful consideration would need to be given to compatibility with Articles 3, 6 and 8 of the Copenhagen Accord, which relate to the agreement that developed countries alone are to provide climate financing for developing countries.

14.103 At this time it is not certain that the maritime sector would be a structural buyer. Depending on the cap set out for emissions, the sector might turn out to be a net exporter of emission reductions, considering the current largely untapped abatement potential.

14.104 Notwithstanding the above comments, the proposal states that the shipping sector would be likely to need credits from other sectors, including Clean Development Mechanism (CDM)[32] credits. Additional consideration is needed on this relationship with an element of the Kyoto Protocol.

14.105 Given that in the proposal the shipping sector would be a net buyer of emission allowances from other sectors, and furthermore would not be subject to an open emission cap, there may be a possibility that some countries or regions may be unwilling to allow a link to their ETS schemes. Such a link might be considered as an increase in a country's own emission reduction targets or commitments, which underpin their scheme. However, other schemes (national or regional) do not need to recognize the shipping sector to buy allowances. A shipping company can already today on a voluntary basis register at one of the existing market places, and buy emission credits.

14.106 A related issue in need of further consideration is whether or not other systems would accept Shipping Emission Units in the surrendering of allowances in these systems (shipping selling allowances).This would need to be recognized by these other systems, and it is only likely that it will be done if the Shipping Emission Units have any value for these systems. That is up to these other systems to decide, but the likelihood of those systems recognizing Shipping Emission Units would increase if any forthcoming new legal agreement under the UNFCCC addresses the issue. However, the inclusion of emissions from international aviation in the EU ETS demonstrates that such recognition, on a unilateral basis, is possible in principle.

14.107 There are currently some inherent uncertainties regarding future availability of CDM credits (see common concept 5), and, to date, even short-term forecasts have been continually scaled down. However, in this regard, it is noted that CDM is a mechanism under the Kyoto Protocol and the targets adopted in the Protocol expire in 2011. The major demand for CDM credits – the EU Member States and the EU ETS – are likely to reduce their demand post 2012. The supply of CDM credits may go up, but it may go down as well. However, it is noted that the demand from shipping may be significant, considering the possible emission growth in shipping (as per the Second IMO GHG Study 2009) and the cap levels considered.

32 The Clean Development Mechanism (CDM) is one of the "flexibility" mechanisms defined in the Kyoto Protocol.

14.108 In general, sufficient supply of emission credits to the maritime ETS and the relation of this proposal to other climate initiatives, in particular the use of CDM credits, will require further examination.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

14.109 Administrations would have to enact new national legislation to regulate and enforce this new requirement for ships/shipowners. It is noted that it would be ships that report emissions, and not fuel suppliers. However, it seems obvious that some sort of reporting from bunker suppliers resident in the flag State will need to be regulated in order to ensure that evasions from the scheme could be addressed and that a proper audit scheme can be put in place. As is usual with mandatory IMO instruments, and in common with other proposals, domestic law would have to be enacted in order for this proposal to be operative and effective – especially to impose sanctions in the event of non-compliance, to harmonize the proposed system with other carbon markets as may exist locally or regionally and to ensure that the proper capital flows may proceed as required.

14.110 There is a recognized need to approve the emissions report from each ship given that these reports provide the basis for acquiring the required allowances. It would require material efforts to verify the data in these reports. In addition, only a limited time is proposed for the Administration to verify and approve these reports. This would add to the workload for the Administration especially if the reporting periods are fixed. However, it is noted that the verification of emission reports could be delegated to a recognized organization, in which case the Administration could examine a sample of the reports rather than all reports.

14.111 The Administration would also have to perform additional tasks in calculating the emissions from ships providing their own reports. While a methodology to do this is included in the proposal, this will add, in some way, to the administrative burden.

14.112 There will also be a need for the Administration to liaise with the International Administration Body in the event of non-compliance by its flagged ships. Given that enforcement actions through legal means could be required to address these non-compliances, the Administration would have to conduct its own investigations to determine the facts of the cases. There are many ways to deal with ships that do not report emissions. It is noted that in other emissions trading schemes, non-compliant entities face a penalty in addition to a requirement to report and surrender allowances. One way could be to assign punitively high emissions to them. In any case, measures and mechanisms to deter non-reporting and non-compliance (noting that these themselves should not be such that they offer an incentive not to report) would need to be further considered.

Additional workload for flag State per ship

14.113 Flag States would have to approve emissions reports submitted for each ship and ensure that the required allowances are surrendered. Ships are expected to surrender their credits to the International ETS Registry. Flag States would have to liaise with the ETS Registry regarding the endorsement of the ETS certificate. In this context, the following issues need to be addressed, which are not necessarily specific to this proposal but are generally common to all proposals (*mutatis mutandis*):

.1 Size of the fleet.

.2 A mechanism to be used, if needed, to verify the actual amount of bunkers lifted to address possible carbon leakage through false declarations by ships on the amount lifted.

.3 Monitor that allowances due are surrendered as required.

.4 Verify, with the International Administrator, the amount of allowances surrendered.

.5 Issuance and annual endorsement of the required ETS certificate.

.6 Take actions in case of non-compliance.

14.114 For ships changing their flag, or de-registering or being taken out of service, the flag State will have to perform a final audit of the vessel to ensure due compliance with the proposal and avoid carbon leakage.

14.115 It is specified that ships should be entered on the register that is maintained by the International Administration Body. However, it is not specified if ships are to register and de-register directly or via the flag State.

14.116 Flag States would have to approve emission reporting (compare the reported emissions with the amount of surrendered allowances) within a timeframe. For flag States with many ships this could be a substantial task, especially if all reporting and approval take place at the same time.

Impacts on port State inspections and additional workload per call or inspected ship

14.117 There would be new rights and responsibilities for port States to inspect visiting ships to verify that sufficient allowances have been surrendered. It is anticipated that these activities would be restricted to documentation checks.

14.118 Treatment of non-Party vessels is an issue that needs to be dealt with by all proposals. If the International Administration Body takes on the roles of the Flag Administration for non-Party ships (i.e. inspection and approval of the CO_2 reports, ensuring that allowances are surrendered leading to the issuance of the required ETS certificates), the impact on the workload for Port State Control Officers (PSCOs) would perhaps not be significant. If not, this scheme may have a significant impact on the administrative burdens and legal aspects of the Activities of PSCOs. Performing tasks such as verification of bunkers lifted as well as allowances surrendered would require new skills to be acquired for PSCOs.

Availability of skilled human resources

14.119 For shipowners, the acquiring and surrendering of allowances would be a new task and may involve training of staff or the sub-contracting of functions to ensure that the trading is performed in the best way for that particular company, especially in relation to issues such as banking, etc. However, it is noted that within many shipowners' organizations there already exists experience and skills related to purchasing bunker fuels, which demonstrate similar volatility characteristics as trading emission allowances.

14.120 Maritime Administrations will also have to establish training programmes in order to have staff competent to monitor and verify the emission reporting, etc.

14.121 It is noted that there are several existing ETS systems. However, within the international shipping industry, *per se*, there are currently very few persons trained and experienced in how to operate within ETS.

Compatibility with national law and Sovereignty implications

14.122 As noted above in the discussion under paragraphs 14.16 to 14.74, some States already have implemented international emission trading schemes.

14.123 Like other proposals, if the ETS Convention includes a definition of CO_2 as a pollutant, some States understand, according to some definitions and national provisions that this would result in significant domestic legal challenges in transposing the treaty provisions into domestic law. Harmonization, as well as the issue of allowing the system's required capital flows to occur without extraneous fiscal or currency controls, is relevant both to this proposal and others.

14.124 It is important to bear in mind possible difficulties with harmonizing the proposal to national laws in the event that the system would require either Flag or port States to directly make emission allowances available on an international market.

14.125 The scheme relies to a degree on interoperability and exchange of the shipping sector's credits with other sectors. How the links to the other emission markets are established, both legally and operationally, may require sovereign decisions beyond the Convention ratification, as well as potential changes in national law. This is a harmonization challenge, which other proposals share to a greater or lesser extent, and indeed this proposal must be understood as predicating this harmonization in inter-sector exchanges in order for it to be effectively operative.

14.126 By way of example of the issues surrounding these linkages, according to observers and analysts, questions on linkages of ETS schemes have a variety of aspects and economic implications[33]. Any links of a new ETS scheme, whether bilateral or unilateral, has been considered to relate to the compatibility of the different schemes being linked, including their relative stringencies[34]. Therefore, it seems that the linking of domestic or regional ETS schemes to the international maritime ETS may require policy decisions, and potentially relevant ratifications and/or changes in national law. As noted, this is an element of harmonization, which is required in the adoption of practically all the proposals.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

14.127 Operating within an ETS requires ships to maintain records of their emissions. Although emission largely hinges on the amount of fuel, it is not a one-to-one match.

14.128 A new regime to require records maintained on fuel consumed is thus required, although not in any way detailed in the proposal. It is a current practice in shipping to keep records of fuel consumption. However, a mandatory recording as proposed, would imply extra administrative work onboard.

[33] Kruger J., Oates W., Pizer W. (2007), Decentralization in the EU Emissions Trading Scheme and Lessons for Global Policy, Resources For The Future, RFF DP 07-02, http://www.rff.org/rff/Documents/RFF-DP-07-02.pdf

[34] See MBM-EG ref. # 2.34.

14.129 Ship operators need to develop procedures to interface with both the auctioning facility established under the scheme as well as with the open carbon market in general.

14.130 For each ship, a transaction log must be maintained to keep track on CO_2 emitted and credits surrendered.

14.131 A further element of administrative work is to submit the annual report to the flag State for verification.

Additional workload onboard

14.132 In the assessment of the ETS the Expert Group found that it is likely to be a stronger driver for uptake of emission reduction technologies due to its price tag on every tonne of CO_2 emitted. In the reference scenario the proposal drives 60 million tonnes of in-sector emission reductions. This represents an additional workload compared to what is being generated by a mandatory EEDI (extra 28% reductions) but the uptake would not be evenly distributed and in relation to the total workload onboard we cannot quantify it for the individual ship.

14.133 For the industry as a whole the Expert Group estimated the additional onboard workload to amount to some $0.7 billion or about 1.5% of the gross cost of the proposal. It shall be emphasized that this value is a gross estimation.

Additional economic impact for individual ships and the shipping industry

14.134 Similarly to the other proposals, this proposal places an additional price element on each tonne of fuel used onboard ships. Although the legal obligation to surrender credits in the ETS is placed on the individual ship, it is likely that industry will adopt contractual agreements to ensure that the cost will be borne by those parties already responsible for paying the fuel billion.

14.135 An element of uncertainty is however present and that is the volatility of the price on the open carbon market. It appears to be difficult to pass on this volatility and it represents thus both a financial opportunity as well as a financial threat to the shipowner/operator. The ability to trade on the carbon market becomes thus an integral part of being a competitive shipowner.

14.136 Additional tonnage to counter for any uptake of slowing the fleet down may well be needed as the ETS is likely to spark an additional in-sector reduction on top of what is driven by a medium EEDI standard of some 28%. The associated mechanisms to drive this reduction are a combination of operational and technical measures, of which slowing down ships is one element that may be chosen.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for a new IMO instrument

14.137 Assuming there is a political will to start substantive work on the development of this proposal in the near future, it is possible that a new instrument could be ready for adoption by 2015. The time necessary for the development of an instrument will be impacted by the policy context surrounding international climate change discussions.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

14.138 There would be a need for the International Administration Body to establish and maintain an International ETS Registry to capture details of ships' fuel consumption as well as to track the allowances surrendered.

14.139 The proposal states that non-Party ships can be registered in the ETS Registry to participate in this scheme. As non-Party States are unlikely to enact any legislation pertaining to this new IMO instrument, the proposal discusses how the International Administration Body would communicate with these ships. This issue needs to be carefully considered to ensure it does not present any legal hurdles and is practically workable.

14.140 Further clarification will be needed on the roles and responsibilities of the International Administration Body in regulating this Maritime ETS market place, e.g., to address the possibilities of any fraud or market cornering taking place.

14.141 If this new maritime ETS is opened to other ETS markets, there could be issues that need to be addressed in accounting for the funds collected and the allowances surrendered, if these allowances were acquired outside of the maritime ETS. Further consideration needs to be given as to whether to reconcile these accounts to reflect the actual funds collected versus the emissions generated.

Role of flag State

14.142 There will be a 'classical' role for the flag State in assessing that any ship flying its flag complies with IMO agreed and adopted provisions which are then implemented in national legislation.

14.143 In the event of non-compliance detected by the International Administration Body/ETS Registry, flag States will have to liaise with these bodies and to conduct their own investigations before enforcement actions are taken.

14.144 While noting that it will be ships that need to report emissions, and not fuel suppliers, there may be a need to regulate and exercise control over bunker suppliers to ensure that all attempts of frauds/evasions are dealt with comprehensively.

Role of port State

14.145 The proposal anticipates incorporation of the traditional permissive system whereby port States, which are Parties to the new instrument, may exercise control to ensure compliance.

14.146 However, an issue that will need careful consideration is how non-Party ships are addressed.

Role of recognized organizations

14.147 The proposal anticipates that Recognized Organizations will be authorized to act on behalf of flag States, in a similar way as under other IMO Conventions.

Survey, Certification and other means of control

14.148 A new survey and certification regime would be required to verify and approve the CO_2 values declared by ships, which may necessitate the audits of bunkers sold by bunker suppliers. Re-survey and adjustment/re-issue of the certification will be required if there are any relevant modifications to the ship that fall within the scope of the scheme.

Involvement of other authorities (e.g., Treasury)

14.149 The involvement of other government authorities, e.g., finance ministries and anti-fraud agencies; that are not usually involved in the development, implementation and enforcement of IMO-agreed instruments may be needed, for instance in relation to the issuing of the SEUs, which potentially may be worth billions of US dollars annually.

15 A GLOBAL EMISSIONS TRADING SYSTEM FOR GREENHOUSE GAS EMISSIONS FROM INTERNATIONAL SHIPPING – THE UNITED KINGDOM (MEPC 60/4/26)

FOCAL POINT SUMMARY OF THE PROPOSAL

15.1 In MEPC 60/4/26, the United Kingdom set out a proposal for a Global Emissions Trading System (ETS) for international shipping. Such an approach has two main benefits:

.1 it defines a clear cap on net emissions from the sector, ensuring that the desired level of emissions from international shipping is achieved; and

.2 it enables emission reductions to take place where the cost of the reduction is lowest, thus lowering the overall costs of combating climate change.

15.2 The key design elements of the system are:

.1 ship operators would be responsible for complying with the system (they could be the legally responsible entity). The point of obligation would be individual vessels (as identified by their IMO number). Ship operators would be responsible for ensuring that each of their individual ships had a "Greenhouse Gas Certificate" on board at all times;

.2 an overall global cap for international shipping would be agreed and a fixed quantity of emissions allowances (each representing $1tCO_2$) would be created in line with the overall cap. These allowances would then be auctioned to ship operators;

.3 in order to provide certainty to the shipping industry, the global cap would be set with a long term declining emissions trajectory. The framework would map out trading phases (of, e.g., five or eight years), each of which would comprise a number of shorter compliance periods (equivalent to one year). This structure would give the ETS greater flexibility (through features such as the ability to bank allowances between trading phases) as well as an opportunity for Parties to assess whether the cap had been set correctly and whether progress in reducing emissions was being made;

.4 the first phase could be an introductory or transitional phase to allow for data gathering and the setting of more accurate emissions baselines. This would also allow shipping operators to become accustomed to the various obligations of the new system. This could be a shorter phase (of, e.g., one or two years) but should also result in emissions reductions. The cap should be reviewed after this initial phase;

.5 throughout each compliance period, ship operators would monitor their international shipping emissions by keeping records of their fuel purchases using the Bunker Delivery Note mechanism, which is already a feature of MARPOL Annex VI. The ETS would be linked to the global carbon market, so that allowances (and project credits) from other sectors of the economy could be bought in to account for international shipping emissions; and

.6 within a set time after the end of the compliance period (e.g., three months), participating operators would be required to report their fleet's independently verified emissions and surrender enough allowances (and/or project credits) to account for these emissions. This would be a condition for maintaining a valid "Greenhouse Gas Certificate" for the compliance period.

ASSESSMENT OF THE PROPOSAL

15.3 Many comments relating to the ETS proposals from the UK and France (chapter 16) are very similar to those made for the Norwegian ETS proposal (MEPC 60/4/22). The following comments must therefore be read with reference to the Norwegian ETS proposal, bearing in mind that this assessment will principally be focused on elements that are either different, or additional, to those already made in relation to the 'base' Norwegian proposal (MEPC 60/4/22 and MEPC 60/4/23).

Environmental effectiveness

15.4 Two aspects of the UK proposal that differ from the Norwegian ETS proposal are the method of allocating emissions allowances and the approach for setting the emissions cap.

15.5 Like the Norwegian ETS proposal, the UK proposal recognizes that emission allowances could be allocated in a number of ways including free allocation based on historic emissions, free allocation based on a baseline, and auctioning. The UK proposal and the Norwegian ETS proposal express a preference for auctioning, but the UK proposal differs by suggesting that allowances could be allocated to national governments for auctioning.

15.6 The UK proposal also suggests the net emission cap would be set with a long term declining trajectory with discrete phases (for example, five to eight years) with an initial introductory or transitional phase of one to two years. The aim of this transitional phase would be to allow shipping companies to become accustomed to the various obligations of the scheme but would also reduce emissions.

15.7 In terms of in-sector reductions, the UK proposal would not differ from the Norwegian ETS proposal. Moreover, even though the UK proposal provides another option for how the emission cap would be set over time, in most circumstances this would have only a small influence on the quantity of in-sector reductions. This is because the scheme is proposed to be an open linked scheme and therefore the carbon price, which determines in-sector reductions, would be relatively independent of the cap.

15.8 In terms of out-of-sector reductions the UK proposal would deliver these in the same way as the Norwegian ETS proposal, that is, through ships purchasing out-of-sector allowances and project credits to meet their obligations under the scheme.

15.9 Any differences in setting the net emissions cap would simply be reflected in more or less out-of-sector allowances and project credits purchased and surrendered to meet the cap.

15.10 There is one significant difference in the UK proposal compared to the Norwegian ETS proposal in the apparent limited potential for the UK proposal to deliver out-of-sector reductions from auction revenues. It appears that funds collected through national auctioning would remain with the government to which the auction allowance was initially allocated. In MEPC 60/2/26 UK mentions that funds may be used for a variety of purposes but do not specify what those would be. This means remaining proceeds would not be collected centrally and may hence not be used for the range of purposes set out in the

Norwegian ETS proposal. Therefore, any additional out-of-sector reductions that may result from use of remaining proceeds for financing mitigation activities under the Norwegian ETS proposal, may not be available under the UK proposal.

In-sector and out-of-sector reductions

15.11 The UK proposal for an ETS was not modelled separately but the results from modelling the Norwegian ETS proposal are applicable. However, a significant difference between the proposals relates to the reductions that could potentially be achieved from the remaining proceeds generated from auctioning allowances. The Norwegian ETS specifies that remaining proceeds be used for mitigation, adaptation or R&D for shipping while the UK proposes national auctioning and the revenue remaining with the government to which the auction allowance was allocated using the funds for a variety of purposes. The potential for supplementary out-of-sector reductions is zero as the proceeds from national auctioning is considered unavailable. Those proceeds could however be made available, subject to decisions and implementation of suitable mechanisms at national level, such as for dedicated Climate Action Funds.

Certainty of reductions

15.12 Reductions under the UK proposal are subject to the same considerations around certainty as the ETS proposal from Norway.

Cost-effectiveness of the proposed MBM

15.13 Table 15.1 shows gross costs under the reference scenarios for the ETS proposed by the UK. These cost estimates are the same as for the Norwegian proposal. However, as funds collected through national auctioning would remain with the government to which the allowance was allocated, revenues would not be collected centrally or be available for the range of purposes set out in the Norwegian ETS proposal.

Table 15-1: Modelled costs under the UK ETS proposal for the B2 and A1B growth scenario with a 10% cap, medium carbon price and reference fuel price

	Year	B2	A1B
Financial: gross costs ($billion)	2020	24	27
	2030	40	49
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	5	8
	2030	9	18
Funds ($billion)	2020	20	20
	2030	31	31
MBM in-sector reductions (Mt)	2020	17	19
	2030	49	60
MBM out-of-sector reductions (Mt)	2020	193	303
	2030	221	452
Cost of reductions ($/tonne CO_2 abated)	2030	148	96
Maximum cost-effectiveness potential ($/tonne CO_2)	2030	148	96

15.14 As with the ETS proposed by Norway, gross costs are apportioned into two components. Firstly, costs of emission credits, which in the case of the Shipping ETS are purchased directly by the shipping industry. Secondly, the net fund represents revenues from auctioning Ship Emission Units. The table shows no rebates or refunds since there are no such mechanisms proposed for the Shipping ETS.

15.15 Although from a shipping perspective the cost of the system remains more or less identical to the Norwegian ETS proposal, the unavailability of net funds at a central mechanism that could potentially be used for climate mitigation and adaptation purposes appears to be the major difference.

15.16 Indirect cost consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in Port State Control Organizations and not least in operation of the decentralized auctioning facilities. These costs are elaborated below.

15.17 As with the Port State Levy proposal, the funds generated will end up with national governments' Treasuries.

A1B: Reference fuel price, 2030, medium carbon price

The cost-of reductions is estimated to be 96 \$/tonne CO_2 abated.

No funds are generated for other purposes

The maximum cost-effectiveness potential of the proposal is 96 \$/tonne CO_2

Administrative Costs (including any central administrative requirements)

15.18 Reductions under the UK proposal are subject to the same considerations of administrative costs as the base proposal by Norway. Moreover, the UK proposal will incur additional administrative burden in determining the allocation of auctioning rights for allowances to national governments.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

15.19 Similar to that for the Norwegian proposal (see Chapter 14).

Practical feasibility of implementing the proposed MBM

Development time for new IMO Instrument

15.20 The UK proposal recognizes that it "will be necessary to ensure that the environmental integrity of the systems is not negatively affected and that the systems have a similar level of ambition". However, the proposal does not consider the issue in detail and it will require further consideration. Potential implications on the ability to define and/or secure linkages of the proposed maritime ETS to other ETS, and to the UNFCCC mechanisms, are not clear.

15.21 More detailed discussions will also be needed on the level of the emission cap, whether the cap will be established using a methodology based on marginal abatement curves (such as proposed in MEPC 60/4/23, by Norway), or established otherwise. Auction options and .a range of other matters would also need to be resolved.

15.22 In the UK proposal, the determination of the "allocation keys" driving the allocation of allowances to national governments may need substantial time to agree, and this would add to the timeframe of developing this IMO instrument accordingly given that it would probably include indicators from beyond the maritime sector.

Experience from similar schemes

15.23 No new issues relating to this criterion have been identified apart from those noted in the Norwegian ETS proposal.

Ease of implementation and potential for phased implementation

15.24 Table 15-2 provides a summary of what are taken as the major elements of the UK proposal related to its potential implementation and phase-in.

Table 15-2: Implementation and phase-in elements

Element	Description
Baseline	Required; Not measured but estimated; UK proposes an introductory phase to allow for data gathering and the setting of more a accurate emission baseline (one or two years).
Target	Required; declining cap To be agreed through the UNFCCC or IMO or a combination of the two bodies
Out-of-sector emission units and/or credits (offsets)	Above cap; unconstrained; CDM and from other sectors, all equivalent
Implementation	Centralized
Exemption	Potentially, e.g., for voyages to and from the most vulnerable countries
Phase-in of emission commitment (issuance/sale of SEUs)	Not described, but UK proposes a data gathering, introductory phase (1-2 years long)
Market linkages	Required; Assumed with CDM markets and other ETS

15.25 From Table 15-2 it appears that certain 'typical' difficulties with quantity instruments are reduced, such as establishing a baseline and a target. The baseline can be estimated rather than measured, and the proposal states that an 'accurate' baseline will be set after a data gathering, introductory phase.

15.26 However, while easing the implementation, such an approach may need careful examination to assess whether the environmental effectiveness of the scheme could be negatively impacted, given that quantity instruments typically require a reliable emission baseline from which an emission target is established. A baseline obtained through estimates may, potentially, be challenged as not robust enough. Also, it may lead to additional questions regarding the precise emission control of the scheme, as the starting baseline may be imprecise or uncertain.

15.27 Therefore, it seems that a balance may need to be established between the goals of the scheme and the ease of estimating its baseline, and the target it relies on. In this regard, it is noted that ETS schemes can typically provide for annual emission reporting once they are established, thus opening a possibility to incorporate adjustments to the baseline and target (cap).

15.28 It is considered that the determination of the "allocation keys" and the regular review of allowances being allocated to national governments would need to be carefully reviewed to consider if they adversely complicate the implementation of this scheme.

Enforcement, potential for evasion and avoidance of carbon leakage

15.29 Reductions under the UK proposal are subject to the same considerations of enforcement, evasion, avoidance and carbon leakage as the Norwegian ETS proposal.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

15.30 The discussion within Chapter 14 is relevant. However, there could be an additional administrative burden if each party State was obliged to establish a national emissions trading body (for auctioning on allocation allowances). If such a requirement was created by the new instrument, it could have considerable impact on developing party States and require significant capacity building.

15.31 The auction of allowances and thus the flow of revenues is not clearly defined. Depending on the use of those revenues, there could be money available for adaptation and mitigation activities in developing countries. Potential climate financing for developing countries comprise funds as shown in the table below.

	Year	**B2**	**A1B**
Funds ($bn)	2020	**20**	**20**
	2030	**31**	**31**

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

15.32 The Expert Group views and comments are as under the Norwegian ETS proposal (see Chapter 14).

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

(to be read alongside the comments noted under the Norwegian ETS proposal)

15.33 According to the UK proposal, the 'registry' would incur an administrative burden in verifying the submissions by governments based on the "allocation keys". This is necessary to properly allocate the allowances to national governments.

15.34 It appears that funds collected through national auctioning would remain with the government. If this is the case, there would not be any requirements for the 'registry' to manage or allocate the funds.

15.35 However, this proposal does not explain the means by which national governments would be able to acquire additional allowances to allow growth in their maritime sectors. This is an important factor especially for developing countries.

15.36 The ability of the 'registry' in auditing the auctioning of credits would need further consideration, especially regarding the legal aspects that would allow it to do so and for it to take any enforcement actions if required. Participation of ships flagged with non-Party States would also need to be further considered to determine the administrative burden for the 'registry' in this regard.

Additional workload for flag State per ship

15.37 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Impacts on port State inspections and additional workload per call or inspected ship

15.38 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Availability of skilled human resources

15.39 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Compatibility with national law and Sovereignty implications

15.40 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

15.41 The requirement to maintain records onboard to document a ship's emissions are limited to that already in place according to MARPOL Annex I (Oil Record Book) and MARPOL Annex VI (Bunker Delivery Notes).

15.42 As the auctioning process is decentralized shipowners may have to engage with more auctioning sites to purchase the required amounts of credits. This is an added complexity for shipowners that may introduce additional cost due to intermediary players facilitating the link between shipowners and auction sites.

15.43 The additional administrative burden for ships is considered minimal due to reliance on existing statutory requirements for documentation onboard.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for a new IMO instrument

15.44 A new IMO instrument will be required, with considerations in parallel to those noted under the Norwegian ETS proposal.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

15.45 In addition to the considerations mentioned in the Norwegian ETS proposal, under the UK proposal, if the auction of the allowances is conducted by national governments, then the roles and responsibilities of the 'registry' will need to be carefully reviewed to allow an assessment regarding its compatibility to be made. In particular, what will the administrative burden be if each Party State is required to establish a national ETS marketplace?

Role of flag State

15.46 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Role of port State

15.47 Aside from the considerations noted under the Norwegian ETS proposal, further consideration of the UK proposal will be necessary to establish how ships from non-Party flag States will be considered by Party port States, as these ships may not have any mechanisms to acquire the necessary allowances.

Role of recognized organizations

15.48 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Survey, Certification and other means of control

15.49 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Involvement of other authorities (e.g., Treasury)

15.50 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

16 FURTHER ELEMENTS FOR THE DEVELOPMENT OF AN EMISSIONS TRADING SYSTEM FOR INTERNATIONAL SHIPPING – FRANCE (MEPC 60/4/41)

FOCAL POINT SUMMARY OF THE PROPOSAL

Features common with the Norwegian proposal, not fully described in 60/4/41

16.1 The ETS would be applicable to all ships above a threshold, regardless of their flags: the threshold could be 400 GT but it is possible to start with a higher threshold.

16.2 A global cap on the emissions for the sector will be included in the system, without any specific cap to Parties or to individual ships. This cap will determine the number of shipping units to be auctioned but it will not be a glass ceiling stopping the traffic. The market will be open, which means that ships will be allowed to use units from other regulated carbon markets, in particular CDM credits.

16.3 An Administrative Body under the control of the Parties will administer the system, and in particular manage the international shipping CO_2 registry, where every ship identified by its IMO Number will have an account. The Bunker Delivering Notes, held on board, will indicate the amount of CO_2 units due by a ship for each bunkering action.

16.4 A Fund will be established with auctioning revenues. The GHG Fund will be managed by the Administrative Body. The GHG Fund will be used for climate change mitigation and adaptation purposes in developing countries as well as technical cooperation activities under IMO.

Monitoring and control: the constant balance option

16.5 The system is based on the usual IMO rules, with the legally responsible entity being the company as identified in SOLAS, and the control being done by the flag State and the port State Authority as for other regulations.

16.6 Port States Authorities' Control and implementation by all stakeholders will be facilitated by real time access to information on a ship account: CO_2 units deposited, units surrendered corresponding to bunkering actions and the balance. CO_2 units should be transferred to a ship's account after each bunkering action. Some delay could be accepted for compliance (e.g., one month).

Auctioning: complements to the Norwegian proposal

16.7 To ensure a high efficiency and a uniform price, there will be a single international auctioning platform for the shipping CO_2 units.

16.8 To facilitate the participation of small ship operators, it is possible to organize non-competitive auction windows where small lots of units, for example one tonne CO_2, are sold at a fixed price, which may be the price paid at the most recent competitive auction.

16.9 To prevent market manipulation, the bid size allowed will be limited for each auction and auctions organized frequently.

16.10 To avoid speculation while ensuring the liquidity of the market, strict market regulation will be set and participation in the system restricted to the appropriate actors (to be determined).

ASSESSMENT OF THE PROPOSAL

16.11 Many comments relating to the ETS proposals by the UK and France are very similar to those made for the Norwegian ETS proposal (MEPC 60/4/22). The following comments must therefore be read with reference to the Norwegian ETS proposal, bearing in mind that this assessment will principally be focused on elements that are either different, or additional, to those already made in relation to the 'base' Norwegian proposal and the UK proposal in chapters 14 and 15, respectively.

Environmental effectiveness

Mechanism of achieving reductions

16.12 The French proposal primarily sets out additional detail on auction design under a shipping ETS, which is consistent with the Norwegian ETS proposal. In most other respects the French proposal advocates for a shipping ETS with analogous design elements to the Norwegian ETS proposal. As such, the environmental effectiveness of the ETS proposed by France appears to be the same as the Norwegian ETS and its environmental effectiveness was not assessed separately.

In-sector and out-of-sector reductions

16.13 The French proposal for an ETS was not modelled separately but the results from modelling the Norwegian ETS proposal show the reductions that would be delivered.

Certainty of reductions

16.14 Reductions under the French proposal are subject to the same considerations around certainty as the Norwegian ETS.

Cost-effectiveness of the proposed MBM

16.15 Costs under the French proposal are similar to those in the proposal from Norway (Chapter 14).

Administrative Costs (including any central administrative requirements)

16.16 Administrative costs under the French proposal are subject to the same considerations of administrative costs as the proposal from Norway. Moreover, the French proposal states that a simpler parallel system of access to allowances could be implemented in the form of non-competitive auction windows, where participants could acquire a small pre-determined number of allowances, sold in small lots (e.g., one tonne) at a price corresponding to the equilibrium price observed during the most recent competitive auction. The non-competitive auction could be open to certain players, e.g., small ship operators. Participants in non-competitive auctions only bid on a quantity and not a price, therefore there is no need to estimate the price level in order to bid.

16.17 To create such a parallel system, the following would incur additional administrative burden and costs:

.1 The International Administration Body would have to determine the number of allowances to be allocated for this parallel system. The mechanism and considerations for pre-determining these allowances were not addressed in the proposal, and the administration load/cost could not be assessed as such; and

.2 a different bidding system is introduced, where the participants bid on quantity rather than price. There would be additional administrative costs involved in running two parallel but different systems.

16.18 The French proposal also recognizes the risks of market manipulation. One example of such manipulation consists in one participant attempting to acquire a significant proportion of all allowances auctioned in order to be able to manipulate the price. To mitigate this risk, the International Administrative Body would need to set up a real-time monitoring capability and, possibly, an audit system to detect any participants acquiring significant amounts of allowances that is beyond their requirements.

16.19 The concern about market manipulation raises the question of whether the auction process should be fully open or in some way restricted to certain players. When discussed within the Expert Group it was noted that one may need to limit the quantity of allowances that may be purchased relative to the tonnage associated with a given company, in order to avoid price manipulation by third parties and large financial institutions; these concerns are also applicable to the Norwegian ETS proposal and the related German impact assessment (annex 6).

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

16.20 Similar to that for the Norwegian proposal (see Chapter 14).

Practical feasibility of implementing the proposed MBM

Development time for new IMO instrument

16.21 In addition to earlier discussion (Chapters 14 and 15), the French proposal points out that "trade should be permitted with other 'compatible' cap-and-trade systems". However, the proposal does not consider the issue in detail and therefore requires further consideration. Potential implications of the ability to define and/or secure linkages of the proposed maritime ETS to outside ETS systems and to the UNFCCC mechanisms within the new IMO convention are not clear.

16.22 More detailed discussions would also be needed on the level of the emission cap, whether the cap would be established using a methodology based on marginal abatement cost curves (such as proposed in MEPC 60/4/22, by Norway), or established otherwise, which proposed auction options should be followed, and so on.

Experience from similar schemes

16.23 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Ease of implementation and potential for phased implementation

16.24 In addition to considerations noted under the Norwegian ETS proposal, the French proposal calls for the participation of "non-compliance" actors (which are taken to be entities that are not ship operators) in this maritime ETS. For these "non-compliance" participants in the market, reliance will have to be placed on other national authorities, such as financial markets authorities, to enforce rules for participation in the market. For most countries, the need to involve the financial markets authorities would complicate the implementation of this scheme, as the regulatory framework may differ across these two sectors (and this is furthermore based on the assumption that these other authorities are available to enforce the rules on behalf of the maritime ETS in the first place).

16.25 It is also noted that, according to the French proposal, to be considered compliant, a ship operator would have to regularly surrender allowances corresponding to the quantity of fuel bunkered for each ship, which is shown on the Bunker Delivery Notes held on board. This 'ongoing' process would require more electronic transactions than in the 'base' ETS proposal (MEPC 60/4/22) and more activity in emissions trading for ship operators. However, this additional burden may prove advantageous in terms of operational simplification for shipowners, in that any changes in the 'status' of the ship (e.g., chartering) can be continuously taken into account, thereby avoiding having to reconstruct past events at the end of the year. In this regard, it is noted that the proposal states that operators would have real time access to their ships' CO_2 accounts in order to facilitate contracting and avoid later litigation.

Enforcement, potential for evasion and avoidance of carbon leakage

16.26 Reductions under the French proposal are subject to the same considerations of enforcement, evasion, avoidance and carbon leakage as the Norwegian ETS proposal.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

16.27 Similar to that for the Norwegian proposal (see Chapter 14). The potential climate financing for developing countries comprise funds as shown in the table below:

	Year	**B2**	**A1B**
Funds ($bn)	2020	**20**	**20**
	2030	**31**	**31**

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

16.28 As under the Norwegian ETS proposal (see Chapter 14).

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

(to be read alongside the comments noted under the Norwegian ETS proposal)

16.29 The French proposal recognizes the limitations of the maritime ETS administrator in conducting investigations and having injunction powers over participants in the scheme. Rather, it would have to rely to a large extent on national authorities. For ship operators, it would rely on flag State and port State controls. However, for non-compliance participants in the market, the maritime ETS administrator would have to rely on other national authorities, such as financial markets authorities, to enforce rules for participation in the market. It also calls for a strict screening of players authorized to hold shipping allowances in the first place, to check their integrity and ensure they are clearly identified. These responsibilities to regulate "non-compliance" actors would pose significant challenges. In particular, Parties to this ETS instrument would have to put in place regulatory frameworks and procedures that go beyond the traditional areas of maritime regulations, which address the regulation of the financial markets to address the issue of "non-compliance" actors.

16.30 It is also unclear from the proposal as presented as to who will screen the players authorized to hold shipping allowances. Careful consideration will need to be given to the screening of all the players and "non-compliance" actors to assess if there would be an increase in the administrative burden for either flag States or the maritime ETS administrator.

Additional workload for flag State per ship

16.31 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Impacts on port State inspections and additional workload per call or inspected ship

16.32 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Availability of skilled human resources

16.33 Specifically, the French proposal will require the development of new skill sets to be developed to conduct the screening of players authorized to hold shipping allowances in the first place, to check their integrity and ensure they are clearly identified.

Compatibility with national law and Sovereignty implications

16.34 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

16.35 Similar to that for the Norwegian proposal (see Chapter 14).

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for a new IMO instrument

16.36 A new IMO instrument will be required, with considerations in parallel to those noted under the Norwegian ETS proposal.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

16.37 Aside from the considerations noted under the Norwegian ETS proposal, the French proposal would require the establishment of a maritime ETS Administrator and an International ETS Registry. The ETS Registry would also need to contain the details of "non-compliance" actors participating in the maritime ETS. The maritime ETS Administrator might also need to conduct screening of players authorized to hold shipping allowances and need enforcement powers to regulate ships and other "non-compliance" actors belonging to non-Party States.

Role of flag State

16.38 Aside from the considerations noted under the Norwegian ETS proposal, the French proposal would require flag States to regulate "non-compliance" actors in the maritime ETS. Appropriate new national legislation would probably be required as this is not an area addressed in existing maritime legislation.

Role of port State

16.39 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Role of recognized organizations

16.40 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Survey, Certification and other means of control

16.41 No new issues relating to this criterion have been identified, apart from those noted in the Norwegian ETS proposal.

Involvement of other authorities (e.g., Treasury)

16.42 The involvement of Finance/Treasury and anti-fraud authorities may be needed in some jurisdictions, for instance in relation of auctioning of emission allowances.

17 MARKET-BASED INSTRUMENTS: A PENALTY ON TRADE AND DEVELOPMENT – THE BAHAMAS (MEPC 60/4/10)

FOCAL POINT SUMMARY OF THE PROPOSAL

Summary

17.1 The Bahamas states that any MBM will be a restraint upon the trade and development of States. Money removed by an MBM will be money lost from the development of the State. Operational and technical measures will produce significant savings and oil prices will provide the incentive to apply them. If an MBM were to be in place, then shipping's contribution must be proportional to the amount of emissions produced by shipping. The Second IMO GHG Study 2009 states that shipping's contribution is 2.7% and so the financial penalty on shipping should not exceed 2.7% of any global GHG fund. Further, any MBM must be administered in the most efficient and practical manner in order to ensure equitable distribution of any fund raised.

Technical and Operational Measures

17.2 The Bahamas contends that operational and technical measures, driven by future high oil prices, will achieve significant GHG savings. The Second IMO GHG Study 2009 states that operational and technical measures would reduce GHG emissions by 25-75%. Such measures would include mandatory adoption of the EEDI. The Bahamas believes that this would be the most effective method for ensuring the minimization of GHG emissions. In addition, such measures are the only direct means by which GHG reductions can be achieved.

High oil price

17.3 The high price of oil will provide the incentive to adopt technical and operational measures. There is no need to set up an expensive bureaucracy when the invisible hand of the market will do the work for free nor would there be a need for training or technical co-operation. By allowing the fuel price to be the driver for the implementation of operational and technical measures, those that use the most fuel pay the most. Trade would be unaffected as smaller vessels serving LDCs and SIDS would use less fuel. No modal shift would occur as there would be no incentives built into the system to do so. If an MBM is intended to increase the cost of fuel to act as an incentive to reduce fuel consumption, then it is unclear to what extent the increase over and above market fluctuations would be necessary to force such a change.

Proportionality

17.4 A vital aspect of the Bahamas proposal is that if an MBM is adopted then the funds raised should be proportionate to the level of emissions. International shipping should not be viewed as an industry which should be used as a means of raising money to offset out-of-sector emissions. The funds raised should be no more than 2.7% of any global fund when all other industries are accounted for. Therefore, if in the post COP 15 discussions the total fund proposed is $100 billion, then shipping should contribute a maximum of $2.7 billion. Additionally, there is no stated purpose for any of the MBM, e.g., reduction of emissions from ships. Without a defined purpose, it is not possible to decide whether an MBM can achieve IMO's aims. Without an aim there is a danger that the MBM may be used as a cash cow as it would be politically more acceptable to raise money from shipping rather than through the imposition of shoreside penalties.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

17.5 The Bahamas proposal does not set explicit standards or reductions to be achieved in-sector or out-of-sector from the shipping industry. The proposal clearly sets forth, however, that the imposition of any costs should be proportionate to the contribution that international shipping makes to global CO_2 emissions. For example, the proposal indicates that if international shipping is subject to the cost of an MBM, the cost should not be larger than 2.7% of any global agreed sum to reduce emissions. Since the proposal does not set explicit standards or targets, the amount of CO_2 reduced is strictly a function of fuel price and the proposal suggests that improved efficiency of the world's fleet can be reasonably expected in a scenario of significantly increased fuel prices. Conversely, flat or decreasing fuel prices would not be expected to result in improved energy efficiency of the fleet.

17.6 Any reductions achieved by the Bahamas proposal would be in relative terms, i.e. fuel prices might drive more efficient shipping but have no power to limit the overall emissions if volumes of trade are growing. Indeed the Bahamas proposal explicitly rejects the notion of a cap on emissions from the sector. However, the Bahamas' Focal Point has indicated that its understanding is that mandatory technical and operational measures will be implemented such as the EEDI.

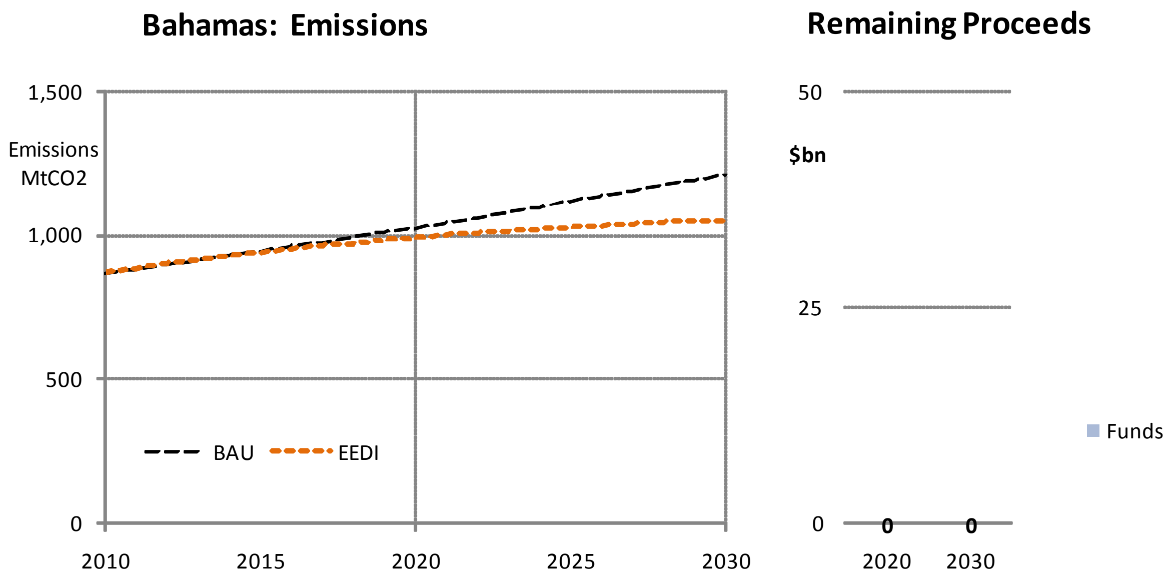
17.7 The proposal would apply to all ships engaged in both domestic and international shipping as fuel prices impact all market segments and trades.

17.8 Both internal and external drivers will influence bunker fuel prices over the coming decades. Key external drivers will include a rising demand for oil, with growth focused in developing countries, and constraints to supply including recent cutbacks in oil and gas investments as a result of the global financial crisis. The key internal driver would be the transition, which may occur to a greater or lesser extent, to more expensive marine gas oil (MGO) in order to meet stricter sulphur standards of the revised MARPOL Annex VI. In general, the shipping industry's expectations are for much higher fuel prices in the future, both as a result of MARPOL Annex VI and the general economic circumstances. The reference fuel price scenario used by this Expert Group assumes a significant price spike around 2020 as ships switch to 100 per cent MGO in order to meet the requirements of MARPOL Annex VI.

In-sector and out-of-sector reductions

17.9 In-sector and out-of-sector GHG emissions reductions were not modelled separately for the Bahamas proposal as agreed by the Expert Group. However, for illustrative purposes the model was run at two growth scenarios assuming a reference fuel price to show the business as usual scenario and the affect of a mandatory EEDI implemented at medium stringency. These are shown in Figures 17-1 and 17-2.

17.10 Under a scenario where a mandatory EEDI is not implemented, emissions increase by 38% above 2010 levels under the B2 scenario in 2030. Under the higher growth A1B scenario emissions increase by 74% by 2030. Under a higher fuel price assumption, with no EEDI implemented, emissions were 3% lower in 2030 under the B2 scenario and 6% lower under the A1B scenario.



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated by a proposal to mitigation. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. Under the modelled scenario there are no remaining proceeds as an MBM has not been implemented.

Figure 17-1: Modelled emission and remaining proceeds under Bahamas proposal under the B2 growth scenario

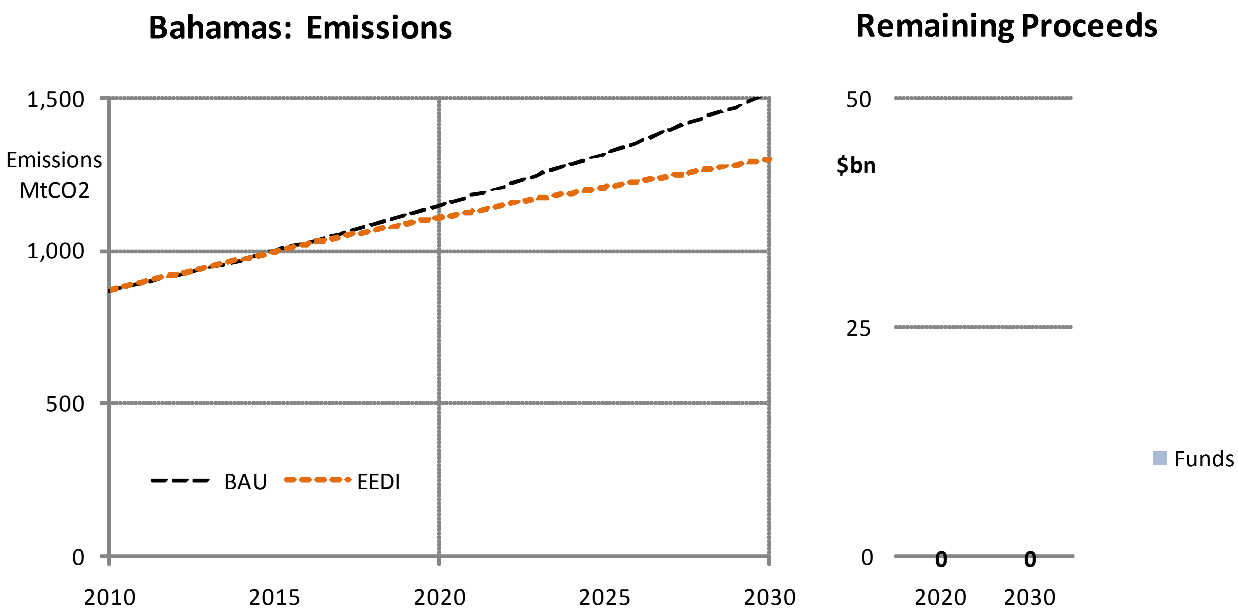


Figure 17-2: Modelled emission and remaining proceeds under Bahamas proposal under the A1B growth scenario

17.11 Should the EEDI be implemented at medium stringency, EEDI reductions would need to be taken into account in the evaluation of Bahamas's proposal. This would reduce emissions by 13% below BAU in 2030 under the B2 scenario and 15% below BAU in 2030 under the A1B scenario.

Certainty of reductions

17.12 In general, rising fuel prices will drive reduction as is stated in MEPC 60/4/10. However, it is difficult to predict the extent and timing of these reductions. While significant and extended increases in the cost of marine fuels can be expected to drive improvements in vessel efficiency, increases in marine fuel prices are driven by a host of macroeconomic factors that cannot be easily predicted. Therefore in general it is difficult to predict both the extent of reductions from changes in fuel prices as well as their timing.

17.13 One driver for higher fuel prices which seems more certain is MARPOL Annex VI which is likely to result in widespread switching from less costly heavy fuel oil to more expensive marine gas oil in the medium term. Assumptions agreed by the Expert Group suggest that this switch could result in an approximate 100 per cent increase in fuel prices by 2020 over the non MARPOL Annex VI scenario, however the extent to which these prices will affect international shipping could be influenced to a greater or lesser extent by the development and uptake of sulphur scrubbing technologies.

17.14 More broadly, the extent to which fuel prices will have an effect on emission reductions will be significantly influenced by expectations of future fuel prices, and how effective the fuel price alone may be in overcoming current non-price barriers. As a general observation, non-price barriers would continue to exist, although it may be reasonable to speculate that some barriers to more efficient design and operation would erode as fuel prices reach significant levels, such as those prices seen in 2008.

Cost-effectiveness of the proposed MBM

17.15 There are no additional costs of the Bahamas proposal to those that would arise under business as usual, which include the normal costs of fuel.

Administrative costs (including any central administrative requirements).

17.16 The Bahamas does not propose an MBM and so there would be no new or exogenous administrative costs to the sector.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

17.17 The volatile price of fuel has historically been an inhibitor for investment stability in shipping.

17.18 Many studies show that a large portion of the emissions from shipping is already in the BAU scenario cost-effective or even with negative MAC.

17.19 As discussed in other sections of this report, barriers exist that prevents uptake of such seemingly cost effective measures. One of the barriers to be considered is the ability of a shipowner to forecast the return on investment in new measures.

Credit for early action

17.20 Reduced fuel consumption is always providing cost savings in the industry.

Availability of technological and operational measures for CO_2 emission reduction

17.21 All available technical and operational measures may contribute to reducing CO_2 emissions from industry.

Practical feasibility of implementing the proposed MBM

17.22 This proposal expressly relies on the existing regulatory and incentive structures in the IMO in forwarding the goal of emissions reductions, thus it does not propose any new implementation of MBM. Consequently, in its operation, no new instruments are to be negotiated or developed, nor could there be any conflicts with or deviations from .existing international regulatory structures, and enforcement and avoidance issues would be dealt with under the existing rules and fora for regulation of international maritime commerce.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

17.23 No capacity building is required for either implementation or enforcement. There is no specific need associated with the proposal for technology transfer for new ship and operational efficiencies. No funds are raised under this proposal. The proposal states, however, that any money raised by the imposition of a market-based measure should be used to reduce emissions from ships and not to subsidize other industries.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC and the Kyoto Protocol

17.24 This proposal does not conflict with the UNFCCC or the Kyoto Protocol.

Compatibility with WTO

17.25 This proposal is not inconsistent with the WTO.

Compatibility with UNCLOS

17.26 No incompatibility with UNCLOS.

Relations with other climate finance institutions or initiatives

17.27 Bahamas contends that any funds from shipping should be proportional to the ratio between emissions from international shipping and global emissions. The Expert Group did not examine this further, as this issue is a policy decision best developed within the Committee or during further development of the proposal.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

17.28 As no MBM is proposed there is no additional administrative burden.

Compatibility with national law

17.29 There may be issues in national law in certain countries that require action to reduce GHG emissions from international shipping.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

17.30 The burden on ships and ship operators may change as other technical and operational measures becomes mandatory for the industry.

Additional workload onboard

17.31 Introduction of a mandatory EEDI for new ships will add to the onboard workload due to addition of technology to reduce emissions.

Additional economic impact for individual ships and the shipping industry

17.32 Mandatory EEDI for new ships may, depending on the stringency level introduced, force some designs to have lower speed. Such a development could potentially call for more ships to be in operation to carry the required trade.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

17.33 Not applicable, as no MBM is proposed.

18 A REBATE MECHANISM FOR A MARKET-BASED INSTRUMENT FOR INTERNATIONAL SHIPPING – IUCN (MEPC 60/4/55)

FOCAL POINT SUMMARY OF THE PROPOSAL

18.1 A Rebate Mechanism, as proposed in MEPC 60/4/55 by IUCN, aims to reconcile the different principles of shipping and climate conventions. Through the mechanism developing countries can be rebated the cost or impact of a maritime MBM. The maritime MBM is defined here as any Market-Based Instrument or Measure (MBM) for international maritime transport. The Rebate Mechanism can apply, in principle, to any maritime MBM, which generates revenue, such as a levy on fuel or an ETS.

18.2 The mechanism calculates the rebate in a top-down manner using the global MBM costs and a simple key, country-by-country. The proposed key is a country's share of global imports by value. A developing country could forego its rebate, or part of it, and be internationally credited for such action. Developed countries are automatically credited for the amount of financing raised through the MBM, based on the same key. Consequently, net revenue raised, after rebates have been issued, would come from customers in developed countries only, complying with the principles and provisions of the UNFCCC.

18.3 This unique Rebate Mechanism has been integrated with a levy to illustrate how it can be operationalized, according to the MEPC 60/4/55. Under the integrated version a market driven levy is established on fuel bunkered, as an alternative for a levy on GHG emissions. The levy would apply to all ships over a predetermined size, engaged in international maritime transport, irrespective of their flag and nationality of the shipowner. The liable entity in the scheme is the ship, uniquely identified by its IMO number.

18.4 In order to deliver proportionality of the shipping effort in combating climate change, the levy is linked to a prevailing fee on land transport emissions, or to the rolling average market carbon price, as available. It is set constant for a quarter, at least 30 days in advance of the start of each quarter. In order to increase investment certainty, the levy is bounded by predetermined price floor and ceiling. Fuel bunkered in a given quarter must be electronically reported and is subject to payment of the constant levy for that quarter. The levy is obtained centrally, bypassing national coffers, and aggregated providing the scheme's gross revenue.

18.5 In order to reduce the burden on the shipping industry, and guarantee a rapid deployment globally, a computer-based system and simple processes are defined. The system is based on a central emissions registry (ER), holding an emission account for each ship, and a predetermined global bank (BK), or banks, providing a payment account for each ship. The scheme operates through six processes:

.1 Reporting of fuel bunkered, by ship (manager) to ER;

.2 Payment of the levy, by ship (charterer) to BK, directly;

.3 Status check of ship's compliance, by Port and flag State Control (PSC and FSC) with ER;

.4 Enforcement of compliance, by PSC and FSC;

.5 Certification of ship compliance, by FSC; and

.6 Disbursement of revenue raised, by BK and/or predetermined funds.

18.6 In order to comply with the UNFCCC principles, including the principle of common but differentiated responsibilities and respective capabilities (CBDR), the Rebate Mechanism as introduced above applies, and is the first step of the disbursement process (6).

18.7 In order to maximize environmental effectiveness and cost-efficiency, the entire net revenue raised is to be disbursed through existing institutions for:

.1 adaptation to climate change in developing countries;

.2 reduction of emissions from deforestation and forest degradation (REDD+); and

.3 technology, R&D, transfer, and transformation in the shipping sector. Furthermore, setting of the ship size threshold higher than 400 GT is proposed for an initial period of time.

ASSESSMENT OF THE PROPOSAL

Environmental effectiveness

Mechanism of achieving reductions

18.8 The IUCN proposal (Rebate Mechanism) primarily focuses on a Rebate Mechanism for compensating developing countries for the financial impact flowing from a MBM. A developing country's rebate would be calculated on the basis of their share of global costs of the MBM, using readily available data on a developing country's share of global imports by value as a proxy for that share (or another metric such as value-distance if data becomes available).

18.9 The proposal indicates that, in principle, the Rebate Mechanism could be applied to any MBM provided it generates revenue of at least 30% of the MBM global impact on costs (this is because 30% is the percentage of imports by global share attributed to developing countries).

18.10 The Rebate Mechanism has been integrated with a system following the IUCN submissions to MEPC 60/4/55 and further details provided in the IUCN Technical Report submitted to the MBM-EG under paragraph 4.7 of the Terms of Reference of MBM-EG. To illustrate how the Rebate Mechanism can be operationalized; and allow the proposal to be comprehensively assessed according to the criteria against which all the MBM proposals are reviewed. This option of the proposal is referred to in this document as "RM integrated" and is described below. In this respect, this option of the proposal therefore has certain common elements with the GHG Fund proposal.

18.11 Given the above, the Rebate Mechanism proposal would (as other MBMs) deliver in-sector and out-of-sector reductions through:

.1 In-sector via the carbon levy that would be paid by ships on the amount of fuel bunkered in each quarter. The proposal envisages that the levy would be set constant for a quarter and established at least 30 days before the quarter through a pre determined mechanism. The levy rate would be indexed to the prevailing carbon price on land transport or to the carbon price in the largest economy-wide ETS and set according to a rolling average market price over a defined period. The rate could not however exceed a price ceiling nor fall below a price floor which would be pre-determined through a specified formula. Ships would pay the levy centrally, into an account in a predetermined bank or banks, to bypass national budgetary processes.

.2 Out-of-sector reductions based on a proportion of the revenue after rebates are used for mitigation projects in developing countries.

18.12 It is important to note that the "RM integrated" would collect a carbon equivalent levy on each tonne of fuel consumed by international shipping. This means that the gross revenue collected would represent a large fraction of the total costs of the MBM, providing for a significant amount of this revenue to be used for non-compensation purposes. A different amount of revenue may be available for these purposes if the Rebate Mechanism were to be linked to a different MBM such as ETS.

18.13 The Rebate Mechanism proposal does not set an efficiency target or target line for net emissions from international shipping; indeed the proposal indicates that setting the levy rate based on a prevailing carbon price means that a global reduction target for international shipping would not be required. However, a certain amount of emissions reductions would be delivered each year through the disbursement of net revenue to various funds.

18.14 The Rebate Mechanism would apply to all ships engaged in international trade above a certain size threshold, and to all fossil fuels. The proposal envisages that the threshold could be initially set higher than 400 GT, and suggests a threshold of 4,000 GT to reduce the number of liable entities and thus facilitate implementation.

18.15 The Technical Report that accompanies the Rebate Mechanism proposal suggests this threshold would practically exclude all ships transporting goods to Small Island Developing States. Analysis by the Expert Group indicates a threshold of 4,000 GT would cover around 91 % of emissions from international shipping and 24,000 ships.

18.16 In broad terms the Rebate Mechanism proposal could be expected to deliver a similar amount of in-sector emission reductions as the Norwegian ETS, and potentially the PSL, as the price experienced by actors in the sector would be derived from an external carbon market. This price based incentive would broadly function in the same way as discussed above for other price based mechanisms including the GHG Fund, the Norwegian ETS and the PSL, and would be subject to the same caveats about non-price barriers.

18.17 Two factors that would have an important influence on the levy rate under the "RM integrated" are:

.1 the choice of ETS or land transport carbon price to which the levy is indexed; and

.2 the presence of a price floor and price ceiling in the Rebate Mechanism.

Each of these is discussed below in turn.

18.18 The IUCN Technical Report indicates that the levy rate would be linked to the rolling average carbon price over a pre-determined period of time in the largest economy-wide ETS or the prevailing price on land transport. The level of ambition reflected in the largest economy-wide ETS would therefore have an important bearing on the carbon price, as would any linking between the largest economy wide ETS and other ETS (for a discussion of the effect of linking see discussion in the Norwegian ETS, chapter 14). The treatment of the transport sector in such an ETS will be an equally important determinant of price as it is proposed that the rate of the levy would be adjusted downward to reflect any free allocation of allowances to the transport sector, so that international shipping would experience the same costs as land transport in the largest economy-wide ETS.

18.19 While the carbon price in the largest economy wide ETS would be the basis for setting the levy rate, a price floor and price ceiling would moderate this price. A price floor and price ceiling should in theory provide shipping with greater certainty over the long run price which could assist in addressing certain non-price barriers that influence the uptake of cost effective emissions reductions opportunities. The proposal does not discuss how the MBM would address a scenario where the carbon price in the largest economy-wide ETS deviated from that price bound for a significant period of time, and it may be important to examine this further if such a "price collar" is considered further.

18.20 As for the GHG Fund, LIS, VES and some of the ETS proposals, the Rebate Mechanism proposes to earmark a portion of revenue to R&D in shipping which could aid in bringing forward technical advances that could contribute to further in-sector reductions.

18.21 The IUCN Technical Report suggests that when integrated with an MBM which raises gross revenue that is comparable with the total costs of the MBM, 70% of gross revenue would be available after 30% had been provided to developing countries for compensation purposes. Of the remaining 70%, the Rebate Mechanism proposes that 40% could be directed to REDD+ arrangements with a further 40% used for adaptation and the remaining 20% directed to the proposed Maritime Technology fund. The absolute amounts directed to various purposes, could of course be higher or lower depending on final revenue policies, and may be different depending on the MBM to which the Rebate Mechanism is applied. However, for the purpose of modelling, the revenue allocation proposed in the IUCN Technical Report has been used.

18.22 The Rebate Mechanism proposal also suggests that some advanced developing countries could decide to forgo their rebate, which would increase the amount of funding available to be directed towards these activities.

In-sector and out-of-sector reductions

18.23 For the Rebate Scheme, modelling was used to observe how growth rates, the model carbon price and the price floor and price ceiling, could be expected to influence in-sector and out-of-sector reductions. For further information about the model, the assumptions that underpin the model, its limitations and the scenarios examined see annex 5.

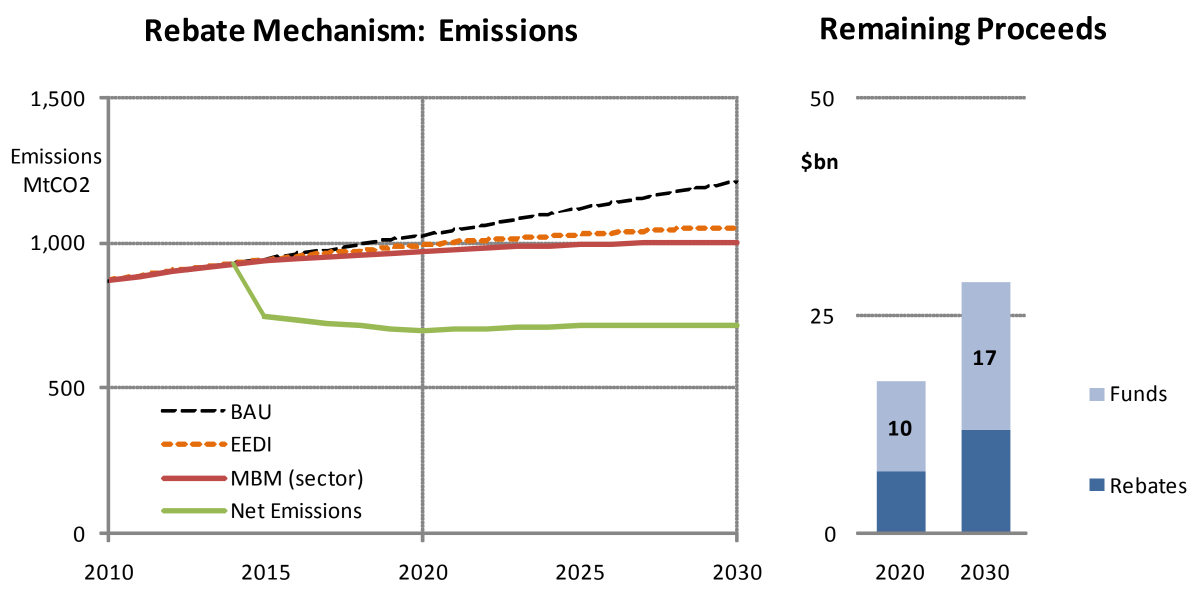
18.24 Figure 18-1 and Figure 18-2 illustrate modelling for each growth scenario assuming 30 per cent of revenues are rebated to developing countries and 28 per cent of revenues are used to purchase out-of-sector reductions (as per the IUCN Technical Report). A reference fuel price and medium model carbon price were used in these model runs. These scenarios are referred to below as the B2 and A1B reference scenarios for the Rebate Mechanism.

18.25 The line graphs show business as usual emissions (black line), and for illustrative purposes the expected emissions if a mandatory EEDI were to be implemented at medium stringency (dashed orange line). It is important to note that the reduction in emissions from the EEDI are not to be attributed to the Rebate Mechanism and would only occur if the EEDI is mandatorily implemented. In-sector emissions that could be expected following the addition of a carbon price to fuel, are represented by the red line (MBM), and achieved GHG emissions from shipping (following the purchase of projects credits or other allowed credits or allowances) are depicted by the green line.

18.26 The remaining proceeds from the Rebate Mechanism are illustrated through the bar graphs which show two elements:

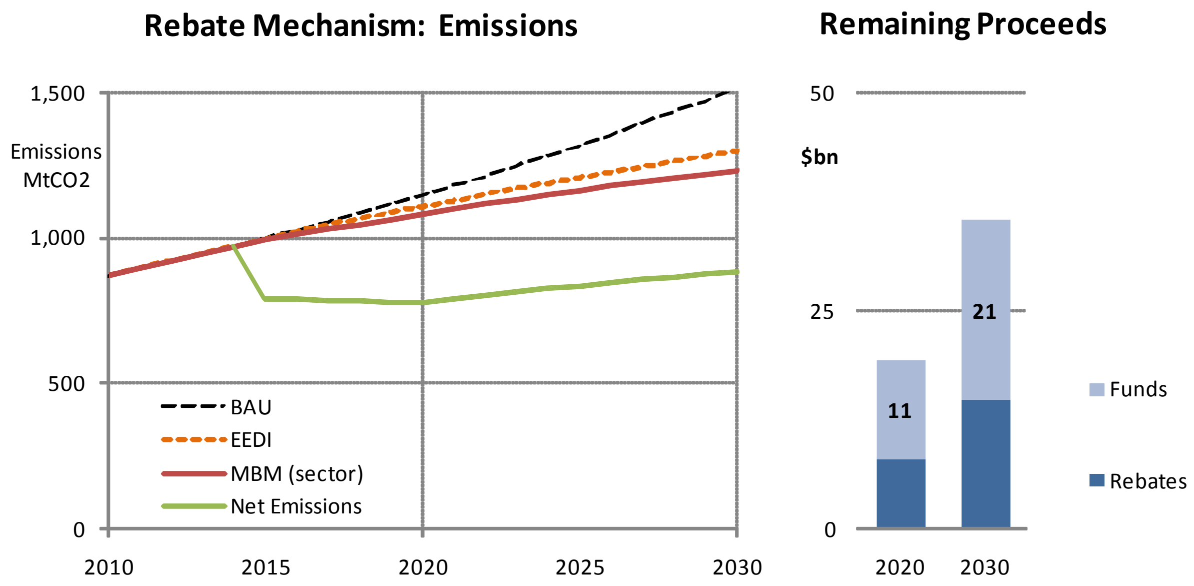
.1 Funds used to rebate developing countries for the impacts flowing from the scheme are shown (Rebates); and

.2 Revenue that is proposed to be used for adaptation and R&D. How these funds would be spent are not prescribed by the MBM and would be subject to policy considerations should the proposal be adopted, as explained in the text accompanying the graph.



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. In the case of the RM integrated remaining proceeds do not include the thirty per cent of revenue proposed to be rebated to developing countries as these are assumed to be retained by national governments. Revenue proposed to be used for mitigation (28 per cent) is also not shown as remaining proceeds as this revenue has been used to achieve the net emissions shown on the graph. Under the IUCN proposal remaining proceeds are proposed to be available for adaptation and R&D. Whilst 100 per cent of remaining proceeds would not be used for mitigation, in order to compare across distinct proposals, the ***potential supplementary out-of-sector reductions*** from using 100 per cent of remaining proceeds for mitigation was calculated to be **409 Mt in 2020 and 421 Mt 2030**.

Figure 18-1: Modelled emissions and remaining proceeds under the Rebate Mechanism for the B2 growth scenario under a medium carbon price and reference fuel price



The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. In the case of the RM integrated remaining proceeds do not include thirty per cent of revenue proposed to be rebated to developing countries as these are assumed to be retained by national governments. Revenue proposed to be used for mitigation (28 per cent) is not shown as remaining proceeds as this revenue has been used to achieve the net emissions shown on the graph. Under the IUCN proposal remaining proceeds are proposed to be available for adaptation and R&D. Whilst 100 per cent of remaining proceeds would not be used for mitigation, in order to compare across distinct proposals, the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these remaining funds for mitigation was calculated to be **455 Mt in 2020 and 517 Mt in 2030**.

Figure 18-2: Modelled emissions and remaining proceeds under the Rebate Mechanism for the A1B growth scenario under a medium carbon price and reference fuel price

18.27 Under the Rebate Mechanism reference scenarios, modelled emissions were held consistently at around 30 per cent below business as usual in both 2020 and 2030 and across both growth scenarios. This consistency results from the carbon equivalent levy being charged on 100 per cent of fuel consumption and 28 per cent of revenue being allocated to project credit or REDD+ arrangements. Because of this approximate three to ten ratio, circa 30% of the GHG emissions from international shipping would be offset.

18.28 The Rebate Mechanism proposal suggests that out-of-sector reductions could be delivered through REDD+ and indicates the possibility of purchasing emission reductions at a discount of 20%. While, as discussed above, the future form of REDD+ is uncertain, the extent to which revenues would deliver reductions could be increased if such a discount could be obtained.

18.29 The levy applied to fuel would deliver a small amount of in-sector reductions, but under the modelled reference scenarios for the Rebate Mechanism (shown above) these reductions represented around seven per cent of the total reductions in 2020 and 16 per cent of the total reductions in 2030.

18.30 Key model results for the Rebate Mechanism reference scenarios are also shown in Table 18-1.

Table 18-1: Modelled emissions and emission reductions under the Rebate Mechanism for the B2 and A1B growth scenario with 28% of revenue used for offsetting, a medium carbon price and reference fuel price

	Year	B2	A1B
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	701	780
	2030	721	887
MBM in-sector reductions (Mt)	2020	20	22
	2030	52	64
MBM out-of-sector reductions (Mt)	2020	273	303
	2030	280	345
MBM reductions (% of BAU)	2020	29%	28%
	2030	28%	27%
MBM in-sector reductions (% of MBM reductions)	2020	7%	7%
	2030	16%	16%
Potential for supplementary out-of-sector reductions (Mt)	2020	409	455
	2030	421	517

The term 'remaining proceeds' is used by the Expert Group to refer to revenue generated by an MBM after subtracting any revenue explicitly allocated to mitigation and any revenue assumed to be retained by national governments. Remaining proceeds could be used for a range of purposes including climate change adaptation and mitigation, and R&D. In the case of the RM integrated remaining proceeds do not include thirty per cent of revenue proposed to be rebated to developing countries as these are assumed to be retained by national governments. Revenue proposed to be used for mitigation (28 per cent) is not shown as remaining proceeds but the line graph shows reductions achieved from this revenue as net emissions. Under the IUCN proposal remaining proceeds are proposed to be available for adaptation and R&D. Whilst 100 per cent of remaining proceeds would not be used for mitigation, in order to compare across distinct proposals, the ***potential supplementary out-of-sector reductions*** from using 100 per cent of these remaining funds for mitigation is shown.

18.31 Under the medium carbon price scenarios, in-sector reductions under Rebate Mechanism are broadly similar to other MBM that apply a full externally derived carbon price such as the PSL and the ETS. The modelled in-sector emission reductions from the Rebate Mechanism are subject to the same uncertainties described for other proposals which stem from uncertainty about how shipping would respond to price incentives on fuel.

18.32 Under a high carbon price scenario, the price floor and price ceiling of the Rebate Mechanism was observed to have a significant influence on the emission reductions achieved by the MBM. This effect was observed by comparing the Rebate Mechanism under the high carbon price scenario with and without the price floor and price ceiling. These model runs are shown in annex 9.

18.33 The effect of the price ceiling is reduced total revenues from the scheme by around 50 per cent in 2030 and cumulative emission reductions in 2030 are reduced by 40 per cent. At the same time the price ceiling limited the gross costs of the scheme to $55 billion in 2030, compared to $118 billion in 2030 when such a constraint is not in place (reductions of circa 50%). The modelled effect of the price floor and ceiling present a reasonable robust prediction of what could be expected if carbon prices quickly exceed the price ceiling.

18.34 The range of responses in terms of MBM reductions observed under all scenarios modelled for the Rebate Scheme are shown in Table 18-2. The term 'remaining proceeds' is explained in the caption to Table 18-1.

Table 18-2: Ranges for emission reductions observed when modelling the Rebate Mechanism in 2030

Key elements	Rebate Mechanism	
	High	**Low**
MBM in-sector reductions (Mt)	68	29
MBM out-of-sector reductions (Mt)	345	124
MBM reductions (% of BAU)	28%	13%
MBM in-sector reductions (% of MBM reductions)	31%	9%
Remaining proceeds ($billion)	23	17

Certainty of reductions

18.35 The Rebate Mechanism does not aim for a particular emissions reduction target in terms of either an efficiency target, or a net emission target line or cap. Agreed rules that govern the disbursement of net revenue to various funds would deliver a reasonably steady amount of out-of-sector emission reductions (not counting the amount as spent on abatement for the reason discussed under Norwegian ETS). The amount would be somewhat predicable over the short to medium term, once the starting carbon price, cost of out-of-sector reductions and the revenue distribution policy has been agreed and can be seen.

18.36 Similarly, the extent to which in-sector reductions would be stimulated by the carbon price is uncertain, for reasons that have been discussed for other carbon price based MBMs including, in the case of the Rebate Mechanism, uncertainty about the future carbon price that would apply if the proposal were to be implemented (see Common concept 4, Carbon Price and Common concept 5, Future availability of international emission project offsets).

18.37 The Rebate Mechanism proposes that out-of-sector reductions would be delivered through REDD+ arrangements. It is important to note that the status of REDD+ is currently being debated in the context of a post 2012 outcome, including whether or not REDD+ abatement will be delivered through a market-based mechanism. While there is some support for market-based mechanisms for REDD+ arrangements, a number of challenges would first need to resolved including; institutional capacity and practical but effective ways of dealing with establishing reference levels, dealing with displacement of emissions, and addressing the risks of non-permanence.

18.38 Nevertheless, while the status of REDD+ as a market-based source of mitigation is uncertain, as discussed for the GHG Fund proposal, the future existence of some form of project credit market is less uncertain. Credits available through that market, whether REDD + or of another type, could be used to deliver the out-of-sector reductions proposed under the Rebate Mechanism. Credit availability issues are discussed in Common concept 5, Future availability of international emission project offsets.

18.39 As with other MBM that require reporting of fuel consumption, there is potential for deliberate underreporting which could affect the effectiveness of the scheme. However, the IUCN Technical Report outlines reasonably detailed monitoring, reporting and verification procedures, often facilitated by electronic systems, which appear reasonably robust. For example, an online central database to check compliance status of individual ships, would provide Port State Controls with a tool to identify non compliant ships and enable them to take appropriate action.

18.40 Should this proposal or any other of the proposals be developed further, it would be necessary to carefully scrutinize possible procedures and mechanisms designed to minimize the risk of fraud and evasion.

18.41 Robust monitoring, reporting, verification and additionality requirements for out-of-sector reductions are also critical to the environmental integrity of the scheme. So long as out-of-sector reductions under the Rebate Mechanism are from regulated carbon markets, the environmental integrity of the scheme would be subject to the same considerations as noted earlier in the discussion of the GHG Fund proposal.

Cost-effectiveness of the proposed MBM

18.42 Table 18.3 shows gross costs under the reference scenarios for the Rebate Mechanism. This is apportioned into three components. Firstly, costs of emission credits, which in the case of the Rebate Mechanism are purchased by the central fund. Secondly, rebates represent the portion of gross costs that are provided to developing countries to offset the costs flowing from the scheme. Thirdly, net fund represents revenues remaining for other purposes after credits have been purchased and rebates provided.

Table 18-3: Modelled cost under the Rebate Mechanism for the B2 and A1B growth scenario with 28% of revenue used for offsetting, a medium carbon price and reference fuel price

	Year	**B2**	**A1B**
Financial: gross costs ($billion)	2020	24	27
	2030	40	49
Rebates to developing countries ($billion)	2020	7	8
	2030	12	15
REDD+ ($billion)	2020	7	8
	2030	11	15
Funds ($billion)	2020	10	11
	2030	17	21
MBM in-sector reductions (Mt)	2020	20	22
	2030	52	64
MBM out-of-sector reductions (Mt)	2020	273	303
	2030	280	345
Cost of reductions ($/tonne CO_2 abated)	2030	120	121
Maximum cost-effectiveness potential ($/tonne CO_2)	2030	53	53

18.43 Since the Rebate Mechanism relies on out-of-sector reductions to deliver a noteworthy portion of the reductions, a significant uncertainty is related to the future state of the carbon market and the costs of achieving reductions from implementing the proposal, or indeed any other proposal that relies on out-of-sector reductions. This is discussed in Common concept 1.

18.44 The total direct cost for the industry in the A1B scenario is estimated to be $49 billion[35] in the year 2030.

18.45 Indirect costs consisting primarily of additional administrative burdens onboard, in shipping companies, in flag State Administrations, in port State control organizations and not least in operation of the GHG Fund mechanism, have not been quantified.

18.46 In the proposal the use of funds to off-set emissions out-of-sector and for adaptation and R&D activities, is defined as whatever is left over after compensating the developing states.

A1B: Reference fuel price, 2030, medium carbon price

The cost-of reductions is estimated to be 121 \$/tonne CO_2 abated.

The amount of funds generated for other purposes is \$21 billion

The maximum cost-effectiveness potential of the proposal is 53 \$/tonne CO_2

Administrative Costs (including any central administrative requirements)

18.47 The main focus of the IUCN proposal is a Rebate Mechanism, which its authors claim can be applied to any type of MBM that generates revenue. This option of the proposal is referred to in the IUCN document as the "Rebate Mechanism add-on" option, or "RM add-on" for short.

18.48 The Rebate Mechanism has been integrated with a system following the IUCN submissions to MEPC 60/4/55 and further details provided in the IUCN Technical Report submitted to the MBM-EG under paragraph 4.7 of its Terms of Reference. This was done to illustrate how the Rebate Mechanism can be operationalized; and allow the proposal to be comprehensively assessed according to the criteria against which all the MBM proposals are being assessed. This option of the proposal is referred to in this document as "RM integrated". The examples provided in the "RM integrated" proposal refer to a market-based fuel levy, with upper and lower bounds on prices. In this respect, this option of the proposal therefore has certain common elements with the Denmark *et al.* 'GHG Fund' proposal (option 2).

18.49 The Rebate Mechanism (RM) is evaluated in terms of Administrative and Legal aspects as both an 'add-on' and 'integrated' scheme.

RM add-on

18.50 The administrative costs associated with this proposal would depend on the specific MBM that the proposed rebate scheme is applied to. However, the following tasks, that will incur associated costs, will be undertaken regarding a Rebate Mechanism.

18.51 In addition to the specific administrative costs associated with this MBM, a central body will be required to calculate and administer the disbursement of the MBM revenue, especially for the first step of disbursement to rebate the economic cost incurred by a developing country Party participating in the MBM. Involved in this process will be the need to calculate a country's usage of international shipping which is used as the country's share of the costs of applying the MBM. There will likely be a need for some sort of overview of the rebate process to ensure transparency and that the rebate is being used for the intended purposes.

35 A1B, Reference fuel price, Medium carbon price.

"RM integrated"

18.52 A centralized computer-based system undertaking a number of processes is proposed. The system is based on a central emissions registry (ER), holding an emission account for each ship, and a predetermined global bank (BK), or banks, providing a payment account for each ship. The scheme operates through six processes:

.1 reporting of fuel bunkered, by ship (manager) to ER;

.2 payment of the levy, by ship (charterer) to BK, directly;

.3 status check of ship's compliance, by flag and port States with ER;

.4 enforcement of compliance, by flag and port States;

.5 certification of ship compliance, by flag States; and

.6 disbursement of revenue raised, by BK and/or pre-determined funds.

18.53 In the disbursement process (6), the entire revenue raised by the scheme will be disbursed through two steps. In the first step, rebates will be calculated and disbursed to developing countries according to a predetermined formula. In the second step, the remaining (net) revenue will be disbursed to predetermined funds or organizations according to agreed rules. The net revenue will preferably be split between action on climate change in developing countries, with preferences for the most vulnerable, and technology transformation to low-carbon shipping globally.

18.54 The proposal argues that the administrative costs would be low due to a centralized structure, and estimates central costs as one to two per cent of funds raised. The proposal attributes its anticipated low operational and transactional costs to the use of the above computer-based system as well as low data requirements for fuel reporting and low transactional costs of paying the levy directly to a ship's bank account (quarterly or more often when convenient). However, all these issues, especially the amount of data that will need to be submitted and processed, will need further and careful consideration.

Proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

Provision of investment certainty

18.55 The proposal has a robust mechanism for setting of the levy on fuel bunkered. The adjustment of the levy is relatively frequent (every 3 months) which potentially makes the price fluctuate more than the GHG Fund proposal where the re-setting of the contribution is anticipated to take place at intervals of years, e.g., four years.

18.56 The Rebate Mechanism does however include both a price floor and a price ceiling that defines the boundary of levy fluctuation in the system, which has a stabilizing effect on cost predictability.

18.57 The Expert Group has assessed the cost predictability to be medium, however, many members were uncertain how to rate this aspect mainly due to uncertainty on which underlying mechanism would be used.

Credit for early action

18.58 The Rebate Mechanism is based directly on the amount of fuel consumed and any investments in efficiency improvements done prior or after entry into force of the proposal would thus result in similar emission reductions and hence impact the fee to be paid.

18.59 The proposal is thus rated "neutral" with regard to credit for early action in the sense that it does not provide enhanced benefits or drawbacks for early actions.

Availability of technological and operational measures for CO_2 emission reduction

18.60 The Rebate Mechanism recognizes all technical and operational measures that can limit the fuel consumption of a ship.

18.61 The proposal acts as a relatively high driver for uptake of in-sector measures due to the high carbon price tag on every tonne of fuel consumed. This factor will trigger more advanced abatement technologies to be applied – especially if in combination with a stringent mandatory EEDI regulation.

18.62 The absence of an emission cap and the interface to out-of-sector offsetting in the proposal ensures however, that only cost-effective measures would be applied.

Practical feasibility of implementing the proposed MBM

Development time for new IMO Instrument

18.63 The stated objective of this Rebate Mechanism proposal is to find a way to apply the principle of 'Common But Differentiated Responsibilities' (CBDR) in relation to emissions from international shipping, it may have the effect of shortening the whole time of developing a new legally binding instrument, however, seeking to apply the CBDR principle in IMO could in turn complicate the development time for a new IMO instrument.

RM add-on

18.64 It is noted that this option does not specify whether a new IMO Convention is needed, or not. However, the development time for any new instrument would be dependent on the MBM the Rebate Mechanism is to be associated with.

18.65 The development time is likely to be extended as a consequence of the discussions needed with regard to the incorporation of a Rebate Mechanism.

18.66 In particular, consensus will have to be achieved on the country import statistics to be used for calculating the rebates and crediting. The IMF is cited as the source of statistics to be used, although there could be other sources. However, it is noted that the proposal argues that as the countries themselves report import data to the IMF, it is unlikely that they would challenge or question their own data. It will also have to be considered if the proposed "share of imports", to be used as a factor for calculating the rebates to developing countries, is a clear reflection of the shipping industry's contribution to GHG emissions, as imports to a country could be transported via different means and not exclusively by shipping. In this regard it is noted that the proposal points out that Parties could replace the use of global imports by value with another measure when such information becomes available (for instance by a country's share of global seaborne imports by value-distance, or similar).

18.67 Also, the determination of the "gross cost" under an ETS option needs careful consideration, especially if there would be widescale acquisition of emission allowances and emission credits from other schemes and sources, rather than being obtained through auctions by the Central Administration. This could impact on the accounting of the funds and could result in the declaration of a lower "gross cost", which, in turn, would impact on the total amount of rebates due to developing countries.

"RM integrated"

18.68 It is noted that development of a new standalone IMO Convention is not proposed. The proposal points out that developing an entirely new convention, which has economic elements, may take a long time and thus significantly reduce the environmental effectiveness of the MBM.

18.69 For the technical aspects of the legislation it therefore proposes to amend one of the existing IMO instruments, for instance by adding a new part on GHG emissions to Annex VI of MARPOL. However, further detailed review would be necessary to assess whether or not there exists sufficient legal basis in the Articles of MARPOL for an amendment of Annex VI to mandate this system, or whether an amendment of another existing instrument would be more appropriate.

18.70 The proposal indicates that agreement on the economic aspect needs to be reached at the UNFCCC. However, given the scope of the UNFCCC, if agreed, the proposal argues that the mechanism would apply to all countries without the need to develop a new IMO Convention and could therefore avoid the potentially long time that may be needed to develop and ratify a new IMO Convention. A new instrument would have to be ratified by at least all the major economies to provide an effective MBM. However, the legal relationship between provisions split between IMO and UNFCCC instruments would need to be carefully considered.

Experience from similar schemes

RM add-on

18.71 While the proposal argues that there is no practical alternative to a global and differentiated mechanism that eliminates the impacts of an MBM on developing countries, the proposal makes no reference to similar rebate schemes, and no such similar scheme is known. Some may consider that the premise of eliminating the impacts of an MBM on developing countries itself may be controversial. Others may argue that such compensation is needed to deliver on equity considerations arising from global action on climate change.

RM integrated

18.72 The above comments relating to the RM add-on option applies also to this option. However, it is noted that the proposal advocates that for some aspects of this option, such as online reporting, recording of fuel consumption in the Oil Record Book, direct payments to a bank account, and flag and port State control mechanisms, there are significant experiences available, in-sector and out-of-sector, that the scheme could build upon.

Ease of implementation and potential for phased implementation

RM add-on

18.73 On the assumption that accurate data on imports (by sea) for each country are readily available, it may initially appear that the proposal would be easy to implement. However, the amount of data required to be submitted and processed need consideration to ensure that the scheme is not unduly burdensome. Considerations on disputes about official data used to calculate the rebates needs to be addressed.

18.74 It is possible that there would be audit requirements by the central body given the amount of money involved in this rebate scheme. Such audit requirements will need to be carefully considered, especially to assess if they could have an impact on the practical feasibility and ease of implementation of the proposal.

RM integrated

18.75 It is noted that the proposal argues that its computer-based system requires little data and can be easily implemented. However, the amount of data required to be submitted and processed will need consideration. The Focal Point noted that the data requirement in the proposal is arguably well specified and that the amount of data required is modest.

18.76 Regarding the possibility for phased implementation, the proposal advocates that the application threshold could be initially set at a level higher than 400 GT, for instance at 4,000 GT. This would exempt the majority of ships serving the Small Islands Developing States (SIDS), and thereby guarantee that their economies would not be negatively impacted by the proposed MBM. The proposal also argues that such a higher application threshold would accelerate the scheme implementation by significantly reducing the number of ships subject to the instrument, initially. At the same time it would reduce the total emissions covered by a small amount only (see Table 18-4).

Table 18-4: Coverage of MBM versus ship size threshold

Ship Size Threshold (in GT)	**No. of Ships** (thousand)	**No. of Ships** (% of base)	**Emissions** (% of base)
400 (base)	43	100%	100%
2,000	30	71%	96%
4,000	24	57%	91%

Source: Ship analysis provided by Lloyd's Register

Enforcement, potential for evasion and avoidance of carbon leakage

18.77 The Rebate Mechanism will be administered by an independent central body, which, *prima facie*, should facilitate minimizing the potential for evasion or carbon leakage.

18.78 The proposal suggests that the application threshold for the MBM could be set at a level higher than 400 GT, possibly at 4,000 GT. This proposal needs to be carefully considered to assess any consequential carbon leakage, noting that, based on a simple GT threshold, not all ships below the threshold trade exclusively between SIDS or other developing countries.

18.79 Regarding the RM add-on option, within the proposal it is stated that developing countries that are Parties to the UNFCCC would be entitled to obtain a rebate. However, if a new IMO Convention is adopted to adopt a MBM, which incorporates such a Rebate Mechanism, will the Parties to this new instrument agree that rebates can go to non-Parties?

Alternatively, do the rebates prioritize SIDS and LDCs only, or does it go to all developing countries equally?

18.80 For the "RM integrated" option, a high level of compliance with the scheme by ships is assumed in the proposal on the basis of the ships' compliance visibility via the "Status Check" process. Both flag and port States would have on-line access to the emissions registry, and would be able to query a ship's compliance with the scheme by just entering the IMO number of the ship, which would ultimately ease verification of compliance, as noted by the proponent.

18.81 It is noted that the rebates would be transferred back to the governments of developing countries. As a number of developing countries have substantial fleets, that may or may not be owned by individuals or companies based in these countries, it needs to be considered if there could be a situation where the industry is 'paying', without knowing how the national government receiving the rebate will allocate the money so received.

Need for technology transfer to, and capacity building within, developing countries, in particular the least developed countries (LDCs) and the small island developing states (SIDS), in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

18.82 There would be similar capacity building needs as for the other market-based measures. There would be further capacity building requirements to enable developing countries to access and apply for the Rebate Mechanism.

18.83 There would be whatever technology transfer requirements for new ship and operational efficiencies as entailed by any given market-based measure.

18.84 The Rebate Mechanism would raise funds that could be distributed to developing countries, using a scale based on a country's share of global imports by volume. The rebates to developing countries can be used for national climate change action, based on a sovereign decision of the country receiving the rebate, according to the proposal.

	Year	**B2**	**A1B**
REDD+ ($bn)	2020	**7**	**8**
	2030	**11**	**14**
Funds ($bn)	2020	**10**	**11**
	2030	**17**	**21**

18.85 Potential climate financing for developing countries comprise REDD+ and funds as shown in the table above.

MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

Compatibility with UNFCCC

18.86 Common concept 14, UNFCCC 1 and UNFCCC REVENUE, describe the Expert Group's views on general compatibility with the UNFCCC for this proposal.

Compatibility with Kyoto Protocol

18.87 Common concept 15, Kyoto Protocol, describes the Expert Group's views on general compatibility with the Kyoto Protocol for this proposal.

Compatibility with WTO

18.88 Common concept 16, WTO, describes the Expert Group's views on general compatibility with the WTO for this proposal.

Compatibility with UNCLOS

18.89 Principle of incorporating a Rebate Mechanism as part of a MBM may not present any compatibility problems regarding UNCLOS.

Relations with other climate finance institutions or initiatives

18.90 Noting that within this proposal it is intended to provide a potential to account for a share of emissions from international maritime transport in national totals, and thus address the reporting of such emissions. This scheme may address the issue of allocating ship emissions as considered by UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA) under its agenda item 7(a) – "Methodological issues under the Convention: Emissions from fuel used for international maritime transport".

18.91 The funding generated by this proposal could contribute to the Copenhagen Accord's goal of mobilizing scaled-up financing for climate change actions from developed countries, given that developing countries only would be entitled to rebates.

Potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

Administrative requirements for implementation and enforcement

RM add-on

18.92 The total extent of administrative burdens and legal issues would depend on the base MBM that this rebate scheme may be premised upon.

RM integrated

18.93 There may be new responsibilities for Administrations, similar to the ones described for the GHG Fund (option 2). The proposal advocates that to alleviate any additional burden, MARPOL Annex VI, regulation 18 could be augmented to require a unique sequence number on the Bunker Delivery Note (BDN). Such an addition would make BDN more suitable for business integration, including fuel measurement, reporting, and verification. It also suggests considering implementing two sequence numbers, one for the receiving ship and one for the fuel supplier. It argues that this could provide additional benefits, such as fraud prevention.

Additional workload for flag State per ship

RM add-on

18.94 As this is a rebate scheme to disburse collected funds to developing countries, there seem to be no significant impact on the workload for flag States in relation to the Rebate Mechanism *per se* and the activities they undertake on ships that fly their flag. As noted, the additional workload under this heading would depend on the underlying MBM that this rebate scheme is to be associated with.

RM integrated

18.95 Additional workload will be required as a consequence of the scheme's Certification process. In this regard, it is noted that the proposal suggests that computer tracking and automatic cross-checking of fuel records (including the use of sequence numbers on BDNs) could be used to alleviate the amount of potential checks of Bunker Delivery Notes and/or Oil Records Book.

Impacts on port State inspections and additional workload per call or inspected ship

RM add-on

18.96 As this is a rebate scheme to disburse collected funds to developing countries, there seem to be no significant impact on the workload for port States in relation to the Rebate Mechanism *per se* and the activities they undertake on ships that enter their jurisdiction. As noted, the additional workload under this heading would depend on the underlying MBM that this rebate scheme is to be associated with.

RM integrated

18.97 It is envisaged that Port State Control (PSC) would be able to use the on-line "Status Check" to validate compliance of ships entering its jurisdiction. However, additional control of existing documents, such as Bunker Delivery Notes, may be required.

Availability of skilled human resources

RM add-on

18.98 The implementation of a Rebate Mechanism, as a part of a MBM, does not appear, *per se*, to require any particular additional skills that would not be necessary in relation to the implementation of the MBM proposal on which this rebate scheme is premised. As noted, the additional workload under this heading would depend on the underlying MBM that this rebate scheme is to be associated with.

RM integrated

18.99 The proposed scheme relies to a degree on using computer systems, so appropriate and relevant IT skills will be required.

Compatibility with national law

18.100 When considering this proposal, CO_2 as a Pollutant and the International Tax Contribution discussed within Common concept 17, should be borne in mind.

18.101 Some states may have legal challenges providing rebates to countries given trade, currency and environmental concerns. These are general compatibility challenges which would need to be dealt with on development.

Sovereignty implications

18.102 Some countries will have sovereignty concerns with using funds derived from its citizens for a Rebate Mechanism in other countries.

Potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

Administrative burden for ships and ship operators

18.103 Ships are already required by MARPOL Annex I to carry on board an Oil Record Book where amounts of fuel bunkered must be recorded. In addition to this, MARPOL Annex VI requires ships to keep on board for 3 years the Bunker Delivery Notes issued by bunker suppliers.

18.104 The Rebate Mechanism proposal would not significantly expand the requirements already placed on ships to maintain records of fuel bunkered and to carry appropriate related documentation.

18.105 The administrative burden on board is considered low.

18.106 The legal requirement is placed on the ship. Shipowners, operators and charterers would likely develop the commercial agreements to ensure the levy is paid in timely to avoid any potential disturbance of ships operations by PSC.

Additional workload onboard

18.107 In the assessment of the Rebate Mechanism the Expert Group found that it is likely to be a stronger driver for uptake of emission reduction technologies due to its built in incentives and that it in the reference scenario drives 64 million tonnes of in-sector emission reductions. This represents an additional workload compared to what is being generated by a mandatory EEDI (extra 30% reductions) but the uptake would not be evenly distributed and the total workload onboard individual ships has not been quantified.

18.108 For the industry as a whole the Expert Group estimated the additional on board workload to amount to some $0.8 billion or about 1.5% of the gross cost of the proposal. It is emphasized that this value is a gross estimation.

Additional economic impact for individual ships and the shipping industry

18.109 The shipping industry has established well functioning practices to make sure that the appropriate parties in the transport chain pays for the fuel.

18.110 Similarly to the other proposals, this proposal places an additional price element on each tonne of fuel used onboard ships and it is expected that the industry would adopt contractual agreements to ensure the additional cost would be borne by those parties already responsible for paying the fuel billion.

18.111 The need for additional tonnage will depend on the underlying MBM the Rebate Mechanism is linked to.

MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

Requirement for a new IMO instrument

RM add-on

18.112 As this is a rebate scheme to disburse collected funds to developing countries, the requirement for a new IMO instrument would be based on the MBM proposal on which this rebate scheme is premised.

RM integrated

18.113 As explained within Development time for new IMO Instrument above, no new IMO instrument is envisaged. The technical, implementation provisions could, according to the proposal, be implemented by amending existing instruments. However, further detailed review will be necessary to assess whether or not there exists sufficient legal basis in the Articles of MARPOL for an amendment of Annex VI to mandate this system, or amend any other existing instrument.

Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)

RM add-on

18.114 There is a requirement for a Central Administration to manage the disbursement of funds collected to developing countries – but this will probably be the same body that would be administering, on an international basis, the MBM.

RM integrated

18.115 In this option a Central Emissions Registry and banking arrangements are needed, *inter alia*, to report fuel bunkered and directly pay the levy, according to the proposal.

Role of flag State

RM add-on

18.116 As this is a rebate scheme to disburse collected funds to developing countries, the role of the flag State would be determined mainly by the base MBM on which this rebate scheme is premised.

RM integrated

18.117 The proposal seems to implement standard IMO enforcement and control framework through the following relevant processes:

.1 status check of ship's compliance, by flag and port States with the ER;

.2 enforcement of compliance, by flag and port States; and

.3 certification of ship compliance, by flag States.

Role of port State

18.118 As this is a rebate scheme to disburse collected funds to developing countries, the role of the port State would be determined more by the base MBM on which this rebate scheme is premised.

Role of recognized organizations

18.119 As this is a rebate scheme to disburse collected funds to developing countries, the role of the RO would be determined more by the base MBM on which this rebate scheme is premised.

Survey, Certification and other means of control

18.120 Incorporating a Rebate Mechanism as part of a MBM is not, *per se*, considered to present any need for additional, or changes to the existing, enforcement or control measures under the IMO legal framework, although the underlying MBM may require particular procedures.

Involvement of other authorities (e.g., Treasury)

18.121 The involvement of other government authorities, e.g., finance ministries and anti-fraud agencies; that are not usually involved in the development, implementation and enforcement of IMO-agreed instruments may be needed.

18.122 In a developing country that does not forego the rebate an agreed entity, such as a National Climate Change Fund or a Treasury, will need to be engaged to receive the rebate.

19 GENERAL IMPACTS OF MARKET-BASED MEASURES ON TRADE, COMPETITION, AND CONSUMER PRICES

OVERVIEW

19.1 Most countries, but developing countries in particular, have a strong reliance on international trade to advance their economic development. Given that an estimated 90% of goods traded internationally are shipped by sea, countries have a strong interest in proposals likely to increase the cost of shipping goods by sea, and hence have an impact on their GDP and general economic development.

19.2 Increased transportation costs have two direct effects on countries: increases in the price of imports and decreases in the competitiveness of their exports. Increases in the price of imports will be particularly important for countries that import a significant proportion of their food supply and where expenditures on food are a large part of household budgets.[36] The decreased competitiveness of exports is of particular concern to developing countries, especially with respect to low value-added exports, and for countries that are furthest away from their market destinations. Improvements in fuel efficiency of ships could lower transportation costs over time. If trade routes serving a given destination are particularly long, this improved fuel efficiency would further contribute to lower the overall costs associated with sea-borne trade serving distant markets.

19.3 Ideally, an analysis of the impact of any market-based measure would use a Computational General Equilibrium (CGE) model to take into account all of these factors, as well as secondary impacts. Such a model would take many months to build because of the complexity and the need for detailed data that are not readily available. Given the time allocated to the Expert Group and the lack of any existing CGE model at the level required to assess at a country-specific level, the assessment of the direct impacts of the different measures on developing countries relies on existing partial equilibrium studies. This includes MEPC 60/INF.7 and MEPC 60/INF.21, and a new analysis commissioned by the Expert Group from Vivid Economics (see Vivid Economics, Assessment of the economic impact of market-base measures, available at IMO website: www.imo.org), as well as a couple of case studies provided by MBM-EG members. The assessment does not consider indirect impacts, which are also important, such as potential shifts in production to locations closer to the export market, shifts in trade patterns, and secondary impacts on freight rates, due to decreased trade.

19.4 The proposed market-based measures seek either to:

- set a cap on GHG emissions (emissions trading);
- set a price directly on each tonne of fuel used or on emissions; or
- mandate efficiency standards for ships.

19.5 Both the emissions trading proposals and the contribution or levy proposals would increase a ship's operating costs. For simplicity, this is analysed by looking at the impacts of an increase in bunker fuel prices. For the efficiency-based proposals, there could be increased costs due to investments in efficiency measures, though these may be at least

36 Jane Korinek and Patricia Sourdin (2009), "Clarifying Trade Costs: Maritime Transport and its Effect on Agricultural Trade", OECD Trade Policy Working Papers, no. 92, OECD Publishing.

partially, offset by fuel savings. Thus, analysing the cost impacts are more complicated than in the case of emissions trading or contribution and levy proposals.

19.6 Specific aspects of a given market-based measure's impact on trade and competition are found at the end of this chapter.

ANALYSIS

Impact on consumers from emissions trading and contribution-type measures

19.7 The analysis in this section focuses on the price of bunker fuel as a proxy to analyse the impacts of most of the market-based mechanisms.

19.8 The extent to which an increase in bunker fuel prices affects end consumers will be affected by the ship operators' ability to pass this on to exporters and to what degree the exporters can pass on the increased freight costs to consumers.

19.9 Consumers will be most affected, the greater the elasticity of freight rates to bunker fuel prices; the greater the elasticity of consumer prices to freight rates; and the greater the market share of foreign producers.

19.10 A simple analysis of trade data and distance from markets was undertaken to determine the maximum potential increase in the total value of imports for a number of countries due to an increase in the price of bunker fuels. The effect of a 10% increase in the price of bunker fuels on the total value of imports is estimated to be less than 0.2%, as shown in Table T9-1[37].

Table 19-1: MBM costs in relation to world imports

Emissions (Mt)	Costs ($billion)	Seaborne Imports ($billion)	Costs/Imports (%)
870	17.4	9.393	0.19%

Source: Comtrade; calculations based on MBM-EG assumptions

19.11 The calculation compared the costs relative to the value of imports. Similar results are obtained for exports. If the cost is split between import and exports, the result does not change. The above estimated costs can be viewed as the maximum additional cost on worldwide trade, assuming there are no benefits from the application of the market-based measure or from any revenue raised.

19.12 However, the impact on individual countries will differ. Detailed transportation cost analysis was performed for Chile and Australia, two illustrative countries that trade over long distances with their trading partners. In this analysis it is assumed that a market-based mechanism would increase bunker fuel costs by 10%.

19.13 Assuming the impact is borne entirely by the importing country, the impacts are shown in Table 19-2.

37 This has been estimated as follows. Data for 2007 is used. Emissions: 870 Mt CO_2, carbon price $20/t CO_2. Total cost: $17.4 billion. Seaborne imports represent about 70% of worldwide imports by value, respectively. Worldwide imports in 2007 by value were $13,418 billion, and therefore seaborne imports were estimated as $9,393 billion.

Table 19-2: Estimated Impact on Import Costs from an MBM equivalent to 10% of fuel price

Australia	Chile
0.16%	0.26%

19.14 The estimated impact on Chile is larger than on Australia, although the distance to their trading partners is similar for both countries. The differences in cost impacts seem partially attributable to the structural differences in their economies, including the structure of their imports, as explained in the appendix. The methodology used in this impact analysis is illustrated in annex 13[38],[39]. It should be noted that results are aggregate and do not capture impacts on individual products. A more detailed analysis by product and trade routes is found below.

19.15 As noted above an increase in import prices will be particularly important, for example, for countries that import a significant proportion of their populations' food supply and where expenditures on food account for a large part of household budgets. There are many factors that impact the cost of shipping, including competition on shipping routes; time spent unloading cargo at a port (which is in turn factored into the price of shipping); imbalances in trade on some routes; and costs that are proportional to the distance from major exporters. One study, however, finds that "the higher shipping costs of grains to the poorest developing countries are principally due to their remoteness from major grains exporting countries"[40].

Impact on producers from emissions trading and contribution-type measures

19.16 Increases in bunker fuel prices affect producers to the extent ship operators can pass on the increase in bunker prices to exporters, and the extent to which exporters can pass on that increase in freight costs to consumers.

19.17 Producers will be more affected, the greater the elasticity of freight rates to bunker prices; the smaller the elasticity of consumer prices to freight rates, and the smaller their market share in the destination markets. Producers will also be more affected the further away they are from their destination markets. Producers of low value-to-weight products would be affected relatively more than producers of higher value-to-weight products.

19.18 Trading distances give some indication which countries would be most affected by the implementation of a market-based measure that increases the cost of bunker fuels. Even though fuel costs are directly determined by distance, there is not a linear relationship between the two. This is because there are many factors that affect shipping costs, including: value-to-weight ratio of the cargo; time spent at sea (correlated with the distance from the market); type of ship; trade volumes (economies of scale); trade imbalances (especially for container traffic); price of fuel oil; level of port infrastructure and efficiency[41]; competition; and regulatory requirements.[42] As such, trading distances should be treated with

38 Data on Chile trade has been kindly provided by the Chilean Customs Agency (Servicio Nacional de Aduanas).

39 Data on Australia trade has been kindly provided by the Australian Bureau of Statistics.

40 Jane Korinek and Patricia Sourdin (2009).

41 See, for example, Gordon Wilmsmeier and Jan Hoffman (2008). "Liner Shipping Connectivity and Port Infrastructure as Determinants of Freight Rates in the Caribbean", *Maritime Economics & Logistics*, vol, 10, pp. 130-151.

42 OECD (2009), "Determinants of Maritime Transport Costs", Working Part of the Trade Committee, TAD/TC/WP(2009) 4, Feb. 27, 2009.

caution and other factors, such as relative competition faced by exporters and their profit margins, should be considered when analysing the impact of market-based measures on exporters.

19.19 A case study of impacts on Chinese exporters of knitwear and folding chairs showed that their profits are negatively affected by increases in bunker fuel prices. How exporters in developing countries will be affected by an increase in freight rates requires further research and is a gap in the literature.

Impact of efficiency market-based measures on consumers and producers

19.20 It is difficult to model how the implementation of measures that are based on the application of efficiency standards would affect prices. The impact of efficiency market-based measures will depend on how freight rates are affected by the upfront capital expenditures needed to adopt the technology; the payback period; the operational costs of adopting technologies or operation changes; and the cost savings from lower fuel consumption.

19.21 Efficiency-based measures have two effects on freight costs. On the one hand, the costs of implementing efficiency measures increase freight costs. The magnitude of those costs depends on the stringency level of the standard, which is not analysed. On the other hand, investments in fuel-efficient technologies and ships or changes in operational procedures, should reduce the consumption of bunker fuels and therefore result in cost savings.

19.22 The net financial impact of efficiency-based measures on freight rates would be less uniform than that of levy or cap-type market-based measures. Efficient ships operating on a particular route could derive net financial benefits from the efficiency measures, whereas less efficient ships would incur net costs. In this case, freight rates on routes operated by more efficient ships could decrease, and increase on routes operated by less efficient ships. There is potential for greater differentiation in the extent to which efficiency based measures would impact trade.

19.23 Even though more work is needed on the impacts efficiency-based measures would have on trade and developing countries, there are some elements worth noting.

19.24 First, over the last several decades, the efficiency of the maritime sector has improved significantly, leading to increased fuel savings. However, while there are still a large number of options where technologies can be applied that have a pay back in fuel savings, thus reducing costs of shipowners and operators, some of the technologies have not been adopted due to non-financial barriers. Efficiency-based measures can help overcome some of these barriers, by providing incentives for a greater uptake of fuel-efficient technologies, with their concomitant fuel, and hence cost savings.

19.25 Second, efficiency standards, like those proposed, could provide ship operators with an incentive to reduce the speed of their ships. Even though ship operators could financially gain from lower fuel costs as a result, spending more time at sea would increase operational, in-transit cargo inventory, and insurance costs.[43] The impact of efficiency measures on the speed of ships should be carefully considered given that, as one study estimates, an extra

43 See, among other studies, Harlilaos N. Psaraftis and Christos A. Kontovas, "Ship Emissions, Logistics and Other Tradeoffs", Laboratory for Maritime Transport, National Technical University of Athens; accessed at www.martrans.org/documents/2009/air/IMDC%202009.pdf.

day at sea has the same impact as increasing the distance to the destination by 70 km,.[44] At the same time, there are significant fuel savings.[45] Whether ship operators choose to optimize their speed will depend on the relative financial incentives of the fuel savings versus the costs induced by additional time at sea.

Analysis of selected goods and trade routes

19.26 There are only a few statistical studies that analyse how an increase in the costs of freight could affect the costs to consumers of imports and few that analyse the impact of freight cost increases on producers in the exporting country.

19.27 While the studies are not directly comparable because different models and data sets were used, the results are indicative and help to inform the assessment of potential impacts of the measures.

19.28 The impacts of bunker fuels prices on freight rates and freight rates on trade, consumers, and producers depend on many factors. This includes the type of cargo; the economic structure of the importing and exporting country; the trade route; the size of ship; and the supply and demand, not only for the product, but also for cargo space on the ship. For this reason, most studies looks at indicative routes and cargo traded, by vessel type. In this section, the impacts on four types of cargo are analysed: iron ore (Capesize); crude oil (VLCC); grains (Panamax); and furniture and clothing (container).

19.29 With respect to the ability of exporters to pass on any increase in freight costs to consumers, the larger the market share domestic production has for the goods in question, the less likely it is that the exporter would be able to pass an increase in transportation costs through to the end consumer due to competition from domestic producers. Conversely, where there is little or no domestic production, the exporter is more likely to be able to pass the increased costs on to the end consumer.

19.30 Increased freight costs will also have a larger impact on exporters of goods that have a low value-to-weight ratio, as the increase in freight cost is a larger share of the final cost than for higher-value added products.

Iron ore

19.31 Iron ore is a bulk commodity that has a low value to weight ratio, and therefore a relatively high average freight rate on an *ad valorem* basis. The results suggest that a 10% increase in either oil prices or bunker fuel prices will lead to increases in iron ore freight costs of around 10%. There is a range, depending on the estimation. An UNCTAD study[46] found that a 10% increase in Brent crude oil prices led to an increase in iron ore freight costs between 8 and 10%, depending on which other independent variables were included in the analysis. Vivid Economics estimates that a 10% increase in bunker fuel price will lead to around a 10% increase in iron ore freight costs. This average, however, reflects a range from a 5% to a 14% increase, depending on the route and the size of the exporting firms.

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44 S. Djankov, C. Frenund, and C.S. Pham (2010), "Trading on Time", Review of Economics and Statistics, Vol. 92, no. 1, pp. 166-173.

45 For example, Maersk North America estimated that an 8,000 TEU container ship travelling at 21 knots will burn 125 tonnes of fuel to go 500 nautical miles, but would only need 80 tonnes of fuel to travel the same distance if it travels 15 knots. Cited in "Ocean shipping lines cut speed to save fuel costs", Los Angeles Times, accessed at articles.latimes.com/2010/jul/31/business/la-fi-slow-sailing-20100731.

46 United Nations Conference on Trade and Development (UNCTAD) (2010), "Oil Prices and Maritime Freight Rates: An Empirical Investigation", UNCTAD/DTL/TLB/2009/2, April 1, 2010.

19.32 For iron ore exports to China, the results suggest that exporters are more likely to be able to pass through an increase in costs and maintain their market share the closer they are to China and the larger their domestic iron ore exporters are. The results indicate that a country like India, which has many small exporters, would lose market share due to an increase in freight costs caused by a market-based measure. The results show a lesser impact on Brazil than India due to the dominance in its iron ore export market of a large, efficient firm. Australia, on the other hand, with both a short distance and large, efficient producers, would experience the least impact of the three countries.

19.33 The price increase for iron ore in China is estimated to be around 1.5%, which benefits Chinese ore producers, as their prices would rise as well, but represents a cost increase for domestic Chinese producers that use iron ore in production of their products.

Crude oil

19.34 VLCC freight rates for shipping crude oil are moderately sensitive to bunker price increases. UNCTAD (2010) finds that the effect of fuel oil prices on freight rates are between 2.2% and 2.8%, depending on the equation estimated. Vivid Economics estimated that a 10% increase in bunker fuel prices will increase the average VLCC freight cost by 3.2% to 3.7%, with a range of 1.2% to 6%, depending on the route and importing country. The ability of exporters to pass on these price increases depends on the market. For example, for the Republic of Korea, which imports all of its oil, (87% from the Middle East alone), the cost pass-through to consumers is 100%, but this represents an increase in consumer price of just under 0.2%. In the United States, in contrast, which has its own oil production and imports oil from Canada by pipeline, the pass through is about 73%, and the increase in consumer costs is only 0.4%. This is because the increase in freight costs is only a very small portion of the value of the product.

19.35 Korinek and Sourdin (2009) find similar results with their estimation over various routes, suggesting that a 9-10% increase in shipping costs for crude oil would lead, on average to a 0.4% increase in the price of crude oil.

Grains

19.36 The market for grains is very diverse, so the impacts vary by grain type and by market. For example, wheat import into South Africa represents 50% of South Africa's total consumption. In this case, wheat prices were estimated by Vivid Economics to increase by approximately 0.2% for the 2.5% increase in freight costs estimated to result from a 10% increase in the price of bunker fuel. The estimated cost pass-through to South African consumers ranges from 10% to 40%, implying the exporters would bear 60% to 90% of the freight cost increase.

19.37 By contrast, Kenya's domestic production of wheat is only about a third of its total consumption. Therefore, less competition from domestic producers implies exporters are more able to pass on the cost of freight increases to consumers, an estimated 50% to 75%. Vivid Economics have calculated that a 10% increase in freight costs would raise bulk wheat prices in Kenya by around 0.4%. While Kenyan wheat producers would benefit from the price increase, Kenyan consumers would lose.

19.38 With regard to maize imports by Saudi Arabia, a country without any significant transhipment of imports, and with only 6% domestic production, the price of maize is estimated to increase by around 0.7%, most of which is borne by Saudi Arabian consumers.

19.39 An OECD study[47] found that it is more expensive to ship grains to smaller markets in developing countries than to larger markets. There are a number of reasons given: less competition on the shipping route; port infrastructure (more time spent unloading the cargo); imbalances in trade on some routes; and distance. The study suggests that distance from major grain exporters is a key determinant of shipping costs, but that other factors are important as well.

19.40 MEPC 60/INF.7 looked at the impact on price increases in certain commodity markets for a 5% transportation cost increase. This price increase was estimated to lead to increases in commodity prices by between 0.15% (coffee from Columbia's Atlantic ports to Europe) to 1.9% (jute from Bangladesh to Europe). The larger the proportion freight rates are as a per cent of the price of the commodity, the larger the potential cost pass-through, everything else being equal.

19.41 These studies suggest that the cost impacts on consumers will depend on a number of factors, but that, overall, the percentage increase in prices would be relatively low. Nonetheless, a low percentage increase in the price of food in countries where expenditures on food form a large percentage of household budgets, can still have a significant impact on consumers. At the same time, domestic grain producers can gain from the general increase in prices, though at the expense of consumers.

19.42 Another study[48] found that for EU imports of cereals from Argentina, an 11% increase in transport costs (caused by an allowance price of $30) would lead to a 3% increase in the value of imports. Similarly, the price of coffee imports from Brazil into the EU would rise by 16% and cause the value of coffee imports to increase by 0.3%.

19.43 Although the studies use different methodologies and are not, therefore, strictly comparable, they all suggest that the percentage increase of the implementation of a market-based measure would be small. It must be cautioned, however, that even a small percentage increase can have a sizeable impact on a poor country or on consumers with poor purchasing power.

Clothing and furniture

19.44 To look at what might happen with the container trade, two categories of goods were selected: clothing and furniture. The analysis of clothing and furniture into Europe from Asia was complicated due to the heterogeneous nature of the trade statistics category. Both low-end and high-end quality clothing and furniture are included in the trade statistics, which mask differences in domestic production versus imports and prices. About 40% of wearing apparel sold in the EU is imported. The estimates by Vivid Economics suggest that between 10% and 40% of the additional freight costs would be passed through to consumers. By contrast around 70% of furniture is imported into the EU. Therefore, there is the possibility for a higher pass-through of the costs, due to less competition from domestic producers. The ability to pass through increased freight costs is estimated to be between 60% to 90%, which imply exporters from Asia bear less than half of the increase in freight costs. The broad ranges for both products stem from their heterogeneity making it difficult to achieve more precise estimates.

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[47] Korinek and Sourdin (2009).

[48] MEPC 60/4/54, A Global Maritime Emissions Trading System: Design and Impacts on the Shipping Sector, Countries, and Regions.

19.45 A micro-level analysis to illustrate the potential impact on developing country exporters estimated the impact on Chinese exporters of knitwear and folding chairs, assuming the implementation of a carbon price of $20 and $40, respectively, and a bunker fuel price of $437/tonne.[49] Assuming these carbon prices are completely passed through to freight rates, the impact on the total transport cost of container ships (4000 - 6000 TEU) was estimated to be 9% and 19%, respectively, for the two carbon prices. Under the assumption that this increase in freight costs is completely borne by the exporters, rather than partially passed on to the consumers, the profit margin of exporters of knitwear was estimated to decrease by 3 - 5%, and of exporters of folding chairs by 19 - 30%, when the carbon price is $20, and by 7% - 11% for knitwear, and 39% - 63% for folding chairs, when the carbon price is $40.

SUMMARY

19.46 In summary, the potential impacts of the implementation of a market-based mechanism upon final consumers depend on the ability of the importers to pass through the increased costs. This, in turn, is partially affected by the existence of domestic production of that product. For countries with little domestic production, an increase in the price of imported goods will be more likely to be passed on to consumers than in the case of a country with a larger portion of the market supplied by domestic production.

19.47 The impact on producers in exporting and importing countries will vary, depending on market shares and price elasticities. The impacts of freight cost increases have a variable impact on countries due to differences in their economic structures.

IMPACT ON LOCAL SHIP OPERATORS

19.48 A case study commissioned by the Indian National Shipowners Association (INSA) looked at the impact of proposed market-based mechanisms on ships registered under the Indian flag. The goal of the study was to analyse the impact of the MBM proposals on the cost of operating old and new ships. Oil tankers, gas carriers, and bulk carriers over 15,000 DWT of differing ages were selected for the study due to the reliability of the EEDI formula for those ship types and sizes.

19.49 INSA had hypothesized that the greatest cost impact to their ships would come through implementing technology measures to lower GHG emissions. Upgrading ships with new technology would have the following implications for a shipowner:

- Incur upfront capital costs to invest in more fuel-efficient design or equipment;
- Change the operating cost structure;
- Affect overall life-cycle profitability of the ship; and
- Lower fuel consumption, resulting in cost savings.

19.50 Preliminary findings suggest:

.1 Implementation of technical and operational measures to reduce fuel consumption would result in substantial savings, taking into account the projected increase in bunker fuel price and would reduce GHG emissions from the reduction in fuel consumption. This will depend where on the abatement cost curve the measures are and whether they are applicable to

49 The study makes use of data in MEPC 60/4/54 (Germany), A Global Maritime Emissions Trading System: Design and Impacts on the Shipping Sector, Countries, and Regions.

a particular ship. As an example of potential increases in fuel prices, the industry is expected to switch from HFO to more costly distillate fuel in 2020 due to changes in sulphur limits under the revised MARPOL Annex VI. This fuel switch is estimated to result in increased cost burdens that are 60 - 90% higher than current costs due to the higher cost of distillate fuel. In such a scenario, any efficiency improvements that help to reduce fuel consumption would also result in cost savings.

.2 The Study also finds that newer ships will benefit more from efficiency measures than older ships. This is because the savings are calculated over the life span of the ship. Efficiency measures still resulted in cost savings for older ships; however, since older ships have fewer years left in service, their total resultant savings are estimated to be lower than those for newer ships.

.3 In general, all market-based measures would increase the cost burden on old, fuel-inefficient ships since they consume more fuel than more efficient ships. The financial burden would increase with the increasing cost of offsetting emissions or an increased stringency of vessel efficiency standards. However, if abatement measures are introduced, the burden could be reduced.

.4 The challenges that would be faced by the industry in implementing carbon mitigation measures include:

.1 Access to technology: especially for those shipping companies that do not have access to new technologies or the means to finance the acquisition of new technologies.

.2 Access to finance: This may be especially true for shipping companies in the developing world, which may find it harder to access the financing needed to implement carbon mitigation technologies than those in the developed world.

19.51 One way to illustrate how a market-based measure could potentially impact different countries is to evaluate how far they are from their trading partners. A model of nautical distances weighted by bilateral trade (NDT) was developed by Dr. Andre Stochniol for this purpose.

The model integrates two sets of data:

- Nautical distances between countries[50]
- Bilateral trade flows with all countries[51]

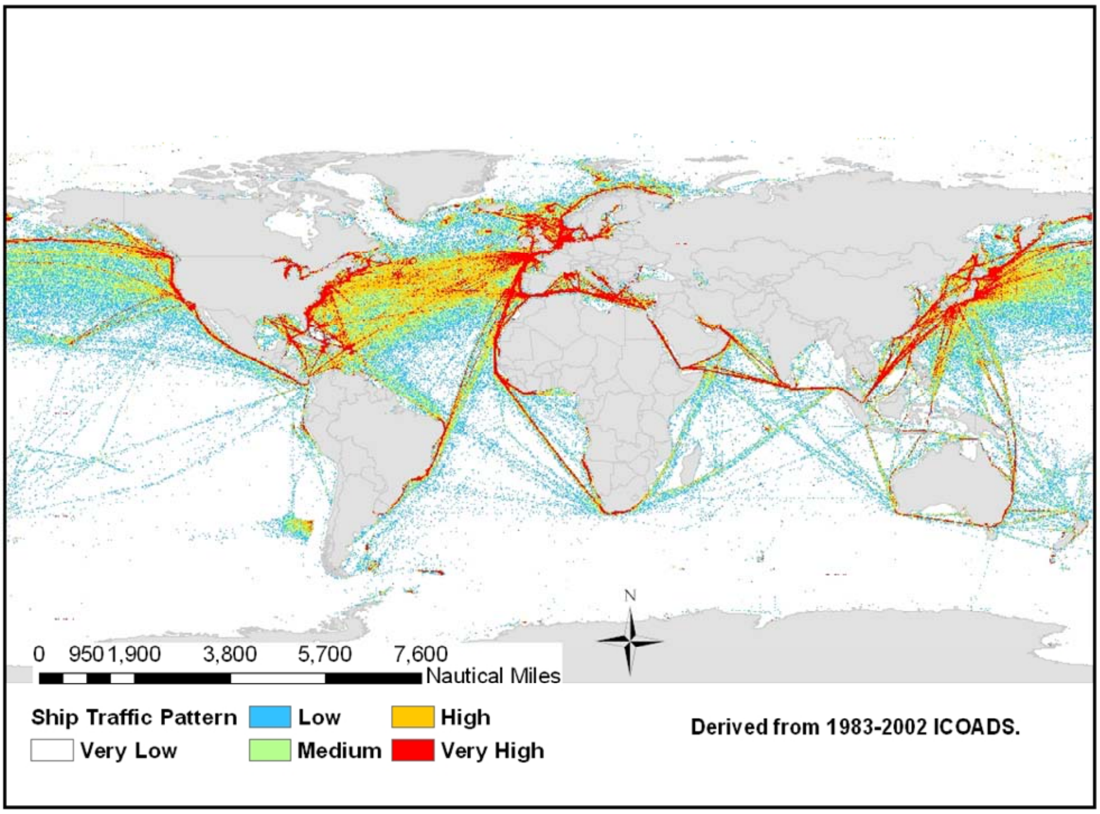
19.52 For each country, its nautical distances from other countries are multiplied by the relevant shares of its bilateral trade with a given country to its total trade. The results are added together to provide a single measure of a country's location relative to its major trading partners, the NDT.

50 The UNCTAD Maritime Connectivity Data Base was kindly made by available by UNCTAD.
51 Bilateral trade data for 2007 was obtained from the UN Comtrade database.

19.53 NDT are shown for 130 countries representing 97% of world trade in Figures 19-15 and 19-16. These results include 17 Small Islands Developing States, and 17 least developed countries.[52]

19.54 The results show that some countries are much further away from their trading partners than others. This illustrates that, when discussing impacts of market-based measures for the maritime sector, developing countries, especially SIDS and LDCs, should not be treated as a collective bloc or blocs of countries. For example, as can be seen in the graphs, countries in the SIDS group have both the largest and the smallest NDT, with French Polynesia and New Caledonia being the furthest from its trading partners, and Bahamas being the closest to its trading partners, including its largest trading partner the United States.

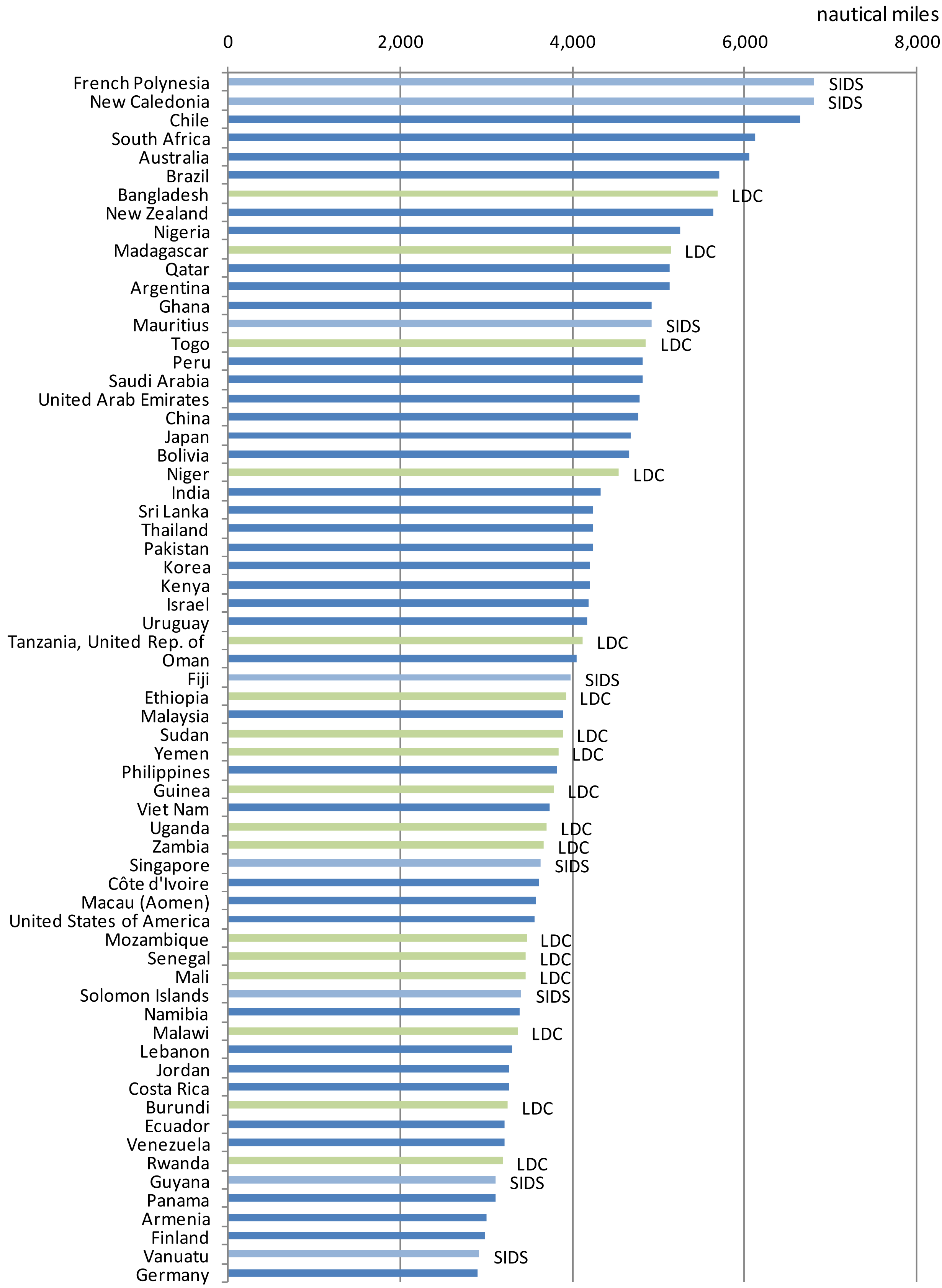
19.55 Based on the above analysis, Chile and Australia, two countries near the top of the NDT graphs, were selected for a more detailed impact analysis. This has previously been described in paragraphs 19.10-19.14.



Approximation of ship traffic distribution based on ICOADS data (Source: Second IMO GHG Study 2009)

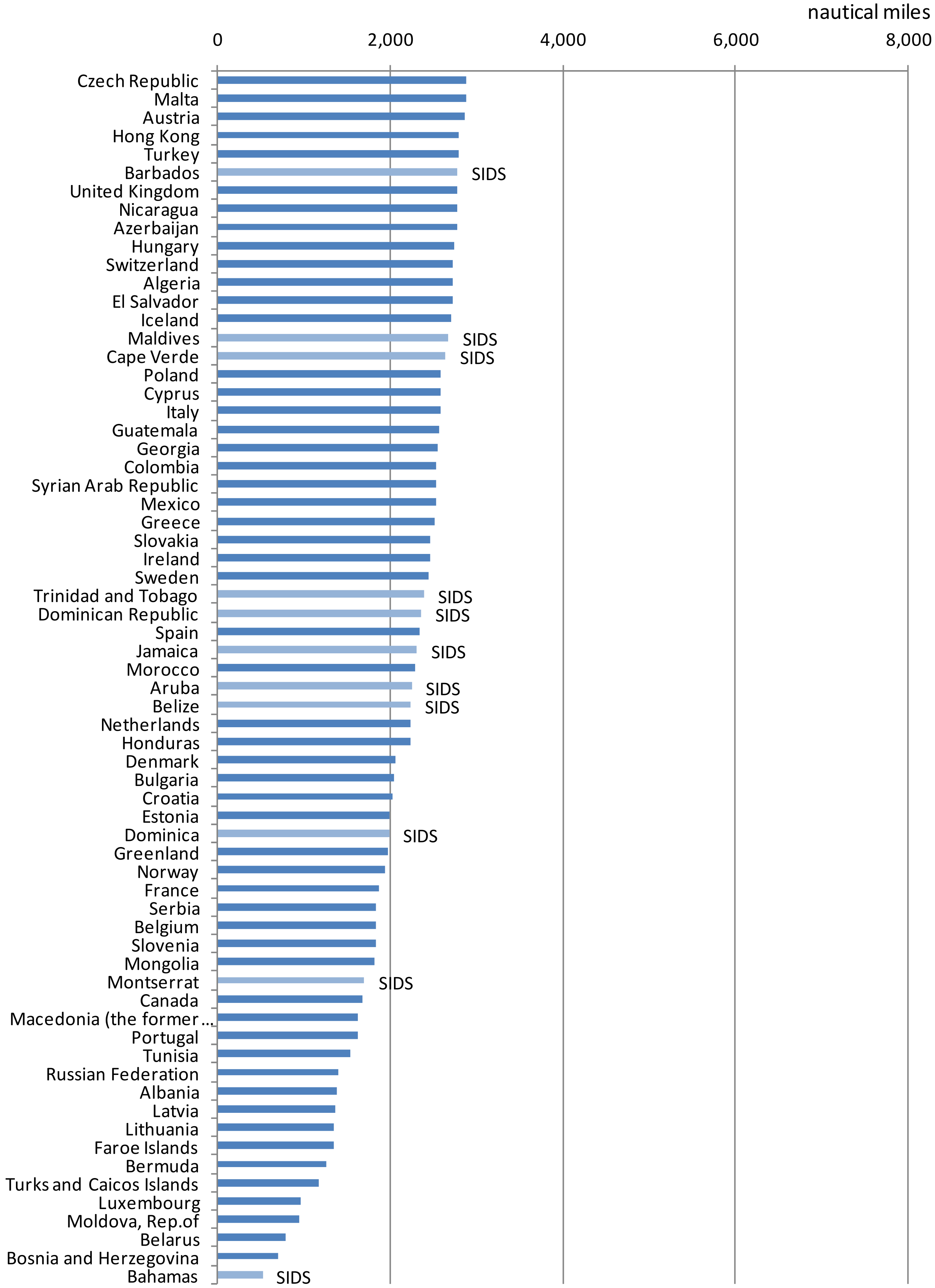
52 Countries for which bilateral flows were not comprehensively available are not shown.

Figure 19-1: Nautical Distance Weighted by Bilateral Trade (#1 of 2)



Source: Dr. Andre Stochniol

Figure 19-1 (Cont.): Nautical Distance Weighted by Bilateral Trade (#2 of 2)



Source: Dr. Andre Stochniol

POTENTIAL IMPACTS ON TRADE RELEVANT TO SPECIFIC PROPOSAL

An International Fund for Greenhouse Gas emissions from ships – Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA (MEPC 60/4/8)

19.56 This proposal is based upon the imposition of a contribution on every tonne of bunker fuel sold. The analysis above suggests that the impacts of any rise in bunker fuel prices due to the imposition of an MBM will depend on the trade route (especially with respect to distance) and the competition from domestic and third country producers, type of cargo, and ship size. The results suggest that, at the levels of contribution being proposed, the impact on freight rates would be relatively small.

19.57 The impact of the increased freight costs could result in increased prices for consumers, depending on the market structure for that product. The results also suggest that the increases in consumer prices in the importing country could benefit domestic producers, though at the expense of domestic consumers.

19.58 This proposal, as it applies to every tonne of bunker fuel sold, should not result in any competitive distortion as all Party ships and all ships, both Party and non-Party, going to a Party port must pay the contribution. Ships that are less fuel-efficient, and hence use more fuel, would be affected to a greater extent than the more efficient ships. Routes that are serviced by older, smaller, less efficient ships may be disadvantaged by this measure, but application of zero-cost efficiency measures could offset the impact of the proposal by reducing fuel costs, and hence the price of shipping for these routes. This proposal applies the "polluter pay" principle in that those ships that pollute the most pay the most. This could become a driver for investments in more efficient ships and technologies, depending on the level of the price signal. Such a transition to more efficient vessels could be assisted by use of the international fund.

19.59 With respect to modal shift, unless the price rise is significant, the shift from sea to road or rail should not occur. A modal shift may occur if the relative price of shipping by sea relative to road or rail increases sufficiently to cause shippers to look for shorter sea routes and move more cargo by land. Since, however, port infrastructure is also a large determinant of freight costs; it may take significant changes in relative freight rates to cause any modal shift. More analysis is needed on this issue.

Consideration of a market-based mechanism: Leveraged Incentive Scheme to improve the energy efficiency of ships based on the International GHG Fund – Japan (MEPC 60/4/37)

19.60 As this proposal is based on the same principle as that outlined in the GHG Fund (MEPC60/4/8), the potential impacts would be the same. As ships would have an incentive to be below the required EEDI and to improve their EEOI, this could advantage those ships and companies that have greater access to financing. This is because they would have more readily funding available to adopt more efficient technologies. Since, any ship that achieved relative improvements in its EEOI to a certain level would be eligible for refunds. Both older and newer ships would have the possibility to be rated as "good performance ships". However, further assessment is needed as to whether the proposal creates competitive distortion. Even though there would be fuel cost savings from such investments, as noted, the upfront investment expenditures could serve as a barrier. Funding new technologies for ships serving LDCs and SIDS could be another potential use for the international fund.

19.61 This proposal is not expected to result in modal shift or competitive distortion for the same reasons expressed in the discussion of the GHG Fund.

Achieving reduction in greenhouse gas emissions from ships through port State arrangements utilizing the ship traffic, energy and environment model, STEEM – Jamaica (MEPC 60/4/40)

19.62 This proposal would charge ships for the emissions for each leg of their journey. The same assessment as for the GHG Fund (MEPC 60/4/8) is applicable to this proposal.

19.63 The ship would be charged for each leg, and that charge would have to be distributed in some manner to the non-discharged cargo owners, similar to the way other costs are distributed for cargos destined for multiple ports. If the effect of this measure, or similar measure, was substantial, there could be a service distortion for routes served by ships serving widely distributed ports, such as in SIDS, where only small amounts of cargo are discharged at each of the ports, but where the cargo for the next port is still being carried. This could lead to shifts in service delivery with some individual islands being served by smaller, single port ships.[53]

Further details on the United States proposal to reduce greenhouse gas emissions from international shipping – the United States (MEPC 60/4/12)

19.64 In this proposal, if ships do not meet the standard or make operational or efficiency improvements to meet the standard, one option for compliance would be to purchase efficiency credits. Such credits would be available from more efficient ships that are above the standard and were issued with credits for the amount they were above the standard. This could lead to a cost saving for transporting goods on those ships, relative to less fuel-efficient ships.

19.65 More efficient ships would have the ability to generate and sell credits, which would allow them to offset some or all of the costs associated with purchasing and installing fuel-efficiency equipment. The efficiency savings would not be exclusive to newer, more efficient ships; indeed some older ships could have significant cost-savings from inexpensive efficiency improvements. However, less fuel-efficient ships would, by definition, need to do more to meet the standard. It is uncertain whether the reduction in the overall costs of the transportation of goods onboard more efficient ships would be passed on to consumers in the short term. In the long term, these savings or costs would be passed on, so exporters and importers could reduce their costs by using more efficient ships.

19.66 Where less efficient ships are widely used, there would be higher costs to import goods into those countries. A regulatory requirement to implement cost-efficient measures could offset some of these cost increases.

19.67 Because the proposal encourages more fuel-efficient ships, the proposal has the potential to provide long term benefits to trade in both developed and developing countries. Low maritime transportation costs have played a large role in the expansion of world trade over the last few decades. This expansion of world trade has allowed developing countries to better participate in the global market place.

19.68 Disruption and distortion could potentially occur if certain ships on certain routes were unable to trade due an inability to obtain sufficient credits, or not being able to afford the permits where there was an inability to pass the costs through. This could impact the competitiveness of certain routes. On the other hand, the proposal would provide an incentive for inefficient ships to become more efficient, leading to reduced operating costs.

[53] See Wilmsmeier and Hoffman (2010) for a related discussion.

19.69 The proposal suggests there could be a phase-in period, with only ships with EEDI-approved baselines covered in the initial phase and "very old ships" (that is, ships that would be decommissioned in the next three years) being exempted during the initial years of implementation. Such an exemption could be beneficial to shipowners with older ships, provided the replacement of such ships is economically feasible for the shipowner.

Proposal to Establish a Ship Efficiency System (VES) – World Shipping Council (WSC) (MEPC 60/4/39)

19.70 This proposal is similar to the one in the SECT proposal (MEPC 60/4/12), but in place of credits, ships that did not meet the standard would have to pay a fee on each tonne of fuel consumed, based on how far the ship's actual efficiency deviated from the standard. Thus, a ship that was only slightly less efficient that the standard would pay less than a ship that was more inefficient. It is uncertain whether the reduction in the overall costs of the transportation of goods onboard more efficient ships would be passed on to consumers in the short term. In the long term, these savings or costs would be passed on, so exporters and importers could reduce their costs by using more efficient ships.

19.71 Where less efficient ships are widely used, there would be higher costs to import goods into those countries. A regulatory requirement to implement cost-efficient measures could offset some of these cost increases.

19.72 Because the proposal encourages more fuel-efficient ships, the proposal has the potential to provide long term benefits to trade in both developed and developing countries. Low maritime transportation costs have played a large role in the expansion of world trade over the last few decades. This expansion of world trade has allowed developing countries to better participate in the global market place.

A further outline of a Global Emission Trading System (ETS) for International Shipping – Norway (MEPC 60/4/22)

19.73 An emissions trading system establishes a price on carbon through the price of the allowances. In theory, for the same level of emission reductions, the price of the allowance should equal the price of a measure needed to achieve the same emission reductions. Thus, the impacts on the costs of transporting goods and the impact on end consumers should be the same whether a reduction measure is applied or there is an emissions trading system. In practice, the impacts on costs and prices of the two measures may not necessarily be the same for a number of reasons, including differences in transactions costs between emissions trading and paying a contribution.

19.74 If all the allowances were auctioned, there would be no competitive distortion. However, ships that were more efficient would not have to buy as many allowances as ships that were less efficient. Thus, the system favours ships that are already efficient, but also provides an incentive for ships that are less efficient to improve their efficiency.

19.75 The need to purchase allowances will raise the cost of shipping freight in a similar fashion to a direct contribution on bunker fuels. The conclusions of the analysis of the impact of an increase of bunker fuels on freight costs and the pass-through of freight costs to final consumers in the importing country then apply.

19.76 The proposal suggests that gross tonnage limits could be applied to limit the scope of applicability of the measure. A gross tonnage limit of 400 GT would imply that just over 42,500 ships would be covered. If this limit were raised to 1,000 GT, just under 34,900 vessels would be covered, which would cover an estimated 98% of carbon dioxide emitted by ships of 400 GT and above. A threshold of 4,000 GT would cover just over 24,000 ships and cover an estimated 91% of the carbon dioxide emitted by ships 400 GT and over (Table 19-3). There is not sufficient information available to establish with certainty how many of the ships exempted would be owned by companies in developing countries. However, an indication is available in MEPC 60/WP.5.

A global emissions trading system for greenhouse gas emissions from international shipping – the United Kingdom (MEPC 60/4/26)

19.77 Many of the comments above relating to the Norwegian ETS apply to ETS proposal by the United Kingdom. In addition, the proposal specifically notes that further analysis would be needed to determine an appropriate minimum size for the inclusion of ships in the emissions trading scheme that would maximize coverage while minimizing administrative burden (MEPC 60/4/26 paragraph 23).

Table 19-3: Ship sizes, numbers and associated emissions

Ship size threshold (GT)	No. of ships	No. of ships as % of ships ≥400 GT	Emissions (as % of emissions from ships ≥400 GT)
≥400	42,697	100%	100%
≥500	39,180	92%	99%
≥,1000	34,866	82%	98%
≥2,000	30,138	71%	96%
≥4,000	24,267	57%	91%
≥5,000	22,311	52%	89%
≥10,000	17,346	41%	81%

Source: Ship analysis provided by Lloyd's Register

Further elements for the development of an Emissions Trading System for International Shipping – France (MEPC 60/4/41)

19.78 Many of the comments above relating to the Norwegian ETS apply to the ETS proposed by France.

Market-Based Instruments: a penalty on trade and development – the Bahamas (MEPC 60/4/10)

19.79 This proposal argues against the imposition of any market-based measure on the grounds that reducing GHG emissions from the shipping industry can only come through technical and operational changes. For this reason, the Bahamas does support the development of the EEDI and EEOI. Market-base measures that would lead to increases in fuel prices are seen as imposing a penalty on trade and development. Instead, it is argued that if there is no market-based measure, then this results in a saving relative to the case where a market-based measure is implemented. The proposal suggests that a general increase in fuel prices would, in any case, be a driver for more fuel-efficient ships. An issue with this approach is that for less efficient ships, a significant increase in fuel prices could disproportionately affect those services. This, in turn, would feed into the price of imported goods, as discussed above. There would not be any funds generated for adaptation and mitigation activities.

19.80 If, however, a market-based measure is put in place, then the "penalty" on shipping should not be larger than 2.7%; that is, it should not be larger than the contribution of the maritime shipping industry to global GHG emissions.

19.81 This proposal would not result in any competitive distortion or change in trade patterns.

A Rebate Mechanism for a market-based instrument for international shipping – IUCN (MEPC 60/4/55)

19.82 This proposal proposes adding a Rebate Mechanism to any of the market-based measure proposals. The rebate would be distributed to developing countries on the basis of each country's share of global imports by value. These funds could be used to offset some of the impacts on consumers due to increases in the price of goods as a result of the imposition of a market-based measure.

19.83 Any potential for competitive distortion would arise from the market-based measure itself, and not from the rebate.

19.84 The proposal suggests the application threshold for a given market-based measure could be set at a level higher than 400 GT. It is suggested that the ship size threshold could be set at 4,000 GT, at least initially (MEPC 60/4/55 paragraph 33). According to Table 19-3, this would represent just over 24,000 ships covering 91% of the emissions that would be covered if a threshold of 400 GT was used. There is insufficient information available to establish with certainty how many of the ships exempted would come from developing countries. However, an indication is available in MEPC 60/WP.5.

19.85 The IUCN proposal allows developing countries to be compensated for any decrease in exports and increases in the price of imports that might occur as the result of the implementation of a market-based measure. The IUCN proposal would not, however, compensate for lost competitiveness. The funds flow to governments and not to companies that might be directly impacted by the measure. The proposal would, on the other hand, partially mitigate any costs to developing countries. It is up to countries to decide how they would use the rebate.

20 CONCLUSIONS

20.1 The evaluation of the proposals was completed as requested by the Committee in accordance with the terms of reference and each evaluation provides the required assessment as described in the terms of reference specifically in its paragraph 2.5.

20.2 The evaluation was complicated by the different levels of maturity of the various proposals. Proposals with a high level of maturity generated more discussion compared to those that were less developed.

20.3 The Group would like to point out that elements of the proposed measures would require further elaboration and development. Proposals at an early stage of development would be required to be developed further.

20.4 The Group reached its conclusions by consensus apart from a few instances where the evaluation of legal or administrative aspects led to different views as captured in the report.

20.5 All proposals address control of GHG emissions from shipping. Some of the proposals go beyond mitigation and propose a mechanism that provides for substantial contribution to address the adverse effects of Climate Change.

20.6 The proposals have different ways of reducing emissions, some focus on "in-sector" reductions and others also utilize reductions in other sectors. The extent of such reductions is detailed within the individual evaluation of each proposal in the report.

20.7 Cost effective operational and technical emission reduction measures are available to the shipping sector. However barriers exist in the uptake of many of these measures.

20.8 The Group has considered sustainable development in a holistic way so that it became an inherent part of the assessment rather than as an isolated criterion, because this was deemed to be the best approach.

20.9 The Group has identified that the implications of implementing the different MBM proposals for international shipping are directly related to the stringency of the proposed measure. Irrespective of this, the Group concluded that all proposals could be implemented notwithstanding the challenges associated with the introduction of new measures.

20.10 The assessment of the impacts of an increase in bunker fuel prices and freight costs showed that implementation of the proposed measures would affect some countries and products more than others. In some cases even small increases in costs could have relatively significant consequences. Indirect economic costs and benefits were not considered in the analysis. Some of the proposed measures include mechanisms aiming to provide means to mitigate negative impacts.

20.11 The proposals lack, to various degrees, sufficient details for the necessary evaluation of issues such as international harmonization in implementation, carbon leakage, fraud, and traffic of vessels between non-party states, among others. These issues require further policy considerations in order to be more properly addressed.

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Document	Author	Title – *summary*	Related parts
MEPC 51/4	Norway	Report of the Correspondence Group on Greenhouse Gas Emissions from Ships *The CG considered market-based solutions under its ToR item 3*	Items 3.11 and 3.13 in main report, pages 7-8 of annex 1, 21-25 of annex 2
MEPC 54/4/2	United Kingdom	The potential of emissions trading to reduce carbon dioxide emissions from ships *Outlines the background of some existing emissions trading schemes, examines the potential of emissions trading for shipping*	all
MEPC 55/INF.7	United Kingdom	Information on the potential of emissions trading to reduce harmful emissions into the air from ships *Complements MEPC 54/4/2*	all
MEPC 56/4/9	Norway	Elements of a possible market-based CO_2 emission reduction scheme *Proposes to establish an international maritime GHG emission fund*	all
MEPC 56/INF.13	European Commission	Available information *Provides information on Greenhouse Gas emissions for shipping and implementation guidance for the marine fuel sulphur Directive*	Item 13
MEPC 57/4/4	Denmark	A global levy on marine bunkers, primarily to be applied for the acquisition of CO_2 emission quotas through the purchase of CO_2 credits *Proposes the establishment of a global levy scheme on marine bunker*	all
MEPC 57/4/5 and Add.1	Australia and the Netherlands	Report of the Intersessional Correspondence Group on Greenhouse Gas Related Issues *The report contains several measures to reduce GHG emission from international shipping with the distinction between short-term and longer-term measures*	Items 5.11, 5.12, 6.7 and 6.8 in main report, and annex 5

Document	Author	Title – *summary*	Related parts
MEPC 57/4/10	FOEI	Immediate action and adoption of vessel speed reductions and carbon tax needed to reduce greenhouse gas emissions from shipping *Urges MEPC to adopt and begin implementing a mandatory GHG reduction scheme including a carbon tax on marine fuels*	Items 16-18
MEPC 57/4/17	United States	Continuation and work plan for greenhouse gas emissions correspondence group *Proposes that MEPC 57 should analyse and discuss the options put forward in the report of the Correspondence Group presented in its report MEPC 57/4/5*	Items 7 and 8
MEPC 57/4/21	Norway	Study on climate regulation of international shipping *Summarizes the study carried out by the Centre for International Climate and Environmental Research) regarding* CO_2 *emission control presented in MEPC 57/INF.21*	all
MEPC 57/INF.3	Sweden	Greenhouse gas emissions trading for the transport sector *Provides information about a study on GHG emissions trading for the transport sector conducted by IVL Swedish Environmental Research Institute*	all
MEPC 57/INF.13	Denmark	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 *Complements MEPC 57/4/4*	all
MEPC 57/INF.21	Norway	Study on climate regulation of international shipping *Complements MEPC 57/4/21*	all
GHG-WG 1/5	FOEI	Measures to Reduce CO_2 Emissions from Ships *Proposes a suite of measures to reduce* CO_2 *emissions from shipping, including MBIs*	Items 11 and 12.3

Document	Author	Title – *summary*	Related parts
GHG-WG 1/5/1	Denmark	Development of a global levy on marine bunkers for the acquisition of CO_2 allowances *Summarizes the informal correspondence work carried out in advance of GHG-WG 1 in order to further develop the proposal of a global levy on marine bunkers based on document MEPC 57/4/4*	all
GHG-WG 1/5/2	INTERFERRY	Maritime carbon reduction scheme *Provides an outline of a possible emission trading scheme for international shipping as basis for further discussion*	all
GHG-WG 1/5/3	European Commission	Key design elements for designing a "cap and trade" greenhouse gas Emissions Trading Scheme (ETS) *Provides a number of key design elements in designing of a "cap and trade" emission trading scheme based on the European Union Emissions Trading Scheme (EU-ETS)*	all
GHG-WG 1/5/4	Norway	A levy-cap-and-trade system for reducing GHG emissions from shipping *Proposes a levy cap-and-trading scheme, – i.e. hybrid system which combines a levy on CO_2 emissions and an emission trading system. Also provides a possible regulatory framework needed to establish the scheme*	all
GHG-WG 1/5/5	Norway	Consideration of elements needed in market mechanism to reduce GHG emissions from international shipping *Provides considerations of various possible elements, especially legal aspects related to market-based reduction instruments*	all
GHG-WG 1/5/6	France	Proposal for an international shipping carbon market *Proposes to establish an international shipping carbon market using a shipping carbon unit (SCU), which represents one tonne of CO_2*	all

Document	Author	Title – *summary*	Related parts
GHG-WG 1/5/7	Germany	Maritime Emissions Trading Scheme (METS) *Proposes a global Maritime Emissions Trading Scheme (METS)*	all
MEPC 58/4/19	IBIA	Response to the outcome of the first Intersessional Meeting of the Working Group on Greenhouse Gas Emissions from Ships *Provides practical approach to a cap-and-trade scheme*	all
MEPC 58/4/21	IMarEST	CO_2 emissions from shipping – a framework for assessment of potential market-based and regulatory control options *Provides framework for analysing potential GHG control measures against the IMO principles and UK industry "golden rules"*	Annex and appendix I
MEPC 58/4/22	Denmark	The feasibility of an International Compensation Fund for GHG Emissions from Ship *Advocates that International Compensation Fund will have a benefit for GHG reduction and for developing countries*	all
MEPC 58/4/23	Australia	Principles for the development of an IMO regulatory framework to address greenhouse gas emissions from international shipping *Stresses the necessity of market-based mechanism*	Items 17-22
MEPC 58/4/25	France, Germany and Norway	Comments on the outcome of GHG-WG 1 regarding the consideration of an Emission Trading Scheme for International Shipping *Proposes to develop a detailed outline of an ETS*	all
MEPC 58/4/39	WWF	Benefits and possible adverse impacts of market-based instruments *Provides analysis for benefit and adverse impacts of MBI*	all

Document	**Author**	**Title – *summary***	**Related parts**
MEPC 58/INF.14	Norway	Technical and operational means for reducing CO_2 emissions from shipping *Outlines a range of technical and operational means for reducing CO_2 emissions from shipping*	all
MEPC 58/INF.21	FOEI	Opportunities for Reducing Greenhouse Gas Emissions from Ships *Summarizes opportunities to reduce emissions of climate forcing agents from ships*	all
MEPC 59/4/5	Denmark	An International Fund for Greenhouse Gas Emissions from Ships *Explains the basic element of "the international GHG fund"*	all
MEPC 59/4/17	OCIMF	Technical evaluation of market-based instruments *Analyses the relative advantages and disadvantages of the ETS and the international GHG fund proposals*	all
MEPC 59/4/25	France, Germany and Norway	Positive Aspects of a Global Emission Trading Scheme for International Shipping *Presents advantages of ETS*	all
MEPC 59/4/26	France, Germany and Norway	Cornerstones for an outline of a convention of a Global Emission Trading Scheme for International Shipping *Proposes a new IMO ETS convention to be applied to all ships above a certain size and identifies the rights and obligations of ships, flag States and port States*	all
MEPC 59/4/32	CLIA	Consideration of adoption of three principles for market-based instruments *Outlines key principles that should be considered by IMO when adopting a market-based reduction measures*	all

Document	Author	Title – *summary*	Related parts
MEPC 59/4/34	Japan	Consideration of a market-based mechanism to improve the energy efficiency of ships based on the International GHG Fund *Supports the international GHG fund and proposes a leveraged incentive scheme*	all
MEPC 59/4/35	Japan	Consideration of appropriate targets for reducing CO_2 emissions from international shipping *Presents scenarios for the reduction of CO_2 emissions and proposes the general policy direction on market-based mechanism*	all
MEPC 59/4/43	INTERTANKO	Comments on MEPC 59/4/8 and MEPC 59/4/9 relating to the Energy Efficiency Design Index, the Ship Energy Management Plan and possible market-based instruments *Requests that selection of a market-based reduction measures for shipping should be based on the nine IMO principles agreed at MEPC 57*	Items 7-10
MEPC 59/4/45	OCIMF	International Fund for Greenhouse Gas Emissions from Ships *Analyses the similarities and differences between the international GHG fund and the IOPC Fund*	all
MEPC 59/4/48	United States	Comments on MEPC 59/4/2 and MEPC 59/4/4 and an additional approach to addressing maritime GHG emissions *Proposes to establish mandatory efficiency standards for new and existing ships using the EEDI and to allow ships to trade efficiency credit*	all
MEPC 59/INF.5	Secretariat	Ministerial Conference on global environment and energy in transport *Provides Ministerial Declaration agreed at the Conference*	all
MEPC 59/INF.9	ICS	Control of greenhouse gas emissions – market-based instruments *Provides an analytical study of various market-based instruments (MBI) options*	all

Document	Author	Title – *summary*	Related parts
MEPC 59/INF.10 MEPC 59/INF.10/Corr.1	Secretariat	Second IMO GHG Study 2009 *Provides the full report of the Second IMO GHG Study 2009*	all
MEPC 59/INF.11	Australia and the Netherlands	Received submissions by the coordinators of the Intersessional Correspondence Group on Greenhouse Gas Related Issues *Provides all original submissions to the Correspondence Group*	all
MEPC 59/INF.27	Japan	Detailed information on the prospect of energy efficiency improvement of new ships *Provides detailed information on the prospect of energy efficiency improvements for new ships*	all
MEPC 60/4/8	Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA	An International Fund for Greenhouse Gas emissions from ships *Elaborates on the proposed International GHG fund*	all
MEPC 60/4/10	Bahamas	Market-Based Instruments: a penalty on trade and development *Argues that market –based instruments are contrary to the best interests of the developing States*	all
MEPC 60/4/12	United States	Further details on the United States proposal to reduce greenhouse gas emissions from international shipping *Elaborates how efficiency credits are traded, purchased or sold and proposes a Ship Efficiency Credit Trading Scheme (SECTS)*	all
MEPC 60/4/13	ICS	Control of greenhouse gas emissions from international maritime transport *Presents some of the criteria that should be used in the analysis of MBIs*	all
MEPC 60/4/22	Norway	A further outline of a Global Emission Trading System (ETS) for International Shipping *Presents how the mechanism can combine precise emission reductions with well tested principles for regulating shipping*	all

Document	Author	Title – *summary*	Related parts
MEPC 60/4/23	Norway	Alternative emission caps for shipping in 2020 and 2030 *Based on four different ambition levels and two IPCC scenarios (A1B and B2)*	all
MEPC 60/4/26	United Kingdom	A global emissions trading system for greenhouse gas emissions from international shipping *Sets out how an emissions trading system might work in practice*	all
MEPC 60/4/28	WSC	Emission "Caps" and Reduction Targets *Views on establishing an emission cap or reduction target from the perspective of broader transportation and environmental policy practices*	all
MEPC 60/4/37	Japan	Consideration of a market-based mechanism: Leveraged Incentive Scheme to improve the energy efficiency of ships based on the International GHG fund *Elaborates Leveraged Incentive Scheme*	all
MEPC 60/4/39	WSC	Proposal to Establish a Vessel Efficiency System (VES) *Introduces a proposal to establish a VES*	all
MEPC 60/4/40	Jamaica	Achieving reduction in greenhouse gas emissions from ships through port State arrangements utilizing the ship traffic, energy and environment model, STEEM *Elaborates a STEEM proposal*	all
MEPC 60/4/41	France	Further elements for the development of an Emissions Trading System for International Shipping *Provides the auctioning procedures which could be implemented to sell shipping allowances*	all
MEPC 60/4/43	France, Germany, Norway and the United Kingdom	Common features on documents submitted on a Global Emission Trading System (ETS) for International Shipping *Emphasizes the common futures on documents already submitted*	all

Document	Author	Title – *summary*	Related parts
MEPC 60/4/49	Greece	An International Fund for Greenhouse Gas emissions from ships *Supports the revised proposal for an International GHG fund (MEPC 60/4/8)*	all
MEPC 60/4/50	OCIMF	Updated Technical Evaluation of Proposed GHG Reduction Measures *Provides the relative pros and cons of the four proposals for a MBI*	all
MEPC 60/4/51	Japan	Comments on MEPC 60/4/8, "An International Fund for Greenhouse Gas emissions from ships *Provides technical comments on numerical figures contained in document MEPC 60/4/8*	all
MEPC 60/4/53	WWF and Greenpeace International	Outcomes of COP 15 and the work of MEPC on market-based instruments in 2010 *Provides views on the outcome of COP 15 and its implications for the work of MEPC 60 and MEPC 61*	all
MEPC 60/4/54	Germany	Impact Assessment of an Emissions Trading Scheme with a particular view on developing countries *Presents results of a scientific study on impact assessment of a global ETS*	all
MEPC 60/4/55	IUCN	A Rebate Mechanism for a market-based instrument for international shipping *Proposes Rebate Mechanism to fulfil CBDR*	all
MEPC 60/WP.5	Secretariat	Information to facilitate discussion on GHG emissions from ships *Presents an updated version of CO_2 emission potentials*	all
MEPC 60/INF.7	Denmark	Effects on sea transport cost due to an International Fund for GHG emission for ships *Demonstrates the possible effects on sea transport cost resulting from the introduction of an International Fund for GHG emissions from ships*	all

Document	Author	Title – *summary*	Related parts
MEPC 60/INF.8	France	Practical aspects of a global emissions trading scheme for international shipping *Presents a report on procedures for the sale and auctioning of CO_2 allowances, submitted to the French Government in summer 2009*	all
MEPC 60/INF.12	World Bank	Climate-change-mitigation finance in the maritime sector *Outlines examples of directing carbon finance within and outside of the maritime sector*	all
MEPC 60/INF 18	Secretariat	Assessment of IMO energy efficiency measures for the control of GHG emissions from ships. *Presents a study carried out by Lloyd's Register and DNV on the projected emissions reductions associated with the technical and operational measures agreed at MEPC 59 (EEDI, EEOI and SEEMP)*	all
MEPC 60/INF.19	Norway	Updated Marginal Abatement Cost Curves for shipping *Presents work undertaken by DNV on CO_2 Marginal Abatement Cost Curves (MACC) for shipping towards 2030*	all
MEPC 60/INF.21	Secretariat	Scientific study on international shipping and market-based instruments *Provides the Scientific Study prepared on behalf of the IMO by an international consortium led by the University of Cambridge*	all
MEPC 60/INF.21/ Corr.1	Secretariat	Scientific study on international shipping and market-based instruments *Corrigenda to MEPC 60/INF.21*	
MEPC 60/WP.5	Secretariat	Information to facilitate discussion on GHG emissions from ships. *Provides an overview impact assessment and describes the underlying methodology and data sources used to create the dataset*	all

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ANNEX 1

COMPOSITION OF THE EXPERT GROUP

(Appointed by the Secretary-General)

Chairman (appointed by the Secretary General) Mr. Andreas I. Chrysostomou Department of Merchant Shipping (Cyprus) Chairman of IMO's Marine Environmental Protection Committee

Nominated by	**Expert**
Australia	Dr. Andrew Pankowski Department of Climate Change and Energy Efficiency
Bahamas	Dr. Phillip Belcher The Bahamas Maritime Authority
Brazil	Mr. Adriano Santhiago de Oliveira Secretariat of Research and Development Policies and Programmes General Coordination on Global Climate Change Ministry of Science and Technology of Brazil
Canada	Dr. Leigh Mazany Environmental Policy Directorate Transport Canada
Chile	Mr. Sebastian Marambio Cathalifaud Ministry of Finance
China	Mr. Sun Jun Department of Dangerous Goods Control and Pollution Prevention Zhejiang Maritime Safety Administration of People's Republic of CHINA
Cyprus	Mr. Philippos Philis Lemissoler Group PCL
Denmark	Mr. Jesper Loldrup Centre for Shipping Policy Danish Maritime Authority
France	Mr. Philippe Maler Transport Services directorate in the Ministry of Ecology, Energy, Sustainable Development and the Sea. MEEDDM –DGITM
Germany	Ms. Petra Bethge Economic Affairs Department
Greece	Prof. Harilaos Psaraftis School of Naval Architecture and Marine Engineering National Technical University of Athens
India	Mr. Indra Nath Bose The Great Eastern Shipping Co. Ltd.
Italy	Dr. Giulia Dramis Ministry of Environment
Jamaica	Mr. Eric E. Deans College of Earth, Ocean and Environment University of Delaware
Japan	Mr. Hideaki Saito Japan Ship Centre (JETRO)

Liberia	Mr. Matthias Rentsch LISCR(Deutschland) GmbH
Marshall Islands	Rear Admiral Robert C. North North Start Maritime Inc.
Nigeria	Dr. Victor Ayodeji Fodeke Special Climate Change Unit Federal Ministry of Environment
Norway	Mr. Sveinung Oftedal Royal Ministry of the Environment
Panama	Ambassador Gilberto Arias Embassy of the Republic of Panama
Singapore	Mr. Cheong Keng Soon Maritime and Port Authority of Singapore
South Africa	Mr. Sobantu Tilayi Centre for Ships South African Maritime Safety Authority (SAMSA)
United Kingdom	Dr. Anne-Marie Warris Lloyd's Register
United States	Mr. Drew Nelson Bureau of Oceans Environment and Scientific Affairs US Department of State

BIMCO	Mr. Lars Robert Pedersen BIMCO Denmark
IACS	Mr. Paul Sadler International Association of Classification Societies Ltd. United Kingdom
ICS	Mr. David Tongue International Chamber of Shipping United Kingdom
INTERCARGO	Mr. Robert Lomas International Association of Dry Cargo Shipowners United Kingdom
INTERTANKO	Mr. Dragos Rauta International Association of Independent Tankers Owners Norway
IPTA	Ms. Janet Strode International Parcel Tankers Association United Kingdom
ITF	Ms. Penny Howard Seafarers Section International Transport Workers' Federation United Kingdom
IUCN	Dr. Andre Stochniol International Union for the Conservation of Nature United Kingdom
OCIMF	Mr. Ken G. Reid Oil Companies International Marine Forum United Kingdom
WSC	Mr. Bryan C. Wood Thomas World Shipping Council United States

WWF	Mr. Peter Lockley (to 16/07/10) World Wide Fund for Nature United Kingdom

EC	Mr. Mark Major European Commission DG Climate Action Directorate B – European and International Carbon Market Unit B3 – International Carbon Market, Aviation and Maritime Belgium
ICAO	Mr. Lorenzo Gavilli International Civil Aviation Organization Canada
UNFCCC	Dr. Florin Vladu Adaptation, Technology and Science Programme [Manager, Analysis and Methods Subprogramme] United Nations Framework Convention on Climate Change Germany

IMO Secretariat
The Secretary-General Mr. Miguel Palomares Director, Marine Environment Division Mr. Eivind Sanden Vågslid Head, Chemical and Air Pollution Prevention Section Sub-Division for Pollution Prevention Marine Environment Division Dr. Gillian Reynolds Consultant, Chemical and Air Pollution Prevention Section Sub-Division for Pollution Prevention Marine Environment Division Ms. Lucy Essuman Principal Secretary, Chemical and Air Pollution Prevention Section Sub-Division for Pollution Prevention Marine Environment Division Ms. E. Patricia Henriques Santos Secretary, Chemical and Air Pollution Prevention Section Sub-Division for Pollution Prevention Marine Environment Division

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ANNEX 2

FOCAL POINTS

MEPC 60/4/8	Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA	Mr. Christian Breinholt Danish Maritime Authority
MEPC 60/4/10	Bahamas	Capt. Douglas Bell Bahamas Maritime Authority
MEPC 60/4/12	United States	Mr. Michael Samulski National Vehicle and Fuel Emissions Laboratory US Environment Protection Agency
MEPC 60/4/22	Norway	Mr. Sveinung Oftedal Royal Ministry of the Environment
MEPC 60/4/26	United Kingdom	Mr. Oliver Chadwick Shipping and the Marine Environment Department for Transport
MEPC 60/4/37	Japan	Mr. Masahiro Samitsu GHG Task Force of the Japanese Shipowners' Association Ministry of Land, Infrastructure, Transport and Tourism
MEPC 60/4/39	WSC	Mr. Bryan C. Wood Thomas World Shipping Council United States
MEPC 60/4/40	Jamaica	Mr. Eric E. Deans College of Earth, Ocean and Environment University of Delaware
MEPC 60/4/41	France	Ms. Marie Claire LHENRY General directorate for energy and climate Ministry of ecology, energy, sustainable development and the sea
MEPC 60/4/54	Germany	Mr. Falk Heinen Federal Ministry for the Environment Nature Conservation and Nuclear Safety
MEPC 60/4/55	IUCN	Dr. Andre Stochniol International Union for the Conservation of Nature United Kingdom

***

ANNEX 3

TASK-GROUP MEMBERSHIP

P Indicates participating group
C Indicates correspondence circulation group

Environment	
Dr. Andrew Pankowski (**task-leader**)	P
Mr. Hideaki Saito	P
Mr. Jesper Loldrup	P
Dr. Anne-Marie Warris	P
Mr. Bryan C. Wood-Thomas	P
Mr. Dragos Rauta	P
Mr. Peter Lockley	P
Mr. Mark Major	P
Dr. Victor Fodeke	P
Mr. Eric E. Deans	P
Dr. Giulia Dramis	P
Mr. Lorenzo Gavilli	P
Mr. Drew Nelson	C
Mr. Sveinung Oftedal	C
Mr. Philippos Philis	C
Mr. Philippe Maler	C
Rear Admiral Robert C. North	C
Mr. Sun Jun	C
Dr. Leigh Mazany	C
Mr. Adriano Santhiago de Oliveira	C
Mr. Matthias Rentsch	C
Prof. Harilaos Psaraftis	C
Ms. Petra Bethge	C
Mr. Cheong Keng Soon	C
Ms. Janet Strode	C
Dr. Andre Stochniol	C
Mr. David Tongue	C
Mr. Ken G. Reid	C
Ms. Penny Howard	C
Dr. Florin Vladu	C
Mr. Indra Bose	C
Mr. Sobantu Tilayi	C
Mr. Sebastian Marambio Cathalifaud	C
Total of participants – P	**12**
Total of participants – C	**21**

Shipping and Maritime	
Mr. L. Robert Pedersen (**task-leader**)	P
Mr. Drew Nelson	P
Mr. Hideaki Saito	P
Mr. Sveinung Oftedal	P
Mr. Philippos Philis	P
Rear Admiral Robert C. North	P
Mr. Matthias Rentsch	P
Prof. Harilaos Psaraftis	P
Mr. Cheong Keng Soon	P
Ms. Janet Strode	P
Mr. Bryan C. Wood-Thomas	P
Mr. David Tongue	P
Mr. Dragos Rauta	P
Mr. Ken G. Reid	P
Ms. Penny Howard	P
Mr. Rob Lomas	P
Mr. Indra Bose	P
Mr. Sobantu Tilayi	P
Dr. Victor Fodeke	P
Mr. Eric E. Deans	P
Mr. Jesper Loldrup	C
Mr. Philippe Maler	C
Dr. Anne-Marie Warris	C
Mr. Sun Jun	C
Mr. Adriano Santhiago de Oliveira	C
Ambassador Gilberto Arias	C
Dr. Andrew Pankowski	C
Ms. Petra Bethge	C
Dr. Andre Stochniol	C
Mr. Paul Sadler	C
Mr. Peter Lockley	C
Dr. Florin Vladu	C
Mr. Mark Major	C
Mr. Sebastian Marambio Cathalifaud	C
Mr. Lorenzo Gavilli	C
Total of participants – P	**20**
Total of participants – C	**15**

Trade and Development and Developing Countries	
Dr. Leigh Mazany (**task-leader**)	P
Mr. Philippe Maler	P
Dr. Phillip Belcher	P
Mr. Sun Jun	P
Mr. Adriano Santhiago de Oliveira	P
Ms. Petra Bethge	P
Dr. Andre Stochniol	P
Mr. Ken G. Reid	P
Mr. Peter Lockley	P
Mr. Indra Bose	P
Mr. Sebastian Marambio Cathalifaud	P
Dr. Giulia Dramis	P
Mr. Drew Nelson	C
Mr. Hideaki Saito	C
Mr. Jesper Loldrup	C
Mr. Sveinung Oftedal	C
Mr. Philippos Philis	C
Dr. Anne-Marie Warris	C
Rear Admiral Robert C. North	C
Ambassador Gilberto Arias	C
Mr. Matthias Rentsch	C
Dr. Andrew Pankowski	C
Prof. Harilaos Psaraftis	C
Mr. Cheong Keng Soon	C
Ms. Janet Strode	C
Mr. Bryan C. Wood-Thomas	C
Mr. David Tongue	C
Mr. Dragos Rauta	C
Ms. Penny Howard	C
Dr. Florin Vladu	C
Mr. Sobantu Tilayi	C
Mr. Mark Major	C
Dr. Victor Fodeke	C
Mr. Eric E. Deans	C
Mr. Lorenzo Gavilli	C
Total of participants – P	**12**
Total of participants – C	**23**

Administrative and Legal	
Mr. Paul Sadler (**task-leader**)	P
Mr. Drew Nelson	P
Mr. Jesper Loldrup	P
Mr. Sveinung Oftedal	P
Mr. Philippe Maler	P
Mr. Sun Jun	P
Mr. Adriano Santhiago de Oliveira	P
Ambassador Gilberto Arias	P
Prof. Harilaos Psaraftis	P
Ms. Petra Bethge	P
Mr. Cheong Keng Soon	P
Ms. Janet Strode	P
Dr. Andre Stochniol	P
Mr. David Tongue	P
Mr. L. Robert Pedersen	P
Dr. Florin Vladu	P
Mr. Sobantu Tilayi	P
Mr. Mark Major	P
Mr. Lorenzo Gavilli	P
Mr. Hideaki Saito	C
Mr. Philippos Philis	C
Dr. Anne-Marie Warris	C
Dr. Phillip Belcher	C
Rear Admiral Robert C. North	C
Mr. Matthias Rentsch	C
Dr. Andrew Pankowski	C
Mr. Bryan C. Wood-Thomas	C
Mr. Dragos Rauta	C
Mr. Ken G. Reid	C
Mr. Indra Bose	C
Mr. Sebastian Marambio Cathalifaud	C
Dr. Victor Fodeke	C
Mr. Eric E. Deans	C
Total of participants – P	**19**
Total of participants – C	**14**

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ANNEX 4

EXPERT GROUP ON FEASIBILITY STUDY AND IMPACT ASSESSMENT OF POSSIBLE MARKET-BASED MEASURES (MBM-EG)
First meeting
Agenda item 4

MBM-EG 1/4
12 May 2010
ENGLISH ONLY

ELABORATION OF CRITERIA

Task-groups and task-leaders and their respective criteria As agreed by the Expert Group 11 may 2010

Note by the Secretariat

Environment: 5.1, 5.2.1 Task leader: Dr. Andrew Pankowski

5.1 The environmental effectiveness and reduction of greenhouse gas (GHG) emissions from international shipping

- Mechanism of achieving emission reduction
- Reduction in CO_2 emissions from international shipping projected – absolute or relative (ie per tonne-mile)
- Reduction in emissions from international shipping and certainty of projected reduction
- Reduction in emissions in other sectors and certainty of projected reduction

5.2.1 The cost-effectiveness of the proposed MBM

- Cost of compliance to industry (input from Shipping and Maritime)*
- Administrative costs (input from Admin and Legal)
- Tonne CO_2 abated/total costs$_{(\text{industry + Administrative})}$

* where text appears "greyed out" this part of the Terms of Reference will be undertaken by another task-group

Shipping and Maritime: 5.2.1, 5.3, 5.8 Task leader: Mr. Lars Robert Pedersen

5.2.1 The cost-effectiveness of the proposed MBM

- Cost of compliance to industry
- Administrative costs
- Tonne CO_2 abated/total costs$_{\text{(industry + Administrative)}}$

5.3 The proposed MBM's potential to provide incentives to technological change and innovation – and the accommodation of current emission reduction and energy efficiency technologies

- Provision of investment certainty
- Credit for early action
- Availability of technological and operational measures for CO_2 emission reduction
- Commercial availability and industry experience of implementing technology or operational measures
- Projected future costs of carbon (allowances, credits, contributions, etc.) vs costs of measures to reduce CO_2 emissions

5.8 The potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector as a whole, of implementing the proposed MBM

- Administrative burden for ships and ship operators
- Other additional workload
- Implementation costs – capital and operating costs
- Need for new/additional tonnage
- Cost implications for cargo owners and shippers
- Impacts on others in the maritime supply chain and industry (ports and port operators, fuel suppliers, brokers, agents, financial institutions, etc.).

Trade and Development and Developing Countries: 5.2.2, 5.2.3, 5.5
Task leader: Dr. Leigh Mazany

5.2.2 Potential impact(s) on trade

- Projected impact on cost of transporting goods and raw materials by ship
- Impact on cost structure
- Impact on service availability
- Impacts for end consumers, particularly in developing countries
- Potential for competitive distortion
- Trade patterns and potential for modal shift

5.2.3 Sustainable development

- Impacts of MBMs on developing countries including administrative requirements
- Impact on local ship operators, potential for competitive distortion (link to Administrative requirements in 5.7 of the different MBM proposals and impact on ships in 5.8)
- Countries/ports/ships/trades particularly affected
- Implications of threshold selected for ship size to which scheme would be applicable
- Implications of possible exemptions described in the proposals

5.5 The need for technology transfer to, and capacity building within, developing countries, in particular LDCs and SIDS, in relation to implementation and enforcement of the proposed MBM, including the potential to mobilize climate change finance for mitigation and adaptation actions

- Requirement for capacity building for implementation and enforcement of new instruments in developing countries (link the different MBM proposals to the Administrative requirements in 5.7)
- Technology transfer needs for developing countries to improve new ship and operational efficiencies for all ships in operation
- Availability of funds that could be used for climate change purposes in developing countries
- Predicted size of fund generated

Administrative and Legal: 5.2.1, 5.4, 5.6, 5.7, 5.9 Task leader: Mr. Paul Sadler

5.2.1 The cost-effectiveness of the proposed MBM

- Cost of compliance to industry
- Administrative costs – including any Central administrative requirements
- Net revenues generated
- Tonne CO_2 abated/total $\text{costs}_{(\text{industry + Administrative})}$

5.4 The practical feasibility of implementing the proposed MBM

- Development time for new IMO instrument
- Experience from similar schemes
- Ease of implementation and potential for phased implementation
- Enforcement, potential for evasion and avoidance of carbon leakage

5.6 The MBM proposal's relation with other relevant conventions such as UNFCCC, Kyoto Protocol and WTO, as well as its compatibility with customary international law, as depicted in UNCLOS

- Compatibility with UNFCCC
- Compatibility with Kyoto Protocol
- Compatibility with WTO
- Compatibility with UNCLOS
- Relations with other climate finance institutions or initiatives

5.7 The potential additional administrative burden, and the legal aspects for National Administrations by implementing and enforcing the proposed MBM

- Administrative requirements for implementation and enforcement
- Additional workload for flag States per ship
- Impacts on port State inspections and additional workload per call or inspected ship
- Availability of skilled human resources
- Compatibility with national law
- Sovereignty implications

5.9 The MBM's compatibility with the existing enforcement and control provisions under the IMO legal framework

- Requirement for new IMO instrument
- Central Administrative requirements, need for supranational organization to oversee scheme and/or need for market place (to trade emission credits, etc.)
- Role of flag State
- Role of port State
- Role of recognized organizations
- Survey, Certification and other means of control
- Involvement of other authorities (e.g. Treasury)

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ANNEX 5

ENVIRONMENTAL MODELLING: FURTHER INFORMATION, ASSUMPTIONS AND CAVEATS

1 A model was developed to examine how the MBMs are likely to behave under defined scenarios. The model was developed by Dr. A. Stochniol supported by members of the Environment, Shipping and Maritime, and Impact on Trade and Development and Developing Countries task-groups. The assumptions used in the model were agreed by the Expert Group at its June meeting and are set out in annexes 7 and 8. The model is useful for understanding the broad behavioural characteristics of the MBMs under review and for general comparative analysis. It was used to generate the majority of the graphs and tables in this report. The modelling considered:

- three targets; 0%, 10% and 20% below 2007 GHG emission levels (as per IMO 2nd GHG study);
- two growth scenarios (A1B; 2.8% and B2; 1.65%);
- two carbon price scenarios (medium and high); and
- two fuel price scenarios (reference and high).

2 *It is important understand the limitations of the model and to not extrapolate beyond those limitations.*

3 One limitation is that the complex range of human and market factors that could influence how international shipping would respond to an MBM are not fully captured within the model. The model therefore assumes the same response to a given price for all MBMs that use price incentives to stimulate the uptake of measures. This assumption of a uniform response may not hold in all circumstances.

4 The model applies a growth rate to emissions over time to develop a BAU baseline and uses sensitivity of in-sector improvements to fuel price increase as the basis for modelling the impact of adding an MBM price to the fuel price. Since there is limited empirical data on how shipping responds at the operational and technical level to fuel prices, or to an incremental charge on top of a fuel price this has been assumed to be 0.04. The assumption translates into a 4 % reduction in emissions below BAU from a 100 per cent increase in fuel price arising from a stable MBM price signal over the long term which represent a plausible relationship for comparative purposes. The response to price may be greater or less than observed through the modelling. Nevertheless, the approach provides a useful basis for comparison but absolute values resulting from price based incentives should be interpreted as indicative. To model the impact of standards based approaches, fleet growth rates and scrapping rates are applied to develop a profile of the proportion of the fleet subject to each standard.

5 In relation to fuel price signals several studies including the Second IMO GHG study indicate there are significant emissions reduction opportunities within shipping that are cost-effective at current fuel prices but that are not being harnessed. This suggests that non-price barriers may influence the uptake of cost-effective measures. There are also views from industry experts within this Expert Group that theoretical estimates of cost effective emission reductions opportunities are often overly optimistic about what can be implemented on the ground. The underlying fuel price could also affect the portion of reductions achieved

in-sector from a price based MBM. More or less in-sector reductions could result from a given price signal, for example from a greater or lesser portion of low cost emission reduction opportunities being taken up under high fuel price scenarios relative to low fuel price scenario.

6 In other words more expensive abatement opportunities may need to be pursued in response to the incentives provided by the MBM when fuel prices are high. This effect was incorporated into the model, through both a reduced BAU for the high fuel price scenario and a reduced responsiveness of emissions to a particular price under high fuel price scenarios, however there was no empirical data to calibrate this response.

7 Where estimates produced by the model are more certain this is indicated in the text. Similarly an attempt has been made to explain the key areas of uncertainty. The modelling results for the agreed scenarios can be found in annex 9.

8 The modelling needed to cover the range of emission reduction options provided by the various MBM. These are divided into three different types, not all of which apply to all MBM under analysis. The types are:

.1 **In-sector GHG emissions reductions:** Direct emission reductions from international shipping where reduction measures are undertaken on the ships.

.2 **Out-of-sector GHG emissions reductions:** Reduction measures undertaken in other sectors to offset emissions from international shipping to a target level of net emissions. The term **out-of-sector GHG emissions reductions** is also used to describe reductions achieved in other sectors when fulfilling a target level of expenditure for revenues raised by the MBM (e.g. 30 per cent of revenues raised by the MBM).

.3 **Remaining Proceeds ('funds'):** Proceeds generated by an MBM after subtracting any funds explicitly allocated by a proposal to the purchase of out-of-sector project credits (under item 2 above), any funds refunded to ships, and any funds rebated to developing countries.. These additional funds are anticipated by the MBM to be used on climate change mitigation, and/or adaptation and/or R&D.

9 Note in some MBM it is clearly stated that this 'fund' would be used specifically for adaptation in such cases the term 'net funds' have been used. It should be noted that policy decision may result in 'funds' from other MBM being also designated as 'net funds'.

10 Note in some of the MBM the distribution of the 'funds' would be the responsibility of an international body and in others be the responsibility of individual Port or flag States.

11 Across the MBM the following pattern emerges in relation to the three different types above:

Type	GHG Fund	LIS	PSL	ETS (3 proposals)	SECT	VES	RM	Bahamas*
In-sector emission reductions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Out-of-sector emission reductions	Yes			Yes			Yes	N/A
Remaining proceeds		Yes	Yes	Yes		Yes	Yes	N/A

*Not applicable to the Bahamas proposal as it does not propose an MBM

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ANNEX 6

SUMMARY OF THE GERMAN SUBMISSION TO MEPC 60 ON AN IMPACT ASSESSMENT OF AN EMISSIONS TRADING SCHEME WITH A PARTICULAR VIEW ON DEVELOPING COUNTRIES (MEPC 60/4/54)

1 As requested by the Committee and based on the Work Plan (MEPC 59/J/10) Germany wants to provide further information on market-based instruments and on a worldwide Maritime Emissions Trading System in particular. Germany therefore commissioned CE Delft supported by Fearnley Consultants and the Institute of Atmospheric Physics of the German Aerospace Centre to further develop a worldwide emissions trading system and to analyse the impacts of such a scheme with particular consideration of developing countries. The authors could benefit from their participation in the IMO GHG study.

2 The underlying scheme is based on the common proposal by France, Germany and Norway as submitted to MEPC 59 (MEPC 59/4/25 and MEPC 59/4/26). The scheme was further developed in the study and is in its design very similar to the METS proposed by Norway in document MEPC 60/4/22. The study concluded that it is feasible to implement the cap-and-trade scheme for GHG emissions in the maritime transport sector as suggested. Given that it is an open scheme it can guarantee a reduction in net maritime emissions in the most cost-effective manner. In its central part the study analysed the impact on the shipping sector, country groups and regions.

3 The size of the impact on the shipping sector depends on vessel type and size, fuel price, allowance price and the proportion of allowances auctioned. Assuming a fuel price of $15 per tonne of CO_2 the cost increase for six different vessel types ranges from 4 to 8 % of total operating costs. In summary the costs of allowances would constitute a small fraction of total vessel operating costs. Disaggregating cargo types, the consultant find that the value of imports of crude oil and manufactured products is least affected, increasing by less than 1%. Ores and coal are most affected, and their import value could increase by a little under 3%. Some positive economic aspects would result for ship builders, the engine manufacturers and classification societies due to a stimulation of demand of emission reduction technologies.

4 Under most market conditions, a major share of the cost increase can be passed on to consumers. Hence, the impact on import values in different groups of countries and regions was calculated. For this, the DLR undertook a very detailed worldwide calculation of shipping emissions based on the Lloyds MUI Database. Based on the emissions the additional costs were calculated assuming prices for a tonne of CO_2 between $10 and $50. The consideration revealed that in average the price increase is only between 0.03% and 0.06% (for 15 and 30 $/tonne of CO_2) of the GDP in the different regions. For the five different regions that were separated the price increase is in the range between 0.02% and 0.15% of GDP except for Small Island Developing States where the range was higher potentially due to one specific country with high CO_2 emissions. While emissions on routes to developing countries are lower than those on routes to developed countries, they are higher relative to GDP. As a result, developing countries face higher costs relative to GDP than developed counties.

5 In summary, the study showed and concluded that the impact of a Maritime Emissions Trading System on the Shipping sector and on different regions and countries is low. In order to consider the particular situation of developing countries the study further developed options to compensate for them. Some ways, such as exempting certain routes, ship types, ship sizes and cargo types, have the disadvantage that they could distort markets and potentially lead to higher emissions. The preferable option would be to use parts of the revenues and to re-distribute them to developing countries in order to mitigate undesired impacts.

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ANNEX 7

EXPERT GROUP ON FEASIBILITY STUDY AND IMPACT ASSESSMENT OF POSSIBLE MARKET-BASED MEASURES (MBM-EG)
Second meeting
Agenda item 1

MBM-EG 2/4/1
18 June 2010
ENGLISH ONLY

KEY ASSUMPTIONS REQUIRED FOR THE WORK OF THE TASK-GROUPS

As agreed by the Expert Group on 18 June 2010

Note by the Secretariat

Key assumptions for use in the evaluations carried out by the MBM Expert Group:

1 Size of world fleet: Use data for 2007 in Second IMO GHG study 2009 projected forward to 2009 assuming also that emissions from shipping in year 2010 are equal to those emissions of the year 2007.

2 Scenarios for growth in shipping: IPCC A1B & B2 scenarios from the Second IMO GHG Study 2009 (Scrapping rate 4% 2007-2012; 3% 2012 onwards).

3 Ships engaged in international shipping to be addressed using the same split as in the Second IMO GHG Study 2009. Domestic shipping to be excluded.

4 Rate of uptake of technical and operational measures for CO_2 reduction – assess medium and high uptake.

5 For the purposes of the analysis and modelling, the datum is 2015 and the time points to be analysed are 2020 and 2030.

6 In order for the Expert Group to understand the effectiveness, behaviour, impact and the marginal abatement costs of the proposed MBMs, the Group will use the following parameters:

Norway, France, UK, Denmark *et al*. – 0, 10% and 20% absolute reduction with respect to 2007 level in Second IMO GHG study 2009

US, WSC – as per set out in appendix 1

Jamaica, Japan, IUCN – medium and high carbon prices translated to fuel prices using values or limits given in the proposals, where applicable[54].

Bahamas – no target

54 The Group agreed for those proposals that do not contain any values or limits, the Secretariat will request input from the Focal Points to be provided by 23 June 2010.

7 For those proposals where EEDI is an intrinsic part of the proposal, the effects of EEDI should be included but EEDI will be excluded for other proposals.

8 Ship threshold above which the MBM would apply: 400 gross tonnes unless specified otherwise in the proposal (in which case tonnage specified to be used).

9 Price of bunker fuel ($/tonne), as set out in appendix 2.

10 Split between HFO and MGO usage:

80% HFO:20% MGO (2015-2019)
100% MGO (2020 onwards)

11 The analysis will assume reductions achieved out-of-sector to be calculated at the model price of carbon.

12 Price of Carbon as follows:

2010	$20	
2020	$25 (medium)	$40 (high)
2030	$40 (medium)	$100 (high)

***

APPENDIX 1

Draft Assumption Points for WSC Vessel Efficiency System (VES) Proposal

New Build Standards
(Six Tiers with a 3 year interval between tiers)

	2015	2018	2021	2024	2027	2030
low	10%	12%	15%	20%	25%	30%
medium	10%	15%	20%	25%	30%	35%
high	15%	20%	30%	35%	40%	45%

Existing Ships
(Limited to Two Tiers with 5 year interval)

	2015	2020
low	5%	10%
medium	8%	15%
high	12%	20%

Applicable Base Fee – WSC VES Proposal
(Base fee in U.S. dollars as a percentage of the price of fuel used in model year)

Scenario	low	medium	high
	20%	30%	40%

Draft Assumption Points for USA Efficiency Credit Proposal

New Build Standards
(Six Tiers with a 3 year interval between tiers)

	2015	2018	2021	2024	2027	2030
low	10%	12%	15%	20%	25%	30%
medium	10%	15%	20%	25%	30%	35%
high	15%	20%	30%	35%	40%	45%

Existing Ships (USA)
(Four Tiers with 5 year interval)

	2015	2020	2025	2030
low	5%	10%	15%	20%
medium	8%	15%	20%	25%
high	12%	20%	25%	30%

***

APPENDIX 2

	1990	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
1. Reference Scenario																														
Residual Fuel Price (per metric tonne)		385	607	371	427	432	482	521	552	569	582	604	620	627	628	638	642	651	659	667	669	681	691	703	716	730	741	751	764	779
Distillate fuel (including uplift from 2020)		615	971	594	684	691	771	834	883	910	931	967	992	1003	1205	1224	1233	1250	1266	1281	1284	1308	1327	1350	1375	1401	1423	1442	1466	1496
2. Low Scenario																														
Residual Fuel Price (per metric tonne)		385	607	371	427	329	310	298	289	278	270	268	265	264	264	257	255	257	254	258	260	258	253	253	254	256	257	258	259	258
Distillate fuel (including uplift from 2020)		615	971	594	683	527	495	477	463	446	432	429	424	423	506	494	489	494	488	496	498	495	486	486	487	491	494	495	497	495
3. High Scenario																														
Residual Fuel Price (per metric tonne)		385	607	371	431	504	622	718	831	907	979	1049	1100	1139	1165	1179	1193	1208	1217	1230	1242	1251	1262	1274	1285	1297	1307	1313	1320	1326
Distillate fuel (including uplift from 2020)		615	971	594	690	807	996	1149	1330	1451	1566	1679	1759	1823	2237	2263	2290	2319	2337	2362	2384	2403	2423	2447	2468	2490	2509	2521	2534	2545
Data from:																														
Fuel price scenarios are from the recently released U.S EIA Annual Energy Outlook 2010 (http://www.eia.doe.gov/oiaf/aeo/index.html). The scenarios are till 2035.																														
Calculated from the price in $2008 dollars per barrel multiplied by 6.66 (to get the prices per metric ton).																														
Pls note that they do not include the MARPOL Annex VI low fuel regulation impact.																														
MBM-EG assumptions																														
Multiplier for Distlilate	1.6																													
Uplift from 2020	0.32																													
Total multilpier from 2020	1.92																													

***

ANNEX 8

EXPERT GROUP ON FEASIBILITY STUDY AND IMPACT ASSESSMENT OF POSSIBLE MARKET-BASED MEASURES (MBM-EG)
Second meeting
Agenda item 4

MBM-EG 2/4/1/Add.1
6 July 2010
ENGLISH ONLY

KEY ASSUMPTIONS REQUIRED FOR THE WORK OF THE TASK-GROUPS

Additional input from Focal Points

Note by the Secretariat

1 Key assumptions required for the work of the task-groups were agreed at the second meeting of the MBM-EG (MBM-EG 2/4/1). However in relation to paragraph 6, reproduced below, the Group agreed that for those proposals which do not contain any values or limits, the Secretariat would request input from the Focal Points.

> "6 In order for the Expert Group to understand the effectiveness, behaviour, impact and the marginal abatement costs of the proposed MBMs, the Group will use the following parameters:
>
> Norway, France, UK, Denmark *et al*. – 0, 10% and 20% absolute reduction with respect to 2007 level in Second IMO GHG study 2009
>
> US, WSC – as per set out in appendix 1
>
> Jamaica, Japan, IUCN – medium and high carbon prices translated to fuel prices using values or limits given in the proposals, where applicable[55].
>
> Bahamas – no target"

2 The Secretariat has now received input from Jamaica, Japan and IUCN. This input is included in the annex.

***

[55] The Group agreed for those proposals that do not contain any values or limits, the Secretariat will request input from the Focal Points to be provided by 23 June 2010.

ANNEX

Mr. Samitsu, Focal Point for Japan Proposal

The levels of GHG contribution of Leveraged Incentive Scheme

1 For fair comparison of environmental effects of the proposals, assumption should be unified, i.e. the rate of GHG contribution for heavy fuel oil should be three times as much as the carbon price. Based on key assumptions for use in the evaluation in MBM-EG2/4/1:

12 Price of Carbon

		Carbon Price		GHG Contribution
2010		\$20/CO_2-tonne	==>	\$60/HFO-tonne
2020	(medium)	\$25/CO_2-tonne	==>	\$75/HFO-tonne
	(high)	\$40/CO_2-tonne	==>	\$120/HFO-tonne

2 If the carbon price is assumed at \$25/CO_2-tonne for the purpose of evaluation of environmental effects of Maritime ETS, \$75/HFO-tonne should be used for evaluation of environmental effects of Leveraged Incentive Scheme on unifying assumption.

3 It does not mean that the rate of GHG contribution should be decided according to the market price of carbon credit[56]. The rate of GHG contribution should provide a stable signal to emitters to adopt all cheap abatement options that are available. This is important in view of the long investment horizons needed for climate mitigation problems. The volatility arisen from carbon market will severely reduce expected returns from investment.

4 On Leveraged Incentive Scheme, it is important that the revenues from GHG contribution are recycled. The more revenues are used to investing in emission-reducing technologies in international shipping, the greater environmental effects of the scheme. This is so-called double-dividend of corrective contributions on GHG emissions. It will lower <u>*future*</u> GHG emissions from international shipping by stimulating innovation and diffusion of GHG emissions-reducing technologies. Such future environmental effects should be evaluated in the study of MBM-EG in addition to the environmental effects in short run.

[56] You should take consideration of total revenues of GHG contribution and their distribution when you set the rate of GHG contribution.
If GHG contribution in 2020 were set at U\$ 75 - 120 per fuel tonne according to market price of carbon credit (\$25 - 40 per CO_2-tonne as assumed above), total revenues of GHG contribution would be \$28 - 44 billion a year assuming 352 million of fuel consumption on B2 scenario (=1,080 million CO_2 tonne) on the basis of IMO GHG Study. It would be 28% - 44% of \$100 billion which is provided from a wide variety of sources to address the needs of developing countries according to Copenhagen Accord, whereas international shipping contributes 2.7% to global emissions. Similar thing would happen on Maritime ETS.
Sum of auction revenues of GHG allowance and carbon credits purchased from other sector would be \$28 - 44 billion on the above assumption. It is a policy issue to decide how to allocate the revenues however, it might be better to consider what kind of option is practically available for allocation before the policy decision. On Leveraged Incentive Scheme, the proceeds can be allocated to "good performance ships".

Eric Deans, Focal Point for Jamaican proposal

5 The Jamaican proposal is directly correlated to the price of carbon which would be used as one the primary determinants of the emissions fee. As such, it would be reasonable to assume that the benefits/impacts are directly proportional to 100% of the carbon price. Therefore this stringency level can be applied to the Jamaican proposal.

Andre Stochniol, Focal Point for IUCN proposal

6 The IUCN price limits are set out as an Appendix to this document. If wording is needed paragraphs 51-54 of the Technical document may be reused:

> 51 In order to increase investment certainty, a price floor and ceiling for the levy is proposed. These may be already defined implicitly through the price floor and ceiling of the carbon price the levy is linked to. In the absence of implicit values the following is proposed.
>
> 52 The floor price for the levy during calendar year 2013 will be [$30] per tonne of fuel (in constant 2010 US dollars). In the subsequent years the price floor will be increased by [3 per cent] plus the rate of inflation.
>
> 53 The ceiling price for the levy during calendar year 2013 will be [$60] per tonne of fuel (in constant 2010 US dollars). In the subsequent years the price ceiling will be increased by [5 per cent] plus the rate of inflation.
>
> 54 In case that other transport sectors are entitled to so called free emission allowances, or similar reduced commitments, a discount factor is applied to the levy formula, as follows:
>
> .1 levy discounted = P x (1 – share of free allowances) x EF.

7 As noted in the spreadsheet, for the sake of simplicity the option of discounted price limits is not proposed for analysis (the discounted price formula and limits could apply if and when other sectors are entitled to free emission allowances). Also, the limits expressed in 2008 are in $, for consistency with other assumptions (in the proposal we used 2010 $).

***

APPENDIX

IUCN PROPOSAL PRICE LIMITS

IUCN proposal price limits		2013	2015	2020	2025	2030
Levy price limits (per ton of fuel, in 2008 US$)						
Floor price (3% growth per annum)	3%	**29.4**	31.2	**36.2**	42.0	**48.7**
Ceiling price (5% growth pa)	5%	**58.9**	64.9	**82.9**	105.8	**135.0**
Price limits per ton of CO2 (in 2008 US$)						
Floor price		**9.7**	10.3	**12.0**	13.9	**16.1**
Ceiling price		**19.5**	21.5	**27.4**	35.0	**44.7**

Notes:

1. For simplicity the option of discounted price limits is not used.
   The levy, its floor and ceiling prices may be discounted for a share of free emission allowances available in other sectors.
   The formula is: levy discounted = Full price x (1 - share of free allowances)

2. Parameters used to standardize assumptions:

2010 vs 2008 US dollar factor	0.982	(based on Consumer Price Index data from: http://www.bls.gov/cpi/)
Fuel CO2 emission factor	3.021	

***

ANNEX 9

RESULTS OF ENVIRONMENTAL MODELLING RUNS

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%
Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	2015
EEDI stringency	Medium
Emission cap for ETS & GHG Fund (relative to 2007 emissions)	0%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme refund rate (%)	25%

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,147						
	2030	1,511						
EEDI emissions (Mt)	2020	1,105						
	2030	1,295						
Net emissions (Mt)	2020	870	870	1,083	780	992	1,081	1,093
	2030	870	870	1,232	887	1,154	1,225	1,266
EEDI reductions (Mt)	2020	42						
	2030	216						
MBM in-sector reductions (Mt)	2020	19	1	22	22	113	24	11
	2030	60	8	64	64	142	70	30
MBM out-of-sector reductions (Mt)	2020	216	233	0	303	0	0	0
	2030	365	418	0	345	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	2%	28%	10%	2%	1%
	2030	28%	28%	4%	27%	9%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	8%	1%	100%	7%	100%	100%	100%
	2030	14%	2%	100%	16%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	877	873	75	1,591	360	83	38
	2030	4,303	4,299	509	5,297	1,410	559	260
Financial: gross costs ($billion)	2020	27	9	27	27	*	27	14
	2030	49	22	49	49	*	49	7
Refunds/rebates ($billion)	2020	0	0	0	8	0	7	0
	2030	0	0	0	15	0	12	0
Emission credits, various ($billion)	2020	5	6	0	8	0	0	0
	2030	15	17	0	14	0	0	0
Funds ($billion)	2020	22	3	27	11	0	20	14
	2030	35	5	49	21	0	37	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.6%
Fuel price scenario	High	
Carbon price scenario	Medium	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	0%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	25%	

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,140						
	2030	1,417						
EEDI emissions (Mt)	2020	1,098						
	2030	1,214						
Net emissions (Mt)	2020	870	870	1,086	782	986	1,085	1,087
	2030	870	870	1,180	850	1,080	1,177	1,186
EEDI reductions (Mt)	2020	42						
	2030	203						
MBM in-sector reductions (Mt)	2020	10	1	13	12	113	14	11
	2030	32	3	34	34	133	37	28
MBM out-of-sector reductions (Mt)	2020	218	228	0	304	0	0	0
	2030	312	340	0	330	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	1%	28%	10%	1%	1%
	2030	24%	24%	2%	26%	9%	3%	2%
MBM in-sector reductions (% of MBM reductions)	2020	5%	0%	100%	4%	100%	100%	100%
	2030	9%	1%	100%	9%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	869	867	44	1,567	360	49	38
	2030	3,830	3,828	279	5,000	1,373	307	252
Financial: gross costs ($billion)	2020	27	8	27	27	*	27	26
	2030	47	19	47	47	*	47	12
Refunds/rebates ($billion)	2020	0	0	0	8	0	7	0
	2030	0	0	0	14	0	12	0
Emission credits, various ($billion)	2020	5	6	0	8	0	0	0
	2030	12	14	0	13	0	0	0
Funds ($billion)	2020	22	3	27	11	0	20	26
	2030	35	5	47	20	0	35	12

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%
Fuel price scenario	Reference
Carbon price scenario	High
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	0%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	25%

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,147						
	2030	1,511						
EEDI emissions (Mt)	2020	1,105						
	2030	1,295						
Net emissions (Mt)	2020	870	870	1,073	875	992	1,070	1,093
	2030	870	870	1,176	1,074	1,154	1,165	1,266
EEDI reductions (Mt)	2020	42						
	2030	216						
MBM in-sector reductions (Mt)	2020	28	2	32	22	113	35	11
	2030	114	16	119	68	142	131	30
MBM out-of-sector reductions (Mt)	2020	207	233	0	208	0	0	0
	2030	311	410	0	154	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	3%	20%	10%	3%	1%
	2030	28%	28%	8%	15%	9%	9%	2%
MBM in-sector reductions (% of MBM reductions)	2020	12%	1%	100%	10%	100%	100%	100%
	2030	27%	4%	100%	31%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	878	873	107	1,140	360	118	38
	2030	4,304	4,299	849	3,252	1,410	932	260
Financial: gross costs ($billion)	2020	43	14	43	30	*	43	14
	2030	118	55	118	55	*	116	7
Refunds/rebates ($billion)	2020	0	0	0	9	0	11	0
	2030	0	0	0	16	0	29	0
Emission credits, various ($billion)	2020	8	9	0	8	0	0	0
	2030	31	41	0	15	0	0	0
Funds ($billion)	2020	35	4	43	12	0	32	14
	2030	87	14	118	23	0	87	7

*unknown

Scenarios & Key Parameters:

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.6%
Fuel price scenario	High	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	0%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	25%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,140						
	2030	1,417						
EEDI emissions (Mt)	2020	1,098						
	2030	1,214						
Net emissions (Mt)	2020	870	870	1,080	877	986	1,078	1,087
	2030	870	870	1,150	1,031	1,080	1,144	1,186
EEDI reductions (Mt)	2020	42						
	2030	203						
MBM in-sector reductions (Mt)	2020	16	1	18	13	113	20	11
	2030	60	7	63	36	133	70	28
MBM out-of-sector reductions (Mt)	2020	213	227	0	208	0	0	0
	2030	283	337	0	147	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	2%	19%	10%	2%	1%
	2030	24%	24%	4%	13%	9%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	7%	1%	100%	6%	100%	100%	100%
	2030	18%	2%	100%	20%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	870	867	63	1,113	360	69	38
	2030	3,831	3,828	465	2,983	1,373	511	252
Financial: gross costs ($billion)	2020	43	14	43	30	*	43	26
	2030	115	46	115	53	*	114	12
Refunds/rebates ($billion)	2020	0	0	0	9	0	11	0
	2030	0	0	0	16	0	29	0
Emission credits, various ($billion)	2020	9	9	0	8	0	0	0
	2030	28	34	0	15	0	0	0
Funds ($billion)	2020	35	4	43	13	0	32	26
	2030	87	13	115	22	0	86	12

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.0%
Fuel price scenario	Reference	
Carbon price scenario	Medium	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	50%	

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,147						
	2030	1,511						
EEDI emissions (Mt)	2020	1,105						
	2030	1,295						
Net emissions (Mt)	2020	783	783	1,083	780	992	1,079	1,093
	2030	783	783	1,232	887	1,154	1,219	1,266
EEDI reductions (Mt)	2020	42						
	2030	216						
MBM in-sector reductions (Mt)	2020	19	2	22	22	113	26	11
	2030	60	11	64	64	142	76	30
MBM out-of-sector Reductions (Mt)	2020	303	319	0	303	0	0	0
	2030	452	501	0	345	0	0	0
MBM reductions (% of BAU)	2020	28%	28%	2%	28%	10%	2%	1%
	2030	34%	34%	4%	27%	9%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	6%	1%	100%	7%	100%	100%	100%
	2030	12%	2%	100%	16%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,268	1,265	75	1,591	360	90	38
	2030	5,564	5,561	509	5,297	1,410	609	260
Financial: gross costs ($ billion)	2020	27	11	27	27	*	27	14
	2030	49	25	49	49	*	49	7
Refunds/rebates ($ billion)	2020	0	0	0	8	0	13	0
	2030	0	0	0	15	0	24	0
Emission credits, various ($ billion)	2020	8	8	0	8	0	0	0
	2030	18	20	0	14	0	0	0
Funds ($ billion)	2020	20	3	27	11	0	13	14
	2030	31	5	49	21	0	24	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.6%
Fuel price scenario	High	
Carbon price scenario	Medium	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	10%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	50%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,140						
	2030	1,417						
EEDI emissions (Mt)	2020	1,098						
	2030	1,214						
Net emissions (Mt)	2020	783	783	1,086	782	986	1,083	1,087
	2030	783	783	1,180	850	1,080	1,173	1,186
EEDI reductions (Mt)	2020	42						
	2030	203						
MBM in-sector reductions (Mt)	2020	10	1	13	12	113	15	11
	2030	32	5	34	34	133	41	28
MBM out-of-sector reductions (Mt)	2020	305	314	0	304	0	0	0
	2030	399	426	0	330	0	0	0
MBM reductions (% of BAU)	2020	28%	28%	1%	28%	10%	1%	1%
	2030	30%	30%	2%	26%	9%	3%	2%
MBM in-sector reductions (% of MBM Reductions)	2020	3%	0%	100%	4%	100%	100%	100%
	2030	7%	1%	100%	9%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,260	1,258	44	1,567	360	53	38
	2030	5,091	5,090	279	5,000	1,373	335	252
Financial: gross costs ($billion)	2020	27	11	27	27	*	27	26
	2030	47	22	47	47	*	47	12
Refunds/rebates ($billion)	2020	0	0	0	8	0	14	0
	2030	0	0	0	14	0	23	0
Emission credits, various ($billion)	2020	8	8	0	8	0	0	0
	2030	16	17	0	13	0	0	0
Funds ($billion)	2020	20	3	27	11	0	14	26
	2030	31	5	47	20	0	23	12

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%
Fuel price scenario	Reference
Carbon price scenario	High
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	10%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	50%

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,147						
	2030	1,511						
EEDI emissions (Mt)	2020	1,105						
	2030	1,295						
Net emissions (Mt)	2020	783	783	1,073	875	992	1,066	1,093
	2030	783	783	1,176	1,074	1,154	1,154	1,266
EEDI reductions (Mt)	2020	42						
	2030	216						
MBM in-sector reductions (Mt)	2020	28	4	32	22	113	38	11
	2030	114	22	119	68	142	142	30
MBM out-of-sector reductions (Mt)	2020	294	318	0	208	0	0	0
	2030	398	490	0	154	0	0	0
MBM reductions (% of BAU)	2020	28%	28%	3%	20%	10%	3%	1%
	2030	34%	34%	8%	15%	9%	9%	2%
MBM in-sector reductions (% of MBM reductions)	2020	9%	1%	100%	10%	100%	100%	100%
	2030	22%	4%	100%	31%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,270	1,265	107	1,140	360	129	38
	2030	5,566	5,561	849	3,252	1,410	1,013	260
Financial: gross costs ($billion)	2020	43	17	43	30	*	43	14
	2030	118	63	118	55	*	115	7
Refunds/rebates ($billion)	2020	0	0	0	9	0	21	0
	2030	0	0	0	16	0	58	0
Emission credits, various ($billion)	2020	12	13	0	8	0	0	0
	2030	40	49	0	15	0	0	0
Funds ($billion)	2020	31	5	43	12	0	21	14
	2030	78	14	118	23	0	58	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.6%
Fuel price scenario	High	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	10%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	50%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,140						
	2030	1,417						
EEDI emissions (Mt)	2020	1,098						
	2030	1,214						
Net emissions (Mt)	2020	783	783	1,080	877	986	1,076	1,087
	2030	783	783	1,150	1,031	1,080	1,138	1,186
EEDI reductions (Mt)	2020	42						
	2030	203						
MBM in-sector reductions (Mt)	2020	16	2	18	13	113	22	11
	2030	60	11	63	36	133	76	28
MBM out-of-sector reductions (Mt)	2020	300	313	0	208	0	0	0
	2030	370	420	0	147	0	0	0
MBM reductions (% of BAU)	2020	28%	28%	2%	19%	10%	2%	1%
	2030	30%	30%	4%	13%	9%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	5%	1%	100%	6%	100%	100%	100%
	2030	14%	2%	100%	20%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,261	1,258	63	1,113	360	76	38
	2030	5,092	5,090	465	2,983	1,373	557	252
Financial: gross costs ($billion)	2020	43	17	43	30	*	43	26
	2030	115	55	115	53	*	114	12
Refunds/rebates ($billion)	2020	0	0	0	9	0	22	0
	2030	0	0	0	16	0	57	0
Emission credits, various ($billion)	2020	12	13	0	8	0	0	0
	2030	37	42	0	15	0	0	0
Funds ($billion)	2020	31	4	43	13	0	22	26
	2030	78	13	115	22	0	57	12

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%
Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	20%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	75%

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,147						
	2030	1,511						
EEDI emissions (Mt)	2020	1,105						
	2030	1,295						
Net emissions (Mt)	2020	696	696	1,083	780	992	1,076	1,093
	2030	696	696	1,232	887	1,154	1,213	1,266
EEDI reductions (Mt)	2020	42						
	2030	216						
MBM in-sector reductions (Mt)	2020	19	4	22	22	113	28	11
	2030	60	15	64	64	142	83	30
MBM out-of-sector reductions (Mt)	2020	390	405	0	303	0	0	0
	2030	539	584	0	345	0	0	0
MBM reductions (% of BAU)	2020	36%	36%	2%	28%	10%	2%	1%
	2030	40%	40%	4%	27%	9%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	5%	1%	100%	7%	100%	100%	100%
	2030	10%	3%	100%	16%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,660	1,657	75	1,591	360	98	38
	2030	6,826	6,823	509	5,297	1,410	658	260
Financial: gross costs ($billion)	2020	27	13	27	27	*	27	14
	2030	49	29	49	49	*	49	7
Refunds/rebates ($billion)	2020	0	0	0	8	0	20	0
	2030	0	0	0	15	0	36	0
Emission credits, various ($billion)	2020	10	10	0	8	0	0	0
	2030	22	23	0	14	0	0	0
Funds ($billion)	2020	17	3	27	11	0	7	14
	2030	28	5	49	21	0	12	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.6%
Fuel price scenario	High	
Carbon price scenario	Medium	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	20%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	75%	

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,140						
	2030	1,417						
EEDI emissions (Mt)	2020	1,098						
	2030	1,214						
Net emissions (Mt)	2020	696	696	1,086	782	986	1,082	1,087
	2030	696	696	1,180	850	1,080	1,170	1,186
EEDI reductions (Mt)	2020	42						
	2030	203						
MBM in-sector reductions (Mt)	2020	10	2	13	12	113	16	11
	2030	32	7	34	34	133	44	28
MBM out-of-sector reductions (Mt)	2020	392	400	0	304	0	0	0
	2030	486	510	0	330	0	0	0
MBM reductions (% of BAU)	2020	35%	35%	1%	28%	10%	1%	1%
	2030	37%	37%	2%	26%	9%	3%	2%
MBM in-sector reductions (% of MBM reductions)	2020	3%	1%	100%	4%	100%	100%	100%
	2030	6%	1%	100%	9%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,652	1,650	44	1,567	360	57	38
	2030	6,353	6,351	279	5,000	1,373	362	252
Financial: gross costs ($billion)	2020	27	13	27	27	*	27	26
	2030	47	25	47	47	*	47	12
Refunds/rebates ($billion)	2020	0	0	0	8	0	20	0
	2030	0	0	0	14	0	35	0
Emission credits, various ($billion)	2020	10	10	0	8	0	0	0
	2030	19	20	0	13	0	0	0
Funds ($billion)	2020	17	3	27	11	0	7	26
	2030	28	5	47	20	0	12	12

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.0%
Fuel price scenario	Reference	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	20%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	75%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,147						
	2030	1,511						
EEDI emissions (Mt)	2020	1,105						
	2030	1,295						
Net emissions (Mt)	2020	696	696	1,073	875	992	1,063	1,093
	2030	696	696	1,176	1,074	1,154	1,143	1,266
EEDI reductions (Mt)	2020	42						
	2030	216						
MBM in-sector reductions (Mt)	2020	28	5	32	22	113	42	11
	2030	114	31	119	68	142	153	30
MBM out-of-sector reductions (Mt)	2020	381	403	0	208	0	0	0
	2030	485	569	0	154	0	0	0
MBM reductions (% of BAU)	2020	36%	36%	3%	20%	10%	4%	1%
	2030	40%	40%	8%	15%	9%	10%	2%
MBM in-sector reductions (% of MBM reductions)	2020	7%	1%	100%	10%	100%	100%	100%
	2030	19%	5%	100%	31%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,661	1,657	107	1,140	360	139	38
	2030	6,827	6,823	849	3,252	1,410	1,095	260
Financial: gross costs ($billion)	2020	43	21	43	30	*	43	14
	2030	118	71	118	55	*	114	7
Refunds/rebates ($billion)	2020	0	0	0	9	0	32	0
	2030	0	0	0	16	0	86	0
Emission credits, various ($billion)	2020	15	16	0	8	0	0	0
	2030	49	57	0	15	0	0	0
Funds ($billion)	2020	28	5	43	12	0	11	14
	2030	70	14	118	23	0	29	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	2.8%	0.6%
Fuel price scenario	High	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	20%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	75%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,140						
	2030	1,417						
EEDI emissions (Mt)	2020	1,098						
	2030	1,214						
Net emissions (Mt)	2020	696	696	1,080	877	986	1,075	1,087
	2030	696	696	1,150	1,031	1,080	1,132	1,186
EEDI reductions (Mt)	2020	42						
	2030	203						
MBM in-sector reductions (Mt)	2020	16	3	18	13	113	24	11
	2030	60	15	63	36	133	82	28
MBM out-of-sector reductions (Mt)	2020	387	399	0	208	0	0	0
	2030	457	503	0	147	0	0	0
MBM reductions (% of BAU)	2020	35%	35%	2%	19%	10%	2%	1%
	2030	37%	37%	4%	13%	9%	6%	2%
MBM in-sector reductions (% of MBM reductions)	2020	4%	1%	100%	6%	100%	100%	100%
	2030	12%	3%	100%	20%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,653	1,650	63	1,113	360	82	38
	2030	6,354	6,351	465	2,983	1,373	602	252
Financial: gross costs ($billion)	2020	43	20	43	30	*	43	26
	2030	115	63	115	53	*	113	12
Refunds/rebates ($billion)	2020	0	0	0	9	0	32	0
	2030	0	0	0	16	0	85	0
Emission credits, various ($billion)	2020	15	16	0	8	0	0	0
	2030	46	50	0	15	0	0	0
Funds ($billion)	2020	28	4	43	13	0	11	26
	2030	70	13	115	22	0	28	12

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%
Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	0%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	25%

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,025						
	2030	1,207						
EEDI emissions (Mt)	2020	993						
	2030	1,054						
Net emissions (Mt)	2020	870	870	973	701	887	971	982
	2030	870	870	1,001	721	922	996	1,027
EEDI reductions (Mt)	2020	32						
	2030	153						
MBM in-sector reductions (Mt)	2020	17	1	20	20	106	22	11
	2030	49	3	53	52	132	58	26
MBM out-of-sector reductions (Mt)	2020	106	122	0	273	0	0	0
	2030	134	181	0	280	0	0	0
MBM reductions (% of BAU)	2020	12%	12%	2%	29%	10%	2%	1%
	2030	15%	15%	4%	28%	11%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	14%	1%	100%	7%	100%	100%	100%
	2030	27%	2%	100%	16%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	473	469	69	1,463	344	76	36
	2030	2,081	2,078	439	4,614	1,353	482	237
Financial: gross costs ($billion)	2020	24	6	24	24	*	24	15
	2030	40	12	40	40	*	40	7
Refunds/rebates ($billion)	2020	0	0	0	7	0	6	0
	2030	0	0	0	12	0	10	0
Emission credits, various ($billion)	2020	3	3	0	7	0	0	0
	2030	5	7	0	11	0	0	0
Funds ($billion)	2020	22	2	24	10	0	18	15
	2030	35	4	40	17	0	30	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%	0.3%
Fuel price scenario	High	
Carbon price scenario	Medium	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	0%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	25%	

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,022						
	2030	1,175						
EEDI emissions (Mt)	2020	990						
	2030	1,025						
Net emissions (Mt)	2020	870	870	979	705	885	978	980
	2030	870	870	996	718	897	994	999
EEDI reductions (Mt)	2020	32						
	2030	149						
MBM in-sector reductions (Mt)	2020	10	0	11	11	106	13	11
	2030	27	1	29	29	129	32	26
MBM out-of-sector reductions (Mt)	2020	111	120	0	274	0	0	0
	2030	128	154	0	279	0	0	0
MBM reductions (% of BAU)	2020	12%	12%	1%	28%	10%	1%	1%
	2030	13%	13%	2%	26%	11%	3%	2%
MBM in-sector reductions (% of MBM reductions)	2020	8%	0%	100%	4%	100%	100%	100%
	2030	17%	1%	100%	9%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	469	467	41	1,442	344	45	36
	2030	1,911	1,909	246	4,428	1,337	271	234
Financial: gross costs ($billion)	2020	25	5	24	24	*	24	28
	2030	40	10	40	40	*	40	13
Refunds/rebates ($billion)	2020	0	0	0	7	0	6	0
	2030	0	0	0	12	0	10	0
Emission credits, various ($billion)	2020	3	3	0	7	0	0	0
	2030	5	6	0	11	0	0	0
Funds ($billion)	2020	22	2	24	10	0	18	28
	2030	35	4	40	17	0	30	13

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%
Fuel price scenario	Reference
Carbon price scenario	High
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	0%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	25%

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,025						
	2030	1,207						
EEDI emissions (Mt)	2020	993						
	2030	1,054						
Net emissions (Mt)	2020	870	870	964	786	887	961	982
	2030	870	870	956	873	922	946	1,027
EEDI reductions (Mt)	2020	32						
	2030	153						
MBM in-sector reductions (Mt)	2020	25	1	29	20	106	32	11
	2030	94	6	98	56	132	107	26
MBM out-of-sector reductions (Mt)	2020	98	122	0	187	0	0	0
	2030	90	178	0	125	0	0	0
MBM reductions (% of BAU)	2020	12%	12%	3%	20%	10%	3%	1%
	2030	15%	15%	8%	15%	11%	9%	2%
MBM in-sector reductions (% of MBM reductions)	2020	20%	1%	100%	10%	100%	100%	100%
	2030	51%	3%	100%	31%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	474	469	99	1,049	344	109	36
	2030	2,083	2,078	730	2,850	1,353	801	237
Financial: gross costs ($billion)	2020	39	9	39	27	*	38	15
	2030	96	29	96	45	*	95	7
Refunds/rebates ($billion)	2020	0	0	0	8	0	10	0
	2030	0	0	0	13	0	24	0
Emission credits, various ($billion)	2020	4	5	0	7	0	0	0
	2030	9	18	0	12	0	0	0
Funds ($billion)	2020	35	4	39	11	0	29	15
	2030	87	11	96	19	0	71	7

* unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%	0.3%
Fuel price scenario	High	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	0%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	25%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,022						
	2030	1,175						
EEDI emissions (Mt)	2020	990						
	2030	1,025						
Net emissions (Mt)	2020	870	870	974	791	885	972	980
	2030	870	870	971	870	897	966	999
EEDI reductions (Mt)	2020	32						
	2030	149						
MBM in-sector reductions (Mt)	2020	14	1	17	12	106	18	11
	2030	51	3	54	31	129	59	26
MBM out-of-sector reductions (Mt)	2020	106	120	0	188	0	0	0
	2030	104	152	0	124	0	0	0
MBM reductions (% of BAU)	2020	12%	12%	2%	20%	10%	2%	1%
	2030	13%	13%	5%	13%	11%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	12%	0%	100%	6%	100%	100%	100%
	2030	33%	2%	100%	20%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	470	467	58	1,025	344	64	36
	2030	1,912	1,909	409	2,655	1,337	449	234
Financial: gross costs ($billion)	2020	39	9	39	27	*	39	28
	2030	97	26	97	44	*	97	13
Refunds/rebates ($billion)	2020	0	0	0	8	0	10	0
	2030	0	0	0	13	0	24	0
Emission credits, various ($billion)c	2020	4	5	0	8	0	0	0
	2030	10	15	0	12	0	0	0
Funds ($billion)	2020	35	4	39	11	0	29	28
	2030	87	10	97	19	0	72	13

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%
Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	10%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	50%

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,025						
	2030	1,207						
EEDI emissions (Mt)	2020	993						
	2030	1,054						
Net emissions (Mt)	2020	783	783	973	701	887	969	982
	2030	783	783	1,001	721	922	991	1,027
EEDI reductions (Mt)	2020	32						
	2030	153						
MBM in-sector reductions (Mt)	2020	17	1	20	20	106	24	11
	2030	49	5	53	52	132	63	26
MBM out-of-sector reductions (Mt)	2020	193	208	0	273	0	0	0
	2030	221	265	0	280	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	2%	29%	10%	2%	1%
	2030	22%	22%	4%	28%	11%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	8%	1%	100%	7%	100%	100 %	100%
	2030	18%	2%	100%	16%	100%	100 %	100%
Cumulative emission reductions (Mt)	2020	864	861	69	1,463	344	83	36
	2030	3,343	3,340	439	4,614	1,353	525	237
Financial: gross costs ($billion)	2020	24	8	24	24	*	24	15
	2030	40	15	40	40	*	40	7
Refunds/rebates ($billion)	2020	0	0	0	7	0	12	0
	2030	0	0	0	12	0	20	0
Emission credits, various ($billion)	2020	5	5	0	7	0	0	0
	2030	9	11	0	11	0	0	0
Funds ($billion)	2020	20	3	24	10	0	12	15
	2030	31	4	40	17	0	20	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%	0.3%
Fuel price scenario	High	
Carbon price scenario	Medium	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	10%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	50%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,022						
	2030	1,175						
EEDI emissions (Mt)	2020	990						
	2030	1,025						
Net emissions (Mt)	2020	783	783	979	705	885	977	980
	2030	783	783	996	718	897	991	999
EEDI reductions (Mt)	2020	32						
	2030	149						
MBM in-sector reductions (Mt)	2020	10	1	11	11	106	14	11
	2030	27	3	29	29	129	34	26
MBM out-of-sector reductions (Mt)	2020	198	207	0	274	0	0	0
	2030	215	240	0	279	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	1%	28%	10%	1%	1%
	2030	21%	21%	2%	26%	11%	3%	2%
MBM in-sector reductions (% of MBM reductions)	2020	5%	0%	100%	4%	100%	100%	100%
	2030	11%	1%	100%	9%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	860	858	41	1,442	344	49	36
	2030	3,173	3,171	246	4,428	1,337	295	234
Financial: gross costs ($billion)	2020	25	8	24	24	*	24	28
	2030	40	14	40	40	*	40	13
Refunds/rebates ($billion)	2020	0	0	0	7	0	12	0
	2030	0	0	0	12	0	20	0
Emission credits, various ($billion)	2020	5	5	0	7	0	0	0
	2030	9	10	0	11	0	0	0
Funds ($billion)	2020	20	2	24	10	0	12	28
	2030	31	4	40	17	0	20	13

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%
Fuel price scenario	Reference
Carbon price scenario	High
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	10%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	50%

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,025						
	2030	1,207						
EEDI emissions (Mt)	2020	993						
	2030	1,054						
Net emissions (Mt)	2020	783	783	964	786	887	958	982
	2030	783	783	956	873	922	937	1,027
EEDI reductions (Mt)	2020	32						
	2030	153						
MBM in-sector reductions (Mt)	2020	25	2	29	20	106	35	11
	2030	94	11	98	56	132	116	26
MBM out-of-sector reductions (Mt)	2020	185	208	0	187	0	0	0
	2030	177	260	0	125	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	3%	20%	10%	3%	1%
	2030	22%	22%	8%	15%	11%	10%	2%
MBM in-sector reductions (% of MBM reductions)	2020	12%	1%	100%	10%	100%	100%	100%
	2030	35%	4%	100%	31%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	866	861	99	1,049	344	119	36
	2030	3,344	3,340	730	2,850	1,353	872	237
Financial: gross costs ($billion)	2020	39	12	39	27	*	38	15
	2030	96	37	96	45	*	94	7
Refunds/rebates ($billion)	2020	0	0	0	8	0	19	0
	2030	0	0	0	13	0	47	0
Emission credits, various ($billion)	2020	7	8	0	7	0	0	0
	2030	18	26	0	12	0	0	0
Funds ($billion)	2020	31	4	39	11	0	19	15
	2030	78	11	96	19	0	47	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%	0.3%
Fuel price scenario	High	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	10%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	50%	

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,022						
	2030	1,175						
EEDI emissions (Mt)	2020	990						
	2030	1,025						
Net emissions (Mt)	2020	783	783	974	791	885	970	980
	2030	783	783	971	870	897	961	999
EEDI reductions (Mt)	2020	32						
	2030	149						
MBM in-sector reductions (Mt)	2020	14	1	17	12	106	20	11
	2030	51	5	54	31	129	64	26
MBM out-of-sector reductions (Mt)	2020	193	206	0	188	0	0	0
	2030	191	237	0	124	0	0	0
MBM reductions (% of BAU)	2020	20%	20%	2%	20%	10%	2%	1%
	2030	21%	21%	5%	13%	11%	5%	2%
MBM in-sector reductions (% of MBM reductions)	2020	7%	1%	100%	6%	100%	100%	100%
	2030	21%	2%	100%	20%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	861	859	58	1,025	344	70	36
	2030	3,173	3,171	409	2,655	1,337	489	234
Financial: gross costs ($billion)	2020	39	12	39	27	*	39	28
	2030	97	34	97	44	*	96	13
Refunds/rebates ($billion)	2020	0	0	0	8	0	19	0
	2030	0	0	0	13	0	48	0
Emission credits, various ($billion)	2020	8	8	0	8	0	0	0
	2030	19	24	0	12	0	0	0
Funds ($billion)	2020	31	4	39	11	0	19	28
	2030	78	11	97	19	0	48	13

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra Efficiency from 2020)	1.7%
Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	2015
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	20%
Additional contribution (for GHG Fund)	10%
Leveraged Incentive Scheme – refund rate (%)	75%

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,025						
	2030	1,207						
EEDI emissions (Mt)	2020	993						
	2030	1,054						
Net emissions (Mt)	2020	696	696	973	701	887	967	982
	2030	696	696	1,001	721	922	986	1,027
EEDI reductions (Mt)	2020	32						
	2030	153						
MBM in-sector reductions (Mt)	2020	17	2	20	20	106	26	11
	2030	49	9	53	52	132	68	26
MBM out-of-sector reductions (Mt)	2020	280	294	0	273	0	0	0
	2030	308	349	0	280	0	0	0
MBM reductions (% of BAU)	2020	29%	29%	2%	29%	10%	3%	1%
	2030	30%	30%	4%	28%	11%	6%	2%
MBM in-sector reductions (% of MBM reductions)	2020	6%	1%	100%	7%	100%	100%	100%
	2030	14%	2%	100%	16%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,256	1,253	69	1,463	344	90	36
	2030	4,604	4,601	439	4,614	1,353	568	237
Financial: gross costs ($billion)	2020	24	10	24	24	*	24	15
	2030	40	18	40	40	*	39	7
Refunds/rebates ($billion)	2020	0	0	0	7	0	18	0
	2030	0	0	0	12	0	30	0
Emission credits, various ($billion)	2020	7	7	0	7	0	0	0
	2030	12	14	0	11	0	0	0
Funds ($billion)	2020	17	3	24	10	0	6	15
	2030	28	4	40	17	0	10	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%	0.3%
Fuel price scenario	High	
Carbon price scenario	Medium	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	20%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	75%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,022						
	2030	1,175						
EEDI emissions (Mt)	2020	990						
	2030	1,025						
Net emissions (Mt)	2020	696	696	979	705	885	976	980
	2030	696	696	996	718	897	988	999
EEDI reductions (Mt)	2020	32						
	2030	149						
MBM in-sector reductions (Mt)	2020	10	1	11	11	106	15	11
	2030	27	4	29	29	129	37	26
MBM out-of-sector reductions (Mt)	2020	285	293	0	274	0	0	0
	2030	302	325	0	279	0	0	0
MBM reductions (% of BAU)	2020	29%	29%	1%	28%	10%	1%	1%
	2030	28%	28%	2%	26%	11%	3%	2%
MBM in-sector reductions (% of MBM reductions)	2020	3%	0%	100%	4%	100%	100%	100%
	2030	8%	1%	100%	9%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,252	1,250	41	1,442	344	53	36
	2030	4,434	4,432	246	4,428	1,337	319	234
Financial: gross costs ($billion)	2020	25	10	24	24	*	24	28
	2030	40	17	40	40	*	40	13
Refunds/rebates ($billion)	2020	0	0	0	7	0	18	0
	2030	0	0	0	12	0	30	0
Emission credits, various ($billion)	2020	7	7	0	7	0	0	0
	2030	12	13	0	11	0	0	0
Funds ($billion)	2020	17	2	24	10	0	6	28
	2030	28	4	40	17	0	10	13

* unknown

Scenarios & Key Parameters

Emission growth scenario (and extra efficiency from 2020)	1.7%	0.0%
Fuel price scenario	Reference	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	20%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	75%	

Key Elements	Year	ETS	GHG Fund	PSL	RM	SECT	LIS	VES
BAU emissions (Mt)	2020	1,025						
	2030	1,207						
EEDI emissions (Mt)	2020	993						
	2030	1,054						
Net emissions (Mt)	2020	696	696	964	786	887	955	982
	2030	696	696	956	873	922	928	1,027
EEDI reductions (Mt)	2020	32						
	2030	153						
MBM in-sector reductions (Mt)	2020	25	4	29	20	106	38	11
	2030	94	17	98	56	132	126	26
MBM out-of-sector reductions (Mt)	2020	272	293	0	187	0	0	0
	2030	264	341	0	125	0	0	0
MBM reductions (% of BAU)	2020	29%	29%	3%	20%	10%	4%	1%
	2030	30%	30%	8%	15%	11%	10%	2%
MBM in-sector reductions (% of MBM reductions)	2020	8%	1%	100%	10%	100%	100%	100%
	2030	26%	5%	100%	31%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,257	1,253	99	1,049	344	128	36
	2030	4,606	4,601	730	2,850	1,353	941	237
Financial: gross costs ($billion)	2020	39	16	39	27	*	38	15
	2030	96	46	96	45	*	93	7
Refunds/rebates ($billion)	2020	0	0	0	8	0	29	0
	2030	0	0	0	13	0	70	0
Emission credits, various ($billion)	2020	11	12	0	7	0	0	0
	2030	26	34	0	12	0	0	0
Funds ($billion)	2020	28	4	39	11	0	10	15
	2030	70	11	96	19	0	23	7

*unknown

Scenarios & Key Parameters

Emission growth scenario (and extra Efficiency from 2020)	1.7%	0.3%
Fuel price scenario	High	
Carbon price scenario	High	
MBM launch date	2015	
EEDI stringency	Medium	
Emission cap (for ETS & GHG Fund)	20%	
Additional contribution (for GHG Fund)	10%	
Leveraged Incentive Scheme – refund rate (%)	75%	

Key Elements	**Year**	**ETS**	**GHG Fund**	**PSL**	**RM**	**SECT**	**LIS**	**VES**
BAU emissions (Mt)	2020	1,022						
	2030	1,175						
EEDI emissions (Mt)	2020	990						
	2030	1,025						
Net emissions (Mt)	2020	696	696	974	791	885	969	980
	2030	696	696	971	870	897	956	999
EEDI reductions (Mt)	2020	32						
	2030	149						
MBM in-sector reductions (Mt)	2020	14	2	17	12	106	22	11
	2030	51	9	54	31	129	70	26
MBM out-of-sector reductions (Mt)	2020	280	292	0	188	0	0	0
	2030	278	321	0	124	0	0	0
MBM reductions (% of BAU)	2020	29%	29%	2%	20%	10%	2%	1%
	2030	28%	28%	5%	13%	11%	6%	2%
MBM in-sector reductions (% of MBM reductions)	2020	5%	1%	100%	6%	100%	100%	100%
	2030	16%	3%	100%	20%	100%	100%	100%
Cumulative emission reductions (Mt)	2020	1,253	1,250	58	1,025	344	76	36
	2030	4,435	4,433	409	2,655	1,337	529	234
Financial: gross costs ($billion)	2020	39	16	39	27	*-	39	28
	2030	97	43	97	44	*-	96	13
Refunds/rebates ($billion)	2020	0	0	0	8	0	29	0
	2030	0	0	0	13	0	72	0
Emission credits, various ($billion)	2020	11	12	0	8	0	0	0
	2030	28	32	0	12	0	0	0
Funds ($billion)	2020	28	4	39	11	0	10	28
	2030	70	11	97	19	0	24	13

* unknown

GHG FUNDS SCENARIOS WITHOUT ADDITIONAL CONTRIBUTION

Scenarios & Key Parameters

Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	0%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	870	870
	2030	870	870
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	0	1
	2030	1	4
MBM out-of-sector reductions (Mt)	2020	123	234
	2030	183	422
MBM reductions (% of BAU)	2020	12%	20%
	2030	15%	28%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	1%
Cumulative emission reductions (Mt)	2020	**469**	**873**
	2030	**2,078**	**4,299**
Financial: gross costs ($billion)	2020	3	6
	2030	7	17
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	3	6
	2030	7	17
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	High
Carbon price scenario	Medium
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	0%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	990	1,098
	2030	1,025	1,214
Net emissions (Mt)	2020	870	870
	2030	870	870
EEDI reductions (Mt)	2020	32	42
	2030	149	203
MBM in-sector reductions (Mt)	2020	0	0
	2030	0	2
MBM out-of-sector reductions (Mt)	2020	120	228
	2030	155	342
MBM reductions (% of BAU)	2020	12%	20%
	2030	13%	24%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	0%	0%
Cumulative emission reductions (Mt)	2020	**467**	**867**
	2030	**1,909**	**3,828**
Financial: gross costs ($billion)	2020	3	6
	2030	6	14
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	3	6
	2030	6	14
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	Reference
Carbon price scenario	High
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	0%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	870	870
	2030	870	870
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	0	1
	2030	2	8
MBM out-of-sector reductions (Mt)	2020	123	234
	2030	182	417
MBM reductions (% of BAU)	2020	12%	20%
	2030	15%	28%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	2%
Cumulative emission reductions (Mt)	2020	**469**	**873**
	2030	**2,078**	**4,299**
Financial: gross costs ($billion)	2020	5	9
	2030	18	42
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	5	9
	2030	18	42
Funds ($billion)	2020	0	0
	2030	0	1

Scenarios & Key Parameters

Fuel price scenario	High
Carbon price scenario	High
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	0%
Additional contribution (for GHG Fund)	0%

	Year	B2	A1B
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	990	1,098
	2030	1,025	1,214
Net emissions (Mt)	2020	870	870
	2030	870	870
EEDI reductions (Mt)	2020	32	42
	2030	149	203
MBM in-sector reductions (Mt)	2020	0	1
	2030	1	4
MBM out-of-sector reductions (Mt)	2020	120	228
	2030	154	340
MBM reductions (% of BAU)	2020	12%	20%
	2030	13%	24%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	1%
Cumulative emission reductions (Mt)	2020	**467**	**867**
	2030	**1,909**	**3,828**
Financial: gross costs ($billion)	2020	5	9
	2030	16	34
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	5	9
	2030	15	34
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	10%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	783	783
	2030	783	783
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	1	1
	2030	3	7
MBM out-of-sector reductions (Mt)	2020	209	321
	2030	268	506
MBM reductions (% of BAU)	2020	20%	28%
	2030	22%	34%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	1%
Cumulative emission reductions (Mt)	2020	**861**	**1,265**
	2030	**3,339**	**5,561**
Financial: gross costs ($billion)	2020	5	8
	2030	11	20
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	5	8
	2030	11	20
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	High
Carbon price scenario	Medium
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	10%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	990	1,098
	2030	1,025	1,214
Net emissions (Mt)	2020	783	783
	2030	783	783
EEDI reductions (Mt)	2020	32	42
	2030	149	203
MBM in-sector reductions (Mt)	2020	0	1
	2030	1	3
MBM out-of-sector reductions (Mt)	2020	207	315
	2030	241	428
MBM reductions (% of BAU)	2020	20%	28%
	2030	21%	30%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	1%
Cumulative emission reductions (Mt)	2020	**858**	**1,258**
	2030	**3,171**	**5,089**
Financial: gross costs ($billion)	2020	5	8
	2030	10	17
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	5	8
	2030	10	17
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	Reference
Carbon price scenario	High
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	10%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	783	783
	2030	783	783
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	1	2
	2030	5	13
MBM out-of-sector reductions (Mt)	2020	209	320
	2030	265	499
MBM reductions (% of BAU)	2020	20%	28%
	2030	22%	34%
MBM in-sector reductions (% of MBM reductions)	2020	0%	1%
	2030	2%	3%
Cumulative emission reductions (Mt)	2020	**861**	**1,265**
	2030	**3,339**	**5,561**
Financial: gross costs ($billion)	2020	8	13
	2030	27	51
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	8	13
	2030	27	50
Funds ($billion)	2020	0	0
	2030	0	1

Scenarios & Key Parameters

Fuel price scenario	High
Carbon price scenario	High
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	10%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	990	1,098
	2030	1,025	1,214
Net emissions (Mt)	2020	783	783
	2030	783	783
EEDI reductions (Mt)	2020	32	42
	2030	149	203
MBM in-sector reductions (Mt)	2020	1	1
	2030	3	6
MBM out-of-sector reductions (Mt)	2020	207	314
	2030	240	425
MBM reductions (% of BAU)	2020	20%	28%
	2030	21%	30%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	1%
Cumulative emission reductions (Mt)	2020	**858**	**1,258**
	2030	**3,171**	**5,090**
Financial: gross costs ($billion)	2020	8	13
	2030	24	43
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	8	13
	2030	24	42
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	Reference
Carbon price scenario	Medium
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	20%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	696	696
	2030	696	696
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	1	2
	2030	5	10
MBM out-of-sector reductions (Mt)	2020	296	407
	2030	353	590
MBM reductions (% of BAU)	2020	29%	36%
	2030	30%	40%
MBM in-sector reductions (% of MBM reductions)	2020	0%	1%
	2030	1%	2%
Cumulative emission reductions (Mt)	2020	**1,253**	**1,656**
	2030	**4,601**	**6,822**
Financial: gross costs ($billion)	2020	7	10
	2030	14	24
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	7	10
	2030	14	24
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	High
Carbon price scenario	Medium
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	20%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	990	1,098
	2030	1,025	1,214
Net emissions (Mt)	2020	696	696
	2030	696	696
EEDI reductions (Mt)	2020	32	42
	2030	149	203
MBM in-sector reductions (Mt)	2020	1	1
	2030	3	5
MBM out-of-sector reductions (Mt)	2020	294	401
	2030	327	513
MBM reductions (% of BAU)	2020	29%	35%
	2030	28%	37%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	1%
Cumulative emission reductions (Mt)	2020	**1,250**	**1,650**
	2030	**4,432**	**6,351**
Financial: gross costs ($billion)	2020	7	10
	2030	13	21
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	7	10
	2030	13	21
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

Fuel price scenario	Reference
Carbon price scenario	High
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	20%
Additional contribution (for GHG Fund)	0%

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	993	1,105
	2030	1,054	1,295
Net emissions (Mt)	2020	696	696
	2030	696	696
EEDI reductions (Mt)	2020	32	42
	2030	153	216
MBM in-sector reductions (Mt)	2020	2	3
	2030	10	20
MBM out-of-sector reductions (Mt)	2020	295	406
	2030	348	580
MBM reductions (% of BAU)	2020	29%	36%
	2030	30%	40%
MBM in-sector reductions (% of MBM reductions)	2020	1%	1%
	2030	3%	3%
Cumulative emission reductions (Mt)	2020	**1,253**	**1,657**
	2030	**4,601**	**6,822**
Financial: gross costs ($billion)	2020	12	16
	2030	35	59
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	12	16
	2030	35	58
Funds ($billion)	2020	0	0
	2030	1	1

Scenarios & Key Parameters

Fuel price scenario	High
Carbon price scenario	High
MBM launch date	**2015**
EEDI stringency	Medium
Emission cap (for ETS & GHG Fund)	20%
Additional contribution (for GHG Fund)	0%

	Year	B2	A1B
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	990	1,098
	2030	1,025	1,214
Net emissions (Mt)	2020	696	696
	2030	696	696
EEDI reductions (Mt)	2020	32	42
	2030	149	203
MBM in-sector reductions (Mt)	2020	1	2
	2030	5	9
MBM out-of-sector reductions (Mt)	2020	293	401
	2030	324	508
MBM reductions (% of BAU)	2020	29%	35%
	2030	28%	37%
MBM in-sector reductions (% of MBM reductions)	2020	0%	0%
	2030	1%	2%
Cumulative emission reductions (Mt)	2020	**1,250**	**1,650**
	2030	**4,432**	**6,351**
Financial: gross costs ($billion)	2020	12	16
	2030	33	51
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	12	16
	2030	32	51
Funds ($billion)	2020	0	0
	2030	0	1

SECT SCENARIOS WITH HIGH OR LOW EEDI STRINGENCY

Scenarios & Key Parameters

MBM launch date	**2015**
EEDI stringency	High

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	980	1,088
	2030	995	1,213
Net emissions (Mt)	2020	844	943
	2030	869	1,088
EEDI reductions (Mt)	2020	44	58
	2030	212	299
MBM in-sector reductions (Mt)	2020	137	145
	2030	125	125
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	13%	13%
	2030	10%	8%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Cumulative emission reductions (Mt)	2020	**497**	**520**
	2030	**1,606**	**1,624**
Potential for supplementary out-of Sector reductions (Mt)	2020	0	0
	2030	0	0
Financial: gross costs ($billion)	2020	Unknown	Unknown
	2030	Unknown	Unknown
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	0	0
	2030	0	0

Scenarios & Key Parameters

MBM launch date	**2015**
EEDI stringency	Low

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	997	1,110
	2030	1,081	1,334
Net emissions (Mt)	2020	931	1,042
	2030	975	1,221
EEDI reductions (Mt)	2020	28	36
	2030	126	177
MBM in-sector reductions (Mt)	2020	66	68
	2030	106	114
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	6%	6%
	2030	9%	8%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Cumulative emission reductions (Mt)	2020	**198**	**202**
	2030	**882**	**900**
Potential for supplementary out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
Financial: gross costs ($billion)	2020	Unknown	Unknown
	2030	Unknown	Unknown
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	0	0
	2030	0	0

VES Scenarios with high or low EEDI stringency

Scenarios & Key Parameters

MBM launch date	**2015**
EEDI stringency	Low
Fuel price scenario	Reference

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	997	1,110
	2030	1,081	1,334
Net emissions (Mt)	2020	991	1,104
	2030	1,067	1,318
EEDI reductions (Mt)	2020	28	36
	2030	126	177
MBM in-sector reductions (Mt)	2020	6	6
	2030	14	16
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	1%	1%
	2030	1%	1%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Cumulative emission reductions (Mt)	2020	**19**	**20**
	2030	**123**	**135**
Financial: gross costs ($billion)	2020	9	8
	2030	5	5
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	9	8
	2030	5	5

Scenarios & Key Parameters

MBM launch date	**2015**
EEDI stringency	Low
Fuel price scenario	High

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	994	1,104
	2030	1,052	1,250
Net emissions (Mt)	2020	989	1,098
	2030	1,038	1,235
EEDI reductions (Mt)	2020	28	36
	2030	123	167
MBM in-sector reductions (Mt)	2020	6	6
	2030	14	15
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	1%	1%
	2030	1%	1%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Cumulative emission reductions (Mt)	2020	**19**	**20**
	2030	**121**	**131**
Financial: gross costs ($billion)	2020	16	16
	2030	8	8
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	16	16
	2030	8	8

Scenarios & Key Parameters

MBM launch date	**2015**
EEDI stringency	High
Fuel price scenario	Reference

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,025	1,147
	2030	1,207	1,511
EEDI emissions (Mt)	2020	980	1,088
	2030	995	1,213
Net emissions (Mt)	2020	963	1,070
	2030	954	1,167
EEDI reductions (Mt)	2020	44	58
	2030	212	299
MBM in-sector reductions (Mt)	2020	17	18
	2030	40	45
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	2%	2%
	2030	3%	3%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Cumulative emission reductions (Mt)	2020	**58**	**61**
	2030	**370**	**404**
Financial: gross costs ($billion)	2020	22	21
	2030	11	11
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	22	21
	2030	11	11

Scenarios & Key Parameters

MBM launch date	**2015**
EEDI stringency	High
Fuel price scenario	High

	Year	**B2**	**A1B**
BAU emissions (Mt)	2020	1,022	1,140
	2030	1,175	1,417
EEDI emissions (Mt)	2020	978	1,082
	2030	968	1,136
Net emissions (Mt)	2020	961	1,064
	2030	928	1,093
EEDI reductions (Mt)	2020	44	58
	2030	207	281
MBM in-sector reductions (Mt)	2020	17	18
	2030	39	43
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
MBM reductions (% of BAU)	2020	2%	2%
	2030	3%	3%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Cumulative emission reductions (Mt)	2020	**58**	**61**
	2030	**364**	**390**
Financial: gross costs ($billion)	2020	41	39
	2030	18	18
Refunds/rebates ($billion)	2020	0	0
	2030	0	0
Emission credits, various ($billion)	2020	0	0
	2030	0	0
Funds ($billion)	2020	41	39
	2030	18	18

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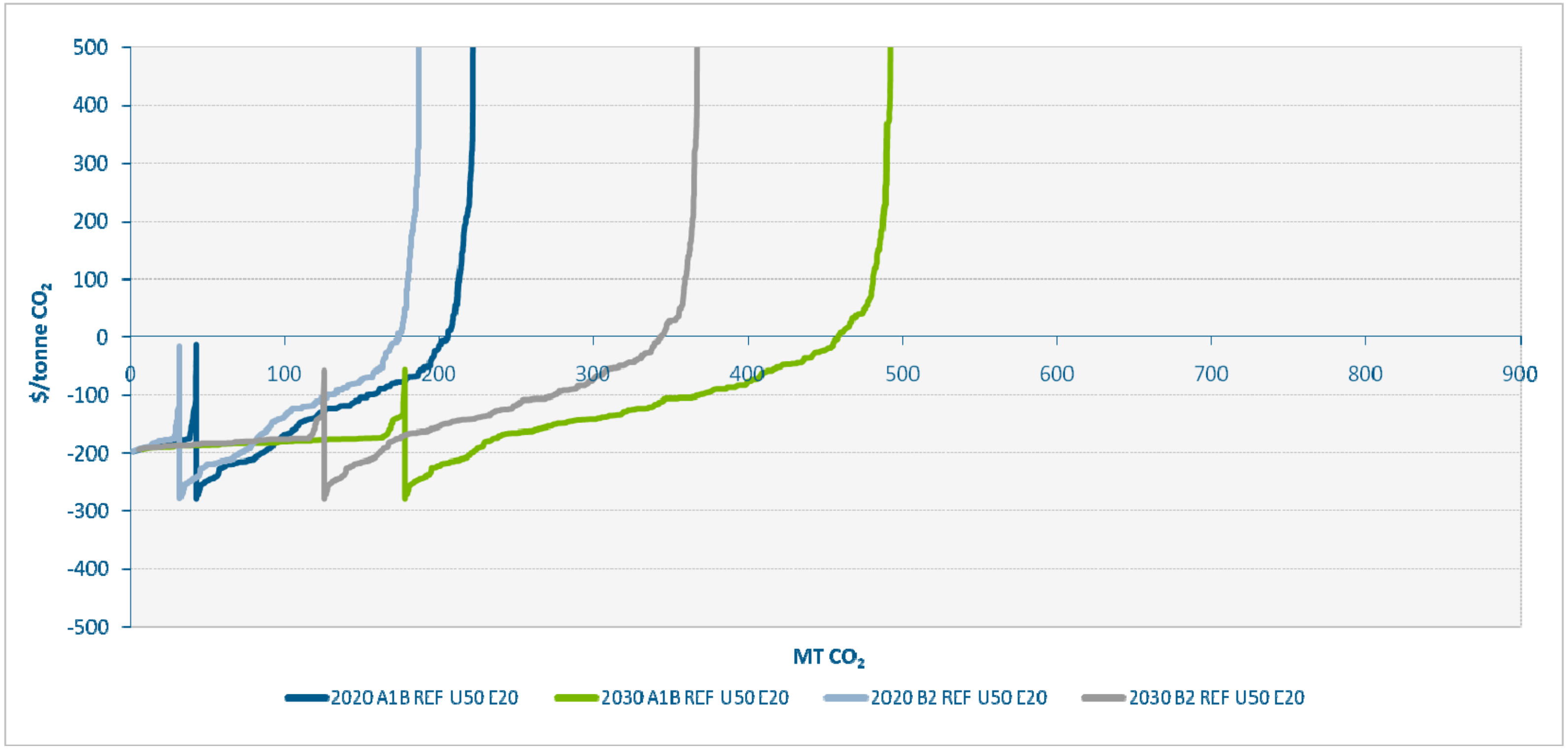
ANNEX 10

MAC CURVES

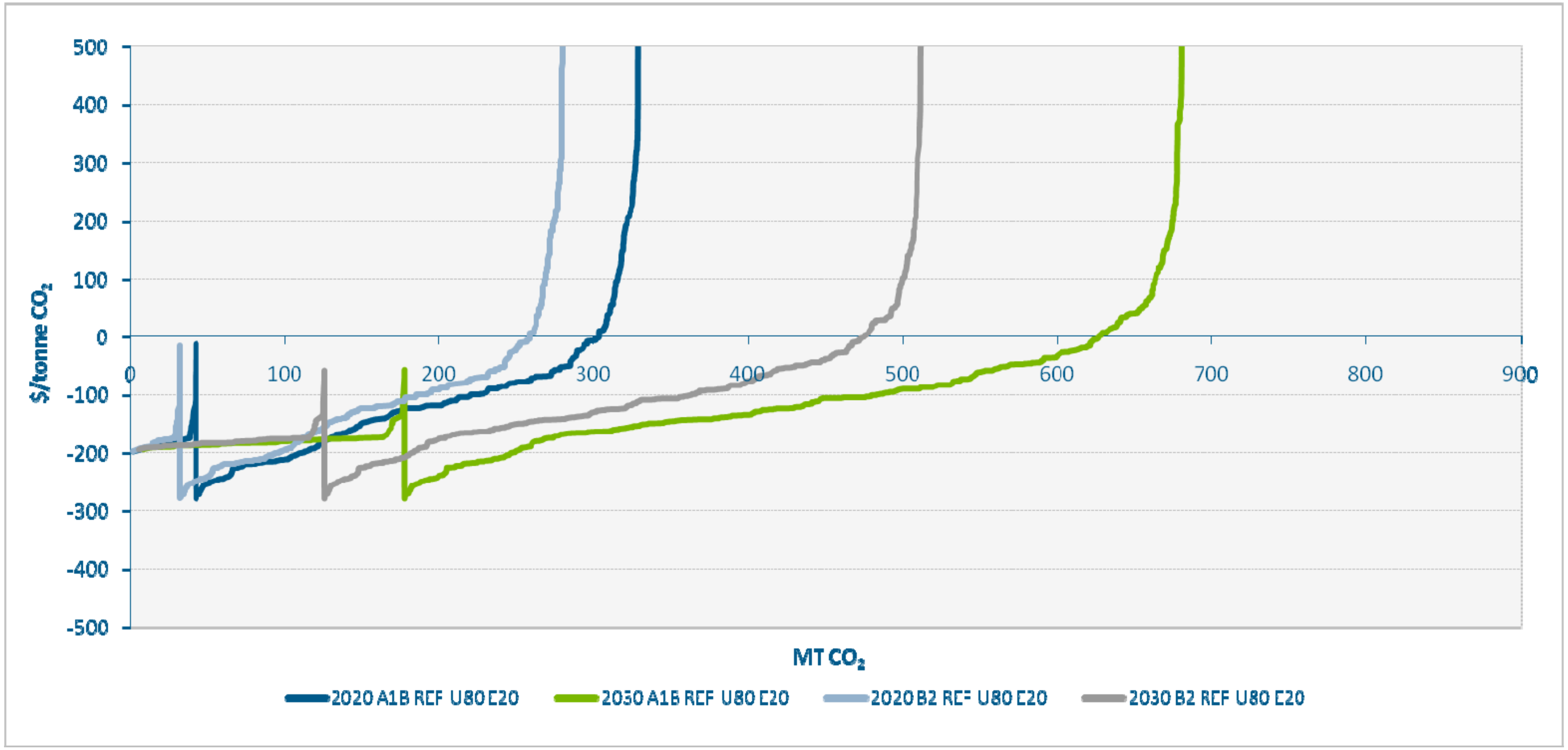
MAC curves for A1B and B2 growth scenarios with reference fuel price, 50% uptake of possible measures, mandatory EEDI applied with medium stringency for new ships.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B REF U50 E20	2020	A1B	REF	50	20	Yes	1134	222	206
2030 A1B REF U50 E20	2030	A1B	REF	50	20	Yes	1506	494	458
2020 B2 REF U50 E20	2020	B2	REF	50	20	Yes	1016	187	174
2030 B2 REF U50 E20	2030	B2	REF	50	20	Yes	1205	368	343



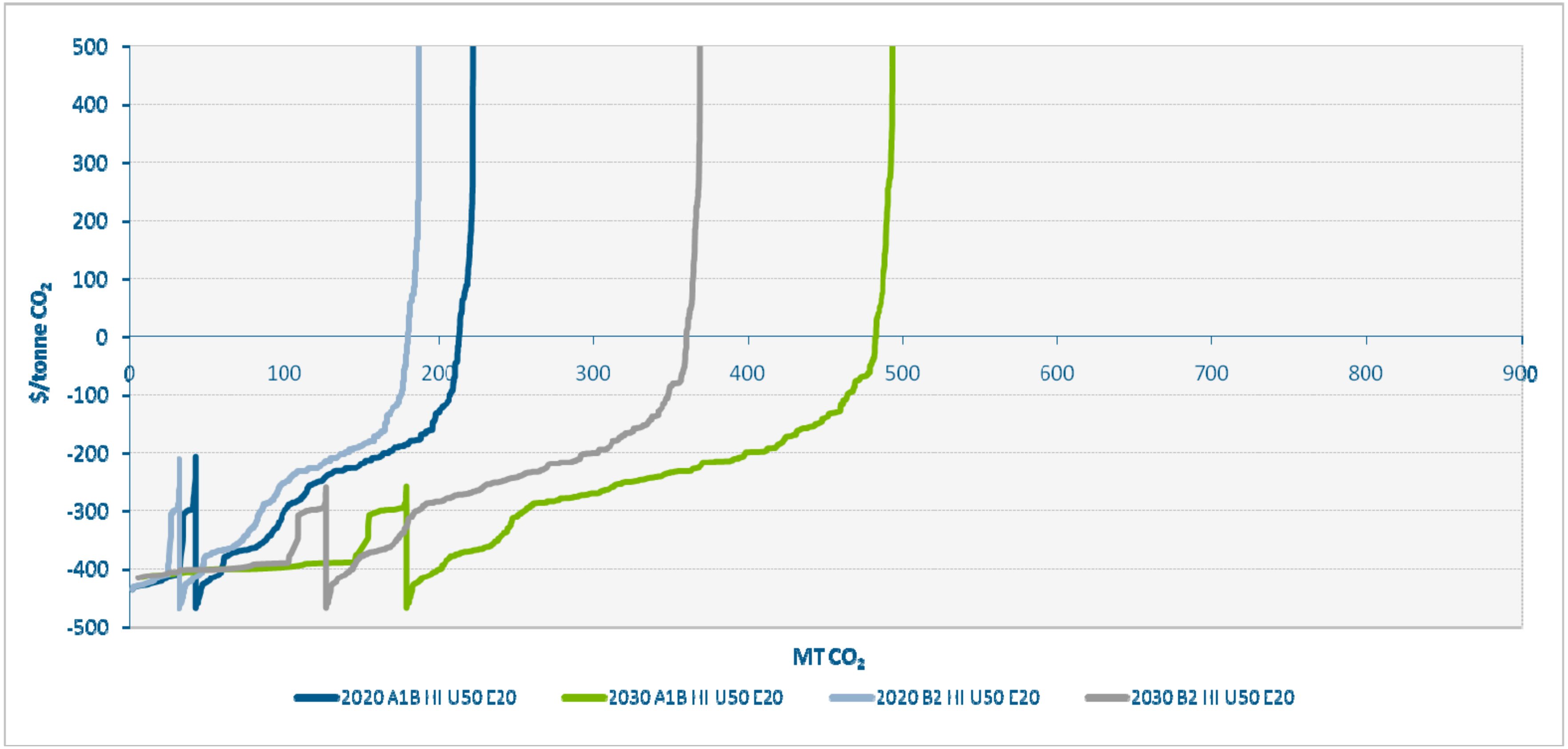
MAC curves for A1B and B2 growth scenarios with reference fuel price, 80% uptake of possible measures, mandatory EEDI applied with medium stringency for new ships.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B REF U80 E20	2020	A1B	REF	80	20	Yes	1134	330	303
2030 A1B REF U80 E20	2030	A1B	REF	80	20	Yes	1506	684	626
2020 B2 REF U80 E20	2020	B2	REF	80	20	Yes	1016	280	259
2030 B2 REF U80 E20	2030	B2	REF	80	20	Yes	1205	514	473



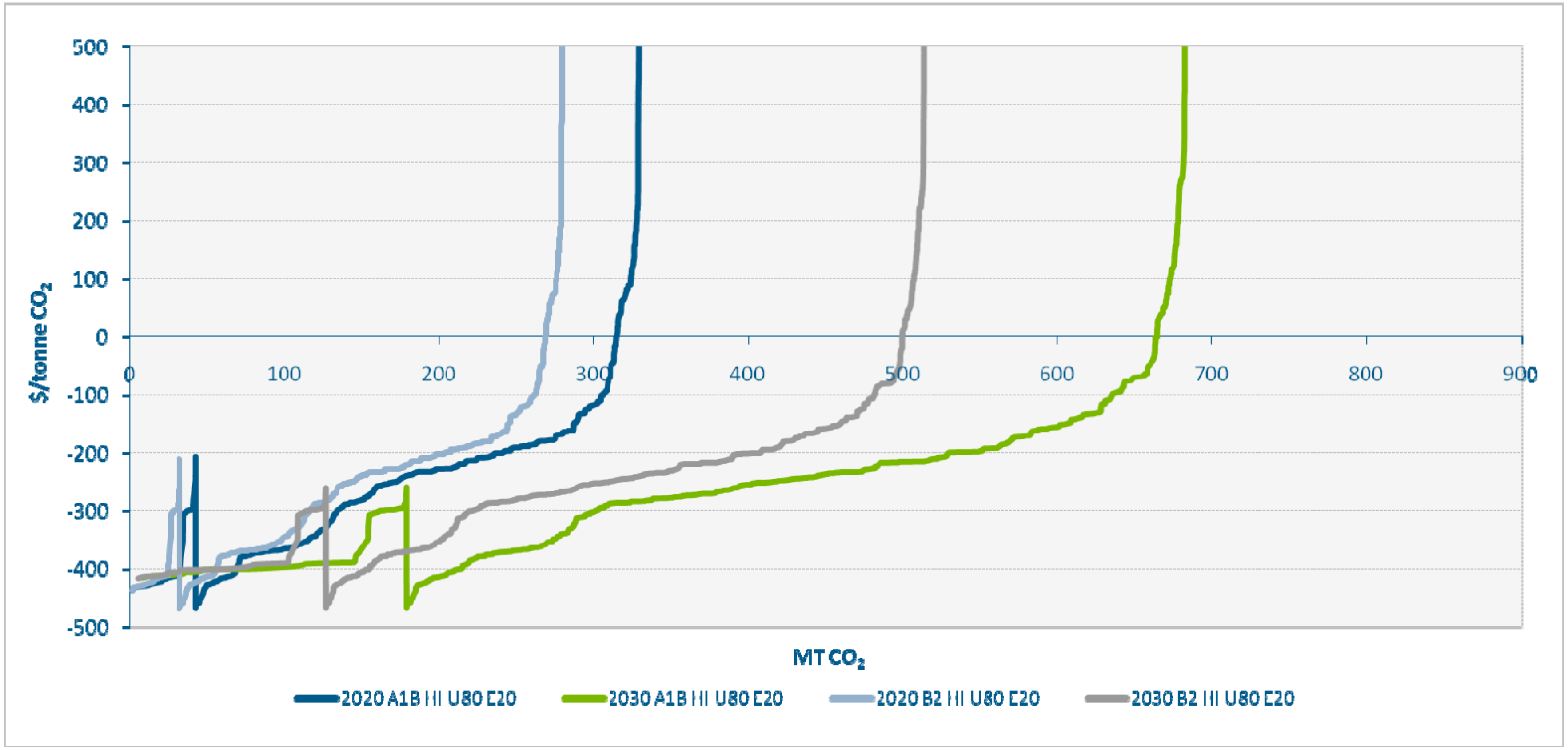
MAC curves for A1B and B2 growth scenarios with high fuel price, 50% uptake of possible measures, mandatory EEDI applied with medium stringency for new ships.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B HI U50 E20	2020	A1B	HI	50	20	Yes	1134	222	213
2030 A1B HI U50 E20	2030	A1B	HI	50	20	Yes	1506	495	482
2020 B2 HI U50 E20	2020	B2	HI	50	20	Yes	1016	187	180
2030 B2 HI U50 E20	2030	B2	HI	50	20	Yes	1205	370	360



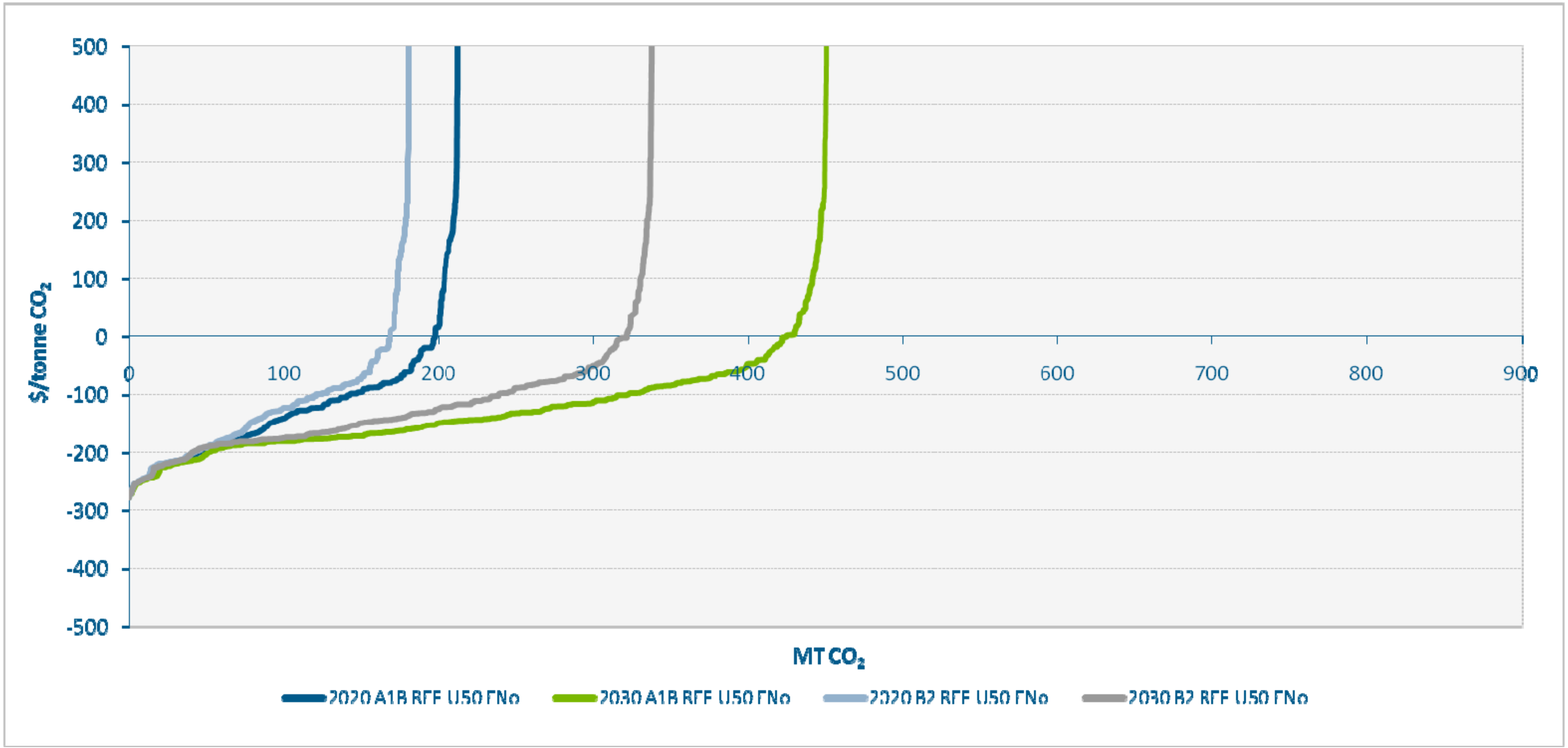
MAC curves for A1B and B2 growth scenarios with high fuel price, 80% uptake of possible measures, mandatory EEDI applied with medium stringency for new ships.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B HI U80 E20	2020	A1B	HI	80	20	Yes	1134	330	315
2030 A1B HI U80 E20	2030	A1B	HI	80	20	Yes	1506	685	664
2020 B2 HI U80 E20	2020	B2	HI	80	20	Yes	1016	280	269
2030 B2 HI U80 E20	2030	B2	HI	80	20	Yes	1205	515	500



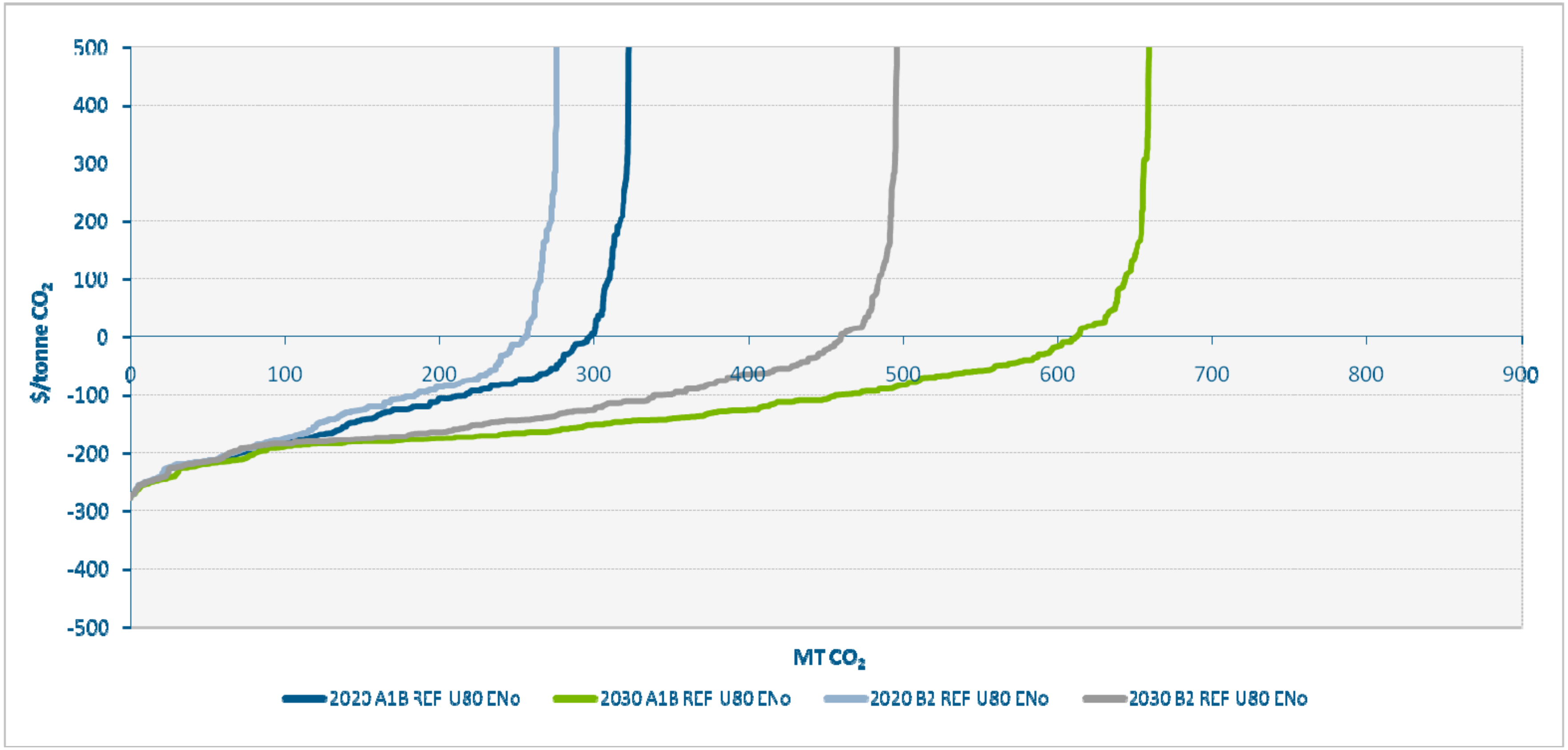
MAC curves for A1B and B2 growth scenarios with reference fuel price, 50% uptake of possible measures, no mandatory EEDI applied.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B REF U50 ENo	2020	A1B	REF	50	No	Yes	1134	213	198
2030 A1B REF U50 ENo	2030	A1B	REF	50	No	Yes	1506	453	425
2020 B2 REF U50 ENo	2020	B2	REF	50	No	Yes	1016	181	169
2030 B2 REF U50 ENo	2030	B2	REF	50	No	Yes	1205	338	321



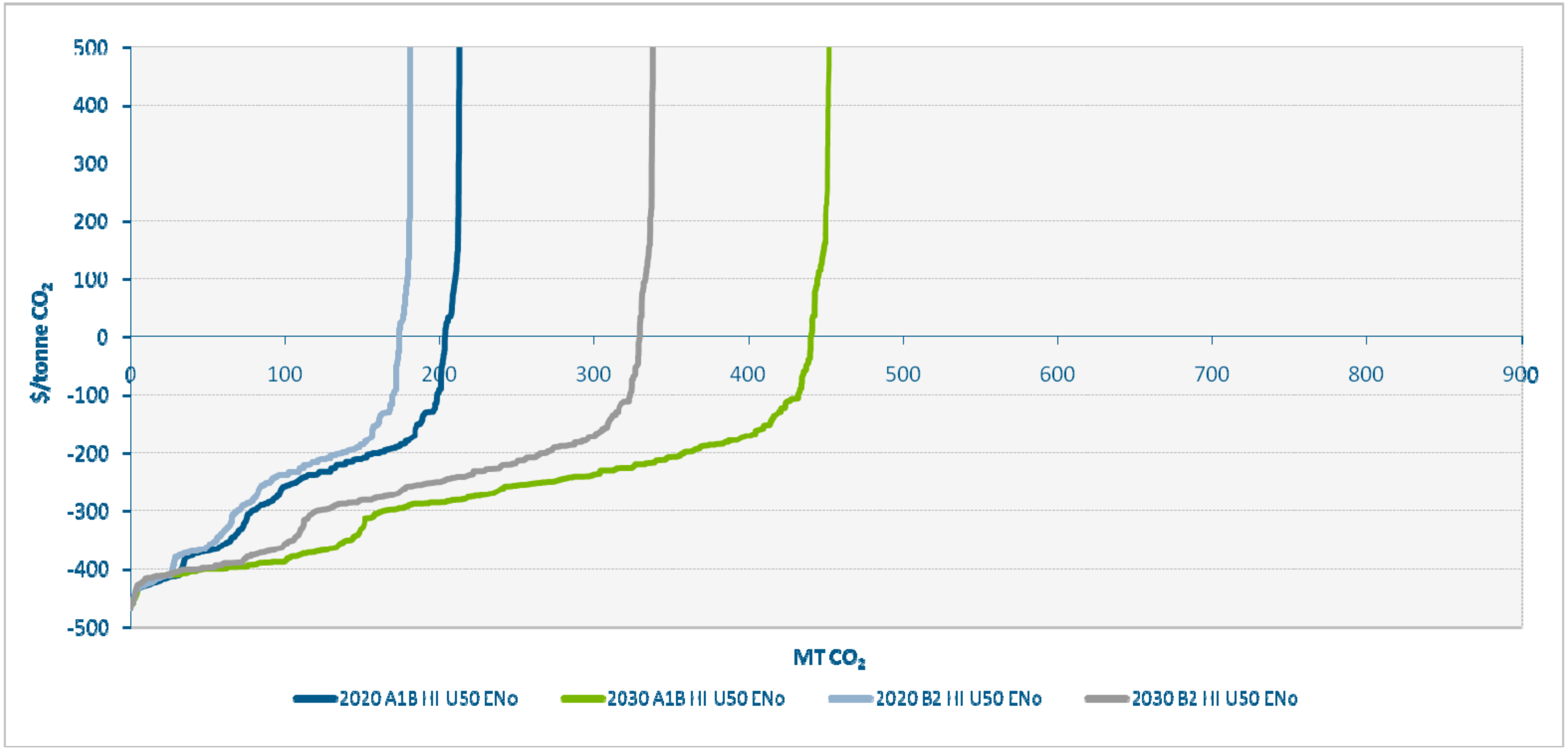
MAC curves for A1B and B2 growth scenarios with reference fuel price, 80% uptake of possible measures, no mandatory EEDI applied.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B REF U80 ENo	2020	A1B	REF	80	No	Yes	1134	324	297
2030 A1B REF U80 ENo	2030	A1B	REF	80	No	Yes	1506	662	612
2020 B2 REF U80 ENo	2020	B2	REF	80	No	Yes	1016	276	256
2030 B2 REF U80 ENo	2030	B2	REF	80	No	Yes	1205	498	460



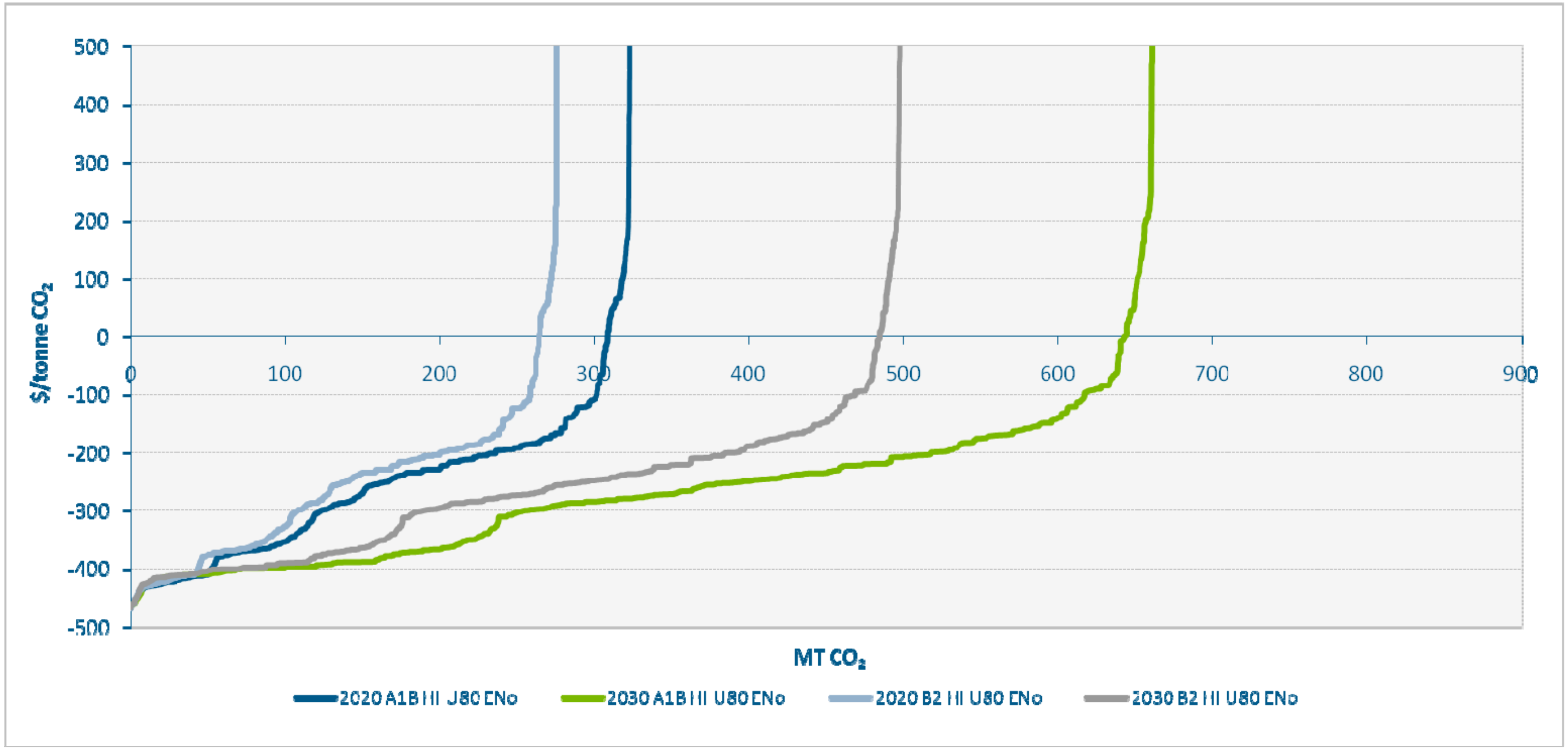
MAC curves for A1B and B2 growth scenarios with high fuel price, 50% uptake of possible measures, no mandatory EEDI applied.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B HI U50 ENo	2020	A1B	HI	50	No	Yes	1134	213	203
2030 A1B HI U50 ENo	2030	A1B	HI	50	No	Yes	1506	453	440
2020 B2 HI U50 ENo	2020	B2	HI	50	No	Yes	1016	181	174
2030 B2 HI U50 ENo	2030	B2	HI	50	No	Yes	1205	339	330



MAC curves for A1B and B2 growth scenarios with high fuel price, 80% uptake of possible measures, no mandatory EEDI applied.

Name	Target Year	Scenario	Fuel price	Uptake	EEDI	Graph?	Baseline	Reduction	Cost effective reduction
2020 A1B HI U80 ENo	2020	A1B	HI	80	No	Yes	1134	324	309
2030 A1B HI U80 ENo	2030	A1B	HI	80	No	Yes	1506	663	643
2020 B2 HI U80 ENo	2020	B2	HI	80	No	Yes	1016	276	264
2030 B2 HI U80 ENo	2030	B2	HI	80	No	Yes	1205	499	485



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ANNEX 11

MODELLING OF IUCN CARBON PRICE FLOOR AND PRICE CEILING

The impact of the price floor and ceiling for the levy proposed by the IUCN (laid out in annex 8) was modelled and assessed.

This approach envisages that the levy would be set constant for a quarter and established at least 30 days before the quarter through a pre determined mechanism. The levy rate would be indexed to the prevailing carbon price on land transport or to the carbon price in the largest economy-wide ETS and set according to a rolling average market price over a defined period. The rate could not however exceed a price ceiling nor fall below a price floor which would be pre-determined through a specified formula. The IUCN assumptions provided in annex 8 were modelled.

The effect of the price floor and price ceiling was examined by modelling the Rebate Mechanism with and without the price floor and price ceiling, under a scenario with a high carbon price, reference fuel price and A1B growth, assuming 28% of revenue would be allocated to mitigation.

These model runs are shown in Figure A11-1 and Figure A11-2 below.

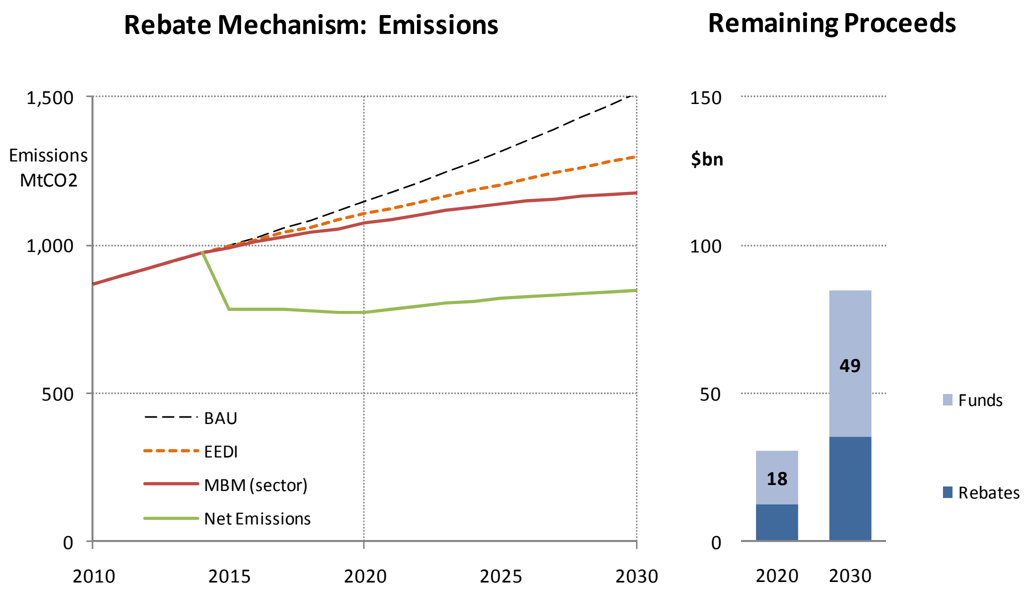

Figure A11-1 Modelled emissions and remaining proceeds under the Rebate Mechanism for the A1B growth scenario under a high carbon price and reference fuel price with 28% of remaining proceeds direct towards offsetting – without a price floor and price ceiling.

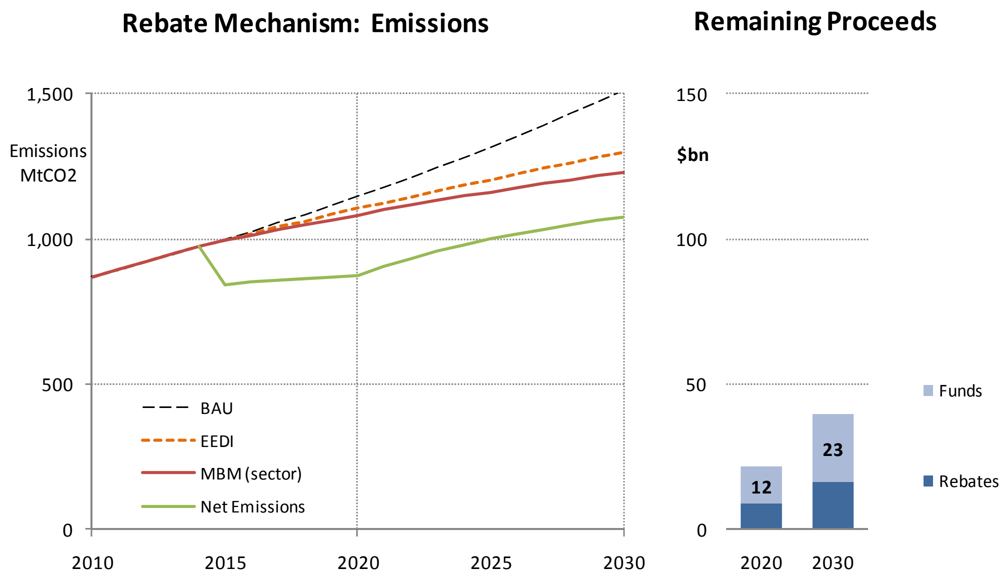

Figure A11-2 Modelled emissions and remaining proceeds under the Rebate Mechanism for the A1B growth scenario under a high carbon price and reference fuel price with 28% of remaining proceeds direct towards offsetting – with price floor and price ceiling.

Under the modelled high carbon price scenario the carbon price reaches the level of the price ceiling very early on, which limits the levy applied to fuel. This reduces the level of the price incentive to reduce emissions in-sector, and the amount of revenue – which reduces the extent to which the sector's emissions are offsets through the purchase of project credits or other credits or allowances.

Under the scenario shown above the effect of the price ceiling is to reduce total revenues from the scheme by around 50 per cent in 2030 and cumulative emission reductions in 2030 are reduced by 40 per cent. At the same time the price ceiling limited the gross costs of the scheme to $55 billion in 2030, compared to $118 billion in 2030 when such constrain is not in place (reductions of circa 50%). The modelled effect of the price floor and ceiling present a reasonable robust prediction of what could be expected if carbon prices quickly exceed the price ceiling.

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ANNEX 12

MODELLING OF VES BASE FEE

1 The impact of the base fee for the VES on reductions and remaining proceeds was modelled and assessed for the medium stringency standard (laid out in annex 9). Two additional base fees of 60% and 90% were modelled at the reference fuel price and A1B growth scenario.

2 These model runs are shown in Figure A12-1 and Figure A12-2 below and the results are summarized in Table A12-1.

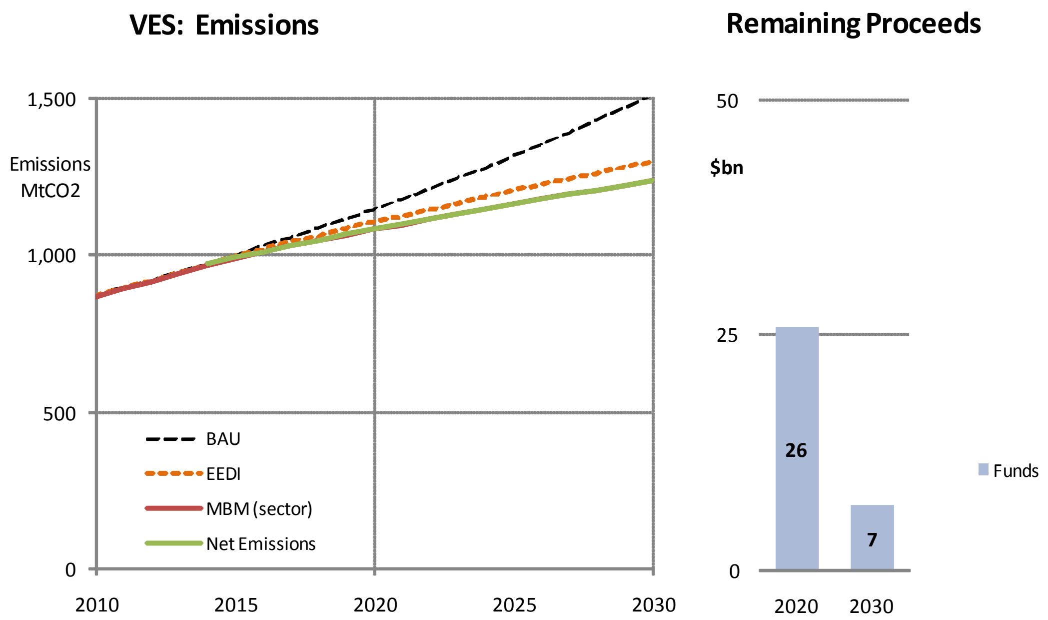

Figure A12-1: Modelled emissions and remaining proceeds under the Vessel Efficiency System with medium stringency standards, A1B growth scenario, reference fuel price and base fee which is 60% of the fuel price

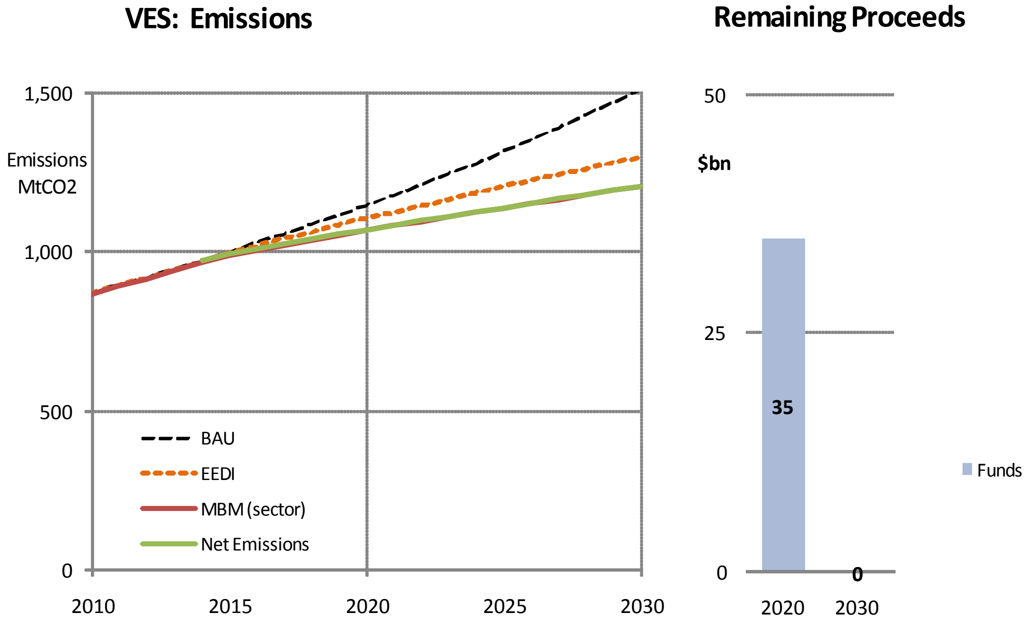

Figure A12-2: Modelled emissions and remaining proceeds under the Vessel Efficiency System with medium stringency standards, A1B growth scenario, reference fuel price and a base fee which is 90% of the fuel price

Table A12-1: Modelled emissions and remaining proceeds under the Vessel Efficiency System with medium stringency standards, A1B growth scenario, reference fuel price and base fee which is 60% OR 90% of the fuel price

	Year	**60%**	**90 %**
BAU emissions (Mt)	2020	1,147	1,147
	2030	1,511	1,511
EEDI emissions (Mt)	2020	1,105	1,105
	2030	1,295	1,295
Net emissions (Mt)	2020	1,082	1,071
	2030	1,236	1,208
EEDI reductions (Mt)	2020	42	42
	2030	216	216
MBM in-sector reductions (Mt)	2020	23	34
	2030	59	88
MBM out-of-sector reductions (Mt)	2020	0	0
	2030	0	0
EEDI reductions (% of BAU)	2020	3%	4%
	2030	15%	14%
MBM reductions (% of BAU)	2020	2%	3%
	2030	4%	6%
Total reductions (% of BAU)	2020	5%	7%
	2030	19%	20%
MBM in-sector reductions (% of MBM reductions)	2020	100%	100%
	2030	100%	100%
Potential for supplementary out-of sector reductions (Mt)	2020	1040	1400
	2030	175	0

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ANNEX 13

METHODOLOGY TO ESTIMATE IMPACT ON A COUNTRY'S TRADE

1 All the proposals evaluated indicate global application of a market-based measure. Under a universal application, costs would generally be passed on and spread between producers and customers. Some studies[57] estimated the maximum impact of a maritime market-based measure, based on the share of fuel costs in total operating costs. Such calculations do not take into account the response of shipping to the market-based measure itself and ignore costs incurred in ports, which may be significant.

2 The econometric analysis performed by Vivid Economics aimed to address such shortcomings. The results may differ from the maximum estimates as they include the response of shipping to the increased fuel prices and reflect other determinants of the freight costs.

3 The analysis by Vivid Economics estimated the elasticity of freight rates to bunker fuel price increases, and was augmented with results from other recent studies.[58] The summary of results is shown in Table A13-1.

Table A13-1: Elasticity estimates of freight rate to bunker price increase

Source	Clean Bulk	Dirty Bulk	Tanker	Container
Vivid Economics	0.25	0.959	0.324	0.116
UNCTAD	-	1.0	0.28	0.19 – 0.36
OECD	0.28	-	-	-

4 The four key segments as shown in Table A13-1 are: Clean Bulk, Dirty Bulk, Tanker, and Container, and have been used to leverage significant work by OECD on maritime transport costs:

.1 clean or dry bulk carriers generally transport grains, oilseeds, and sugar;

.2 dirty or industrial goods bulk: bulk carriers transport of "dirty bulk" goods, like iron ore, coal, bauxite and other industrial raw materials;

.3 tankers: which typically transport petroleum, petroleum products and some liquid chemicals, and

.4 containers: used to transport most of the manufactured goods and an increasing amount of agricultural products.

5 For further analysis, the average elasticity for each sector was obtained and is shown in Table A13-2 below.

Table A13-2: Average elasticity estimates of freight rate to bunker price increase used

Clean Bulk	Dirty Bulk	Tanker	Container
0.27	0.98	0.30	0.20

6 These categories were used to obtain comprehensive data from the Maritime Transport Cost database of OECD.

57 MEPC 60/4/54.

58 UNCTAD (2010), OECD (2009).

7 On the basis of that investigation, one can calculate the impact on freight costs for the four shipping sectors in relation to an increase in ship's fuel costs due to a given market-based measure. For instance, for a 10% increase in fuel costs resulting from a market-based measure, the estimated increase in freight costs is shown in Table A13-3. This is obtained by multiplying the percentage of increase of fuel costs (10%) by the elasticity provided in Table A13-2.

Table A13-3 Increase in freight costs from an MBM equivalent to 10% of fuel price

Clean Bulk	Dirty Bulk	Tanker	Container
2.7%	9.8%	3.0%	2.0%

8 As illustrated, the average increase in freight cost for bulk transport of raw materials, such as iron ore, is highest at nearly 10%.

9 Even though the elasticity values are approximate, when the same values are used to assess impacts on different countries, the differences in impacts can be shown. Detailed calculations are shown below for Chile and Australia.

Box: Elasticity calculations for Chile and Australia

Australia

The value of Australian imports by sea was $133 billion in 2007, representing 74% of the value of total imports ($180 billion).

Representative values for key cargoes transported by different ship types are illustrated in Table A13-4, together with their Harmonized System categorization (HS-2, shown in brackets).

Table A13-4: Ad valorem maritime transport costs for representative cargoes (Australia)

Cereals (10)	Ores (26)	Crude Oil (27)	Manufactured
11%	20%	13%	5%

The same values have been applied to detailed import data for each country (obtained from the World Trade Organization).

Chile

The value of Chilean imports by sea was $31 billion in 2007, representing73% of the value of total imports ($43 billion).

Representative values for key cargoes transported by different ship types are illustrated in Table A13-5, together with their Harmonized System categorization (HS-2, shown in brackets).

Table A13-5: Ad valorem maritime transport costs for representative cargoes (Chile)

Cereals (10)	Ores (26)	Crude Oil (27)	Manufactured
27%	20%	6%	5%

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