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МЕЖДУНАРОДНАЯ МОРСКАЯ ОРГАНИЗАЦИЯ
المنظمة البحرية الدولية
国际海事组织

**Note by the International Maritime Organization to the thirty-third session of the Subsidiary Body for Scientific and Technical Advice (SBSTA 33)**

**Agenda item 6. (a) - Emissions from fuel used for international aviation and maritime transport**

**Outcome of the sixty-first session of IMO's Marine Environment Protection Committee Further progress made on technical, operational and market-based measures**

4 November 2010

**SUMMARY**

The Marine Environment Protection Committee (MEPC) of IMO, meeting for its 61st session in London, made further progress in developing measures to improve the energy efficiency of ships, in order to reduce greenhouse gas (GHG) emissions from international shipping. More than 900 delegates from 97 Member States, five United Nations bodies, nine intergovernmental organizations and 42 non-governmental organizations with consultative status with IMO participated at the session.

Having considered means by which technical and operational measures could be introduced in the Organization's regulatory regime, the Committee noted the intention of some States party to MARPOL Annex VI – *Regulations for the prevention of air pollution from ships,* to request the Secretary-General to circulate proposed amendments to that Annex, to make mandatory the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP)), both of which have already been disseminated for voluntary use. The circulated draft amendments will be considered by the Committee's next session, in July 2011, with a view to adoption under MARPOL Annex VI. The Committee also noted, however, that some other States did not support the circulation of the proposed amendments.

The Committee also held an extensive debate on how to progress the development of suitable market-based measures (MBMs) for international shipping, following the submission of a comprehensive report by an Expert Group, which had carried out a feasibility study and impact assessment of several possible market-based measures submitted by governments and observer organizations. The Committee agreed to continue the work on development of an MBM for international shipping at an inter-sessional meeting in March 2011 in order to comply with its work plan on further consideration of MBMs which culminates in July 2011.

## Introduction

1 Work on the prevention of air pollution and control of greenhouse gas (GHG) emissions from ships started within the International Maritime Organization (IMO) in the late 1980s. The first regulatory steps were outphasing of ozone depleting substances both as refrigerant gases and in fire-fighting systems and later, prevention of air pollution in the form of oil cargo vapours and exhaust gases were targeted by, *inter alia*, adopting limits for nitrogen oxides and sulphur oxides in ship exhaust gases. In recent years the focus has been on control of GHG emissions from ships engaged in international trade.

2 Due to its close connection to global commerce, international shipping plays a vital role in the facilitation of world trade as the most cost-effective and energy-efficient mode of transport, making a significant contribution to global prosperity in both developing and developed countries. Shipping is probably also the most international of all the world's industries and the global character of shipping requires global regulation that applies universally to all ships. IMO, as the United Nation's specialized agency responsible for the global regulation of all facets pertaining to international shipping, has a key role in ensuring that lives at sea are not put at risk and that the environment is not polluted by ships' operations – as summed up in IMO's mission statement: **Safe, Secure and Efficient Shipping on Clean Oceans**.

3 IMO is regarded as the sole competent international organization with a global mandate to regulate all non-commercial aspects of international shipping, including reduction or limitation of GHG emissions. As shipping is a global industry and ships are competing in a single global market, it must be regulated at the global level for any control regime to be environmentally effective (avoid carbon leakage) and to maintain a level playing field for all ships irrespective of flag (nationality) or ownership. IMO's vision is to eliminate all adverse environmental impact from ships by developing robust and effective regulations that apply universally to all ships.

## Work on control of GHG emissions from international shipping

4 IMO's Assembly resolution A.963(23) on IMO Policies and Practices Related to the Reduction of Greenhouse Gas Emissions from Ships urges the Organization's Marine Environment Protection Committee (MEPC) to identify and develop the mechanisms needed to achieve limitation or reduction of GHG emissions from international shipping.

5 The Assembly resolution also called for MEPC to develop a GHG work plan with timetable to identify and develop the needed mechanisms. Subsequently, an ambitious but realistic work plan was adopted by the Committee in October 2006 and a significant amount of work has been carried out in accordance with it, leading to the development of a set of robust technical and operational measures that will, when fully implemented, result in significant reductions of GHG emissions from ships.

## Outcome MEPC 61

6 The Marine Environment Protection Committee of the International Maritime Organization, meeting for its 61st session in London, made further progress in developing measures to improve the energy efficiency of ships, in order to reduce greenhouse gas emissions from international maritime transport.

7 Although international maritime transport is the most energy efficient mode of mass transport and only a modest contributor to global $CO_2$ emissions (2.7% in 2007) while carrying 90% of world trade, a global approach for further improvements in energy efficiency and emission reduction is needed as sea transport is predicted to continue growing significantly in line with world trade. IMO's work on enhanced energy efficiency and GHG emission control has three distinct building blocks and the Organization has over several

years developed technical and operational reduction measures that will when fully implemented significantly improve the maritime sector's carbon footprint. The third building block is the market-based mechanisms where IMO currently is working in accordance with a work plan culminating in 2011.

**Technical and operational measures**

8 The most important technical measure is the Energy Efficiency Design Index for new ships (EEDI) that will require a minimum energy efficiency level per capacity mile (e.g. tonne mile) for different ship type and size segments. With the level being tightened incrementally every five years the EEDI will stimulate continued technical development of all the components influencing the fuel efficiency of a ship.

9 On the operational side, a mandatory management tool for energy efficient ship operation, the Ship Energy Efficiency Management Plan (SEEMP), has been developed to assist the international shipping industry in achieving cost-effective efficiency improvements in their operations using the Energy Efficiency Operational Indicator (EEOI) as a monitoring tool and benchmark.

10 Having considered means by which technical and operational measures could be introduced in the Organization's regulatory regime, the Committee noted the desire of some States party to MARPOL Annex VI – *Regulations for the prevention of air pollution from ships* to request the Secretary-General to circulate proposed amendments to that Annex, to make mandatory, for new ships, EEDI and the SEEMP, both of which have been previously disseminated for voluntary use. The circulated draft amendments would then be considered by the Committee's next session with a view to adoption under MARPOL Annex VI. The Committee also noted, however, that some other States did not support the circulation of such amendments.

11 A description of the technical and operational energy efficiency measures for ships agreed by MEPC 59, the EEDI, the SEEMP and the EEOI as well is their purpose, effect and status, is set out in annex 1.

12 Although decisions on how to proceed with IMO's climate change strategy were not reached by consensus at MEPC 61, the Committee made noteworthy progress on all three elements of its GHG work and it is expected that further progress will continue to be made. At MEPC 62 in July 2011 the Committee will consider, with a view to adoption, draft amendments to MARPOL Annex VI circulated at the request of a number of Parties to make the technical and operational measures mandatory for relevant ship types in line with IMO's well established practice and policy.

**Market-based measures**

13 Development of the technical and operational measures is a very important step in ensuring that the global shipping industry has the necessary mechanisms to reduce its GHG emissions. However, the Committee has at several sessions recognized that these measures would not be sufficient to satisfactorily reduce the amount of GHG emissions from international shipping in view of the growth projections of world trade. Therefore, market-based mechanisms have been considered by the Committee in line with Assembly resolution A963(23) and its GHG work plan.

14 A market-based mechanism would serve two main purposes:

.1 off-setting in other sectors of growing ship emissions (out of sector reduction); and

.2 providing an economic incentive for the maritime industry to invest in more fuel-efficient ships and technologies and to operate ships in a more energy-efficient manner (in sector reductions).

15 In July 2009 MEPC 59 agreed by overwhelming majority that a market-based instrument is needed as part of a comprehensive package of measures for regulation of GHG emissions from international shipping. As shipping is a global industry and ships are competing in a single global market, it must be regulated at the global level to be environmentally effective (avoid Carbon leakage) and to maintain a level playing field for all ships, irrespective of flag or ownership.

16 The MBM proposals under review range from proposals for contribution schemes for all $CO_2$ emissions from international shipping (to be collected by fuel oil suppliers and transferred to a global fund), or only emissions from ships not meeting the EEDI requirement, via emission trading systems, to schemes based on the actual ship's efficiency both by design and operation. Among the measures are also proposals for rebate mechanisms and other ways to accommodate the difference in the socioeconomic capability between developing and developed states, as well as other suggestions on how the special needs and circumstances of developing countries can be accommodated.

17 Some of the proposed schemes would reward efficient ships and ship operators by recycling parts of the financial contribution to the most efficient ones based on benchmarking. Other schemes would drive investments in more energy efficient technologies and improvements in operations by setting compulsory efficiency standards for all vessels (new and existing) and the trading of efficiency credits. Several of the proposed mechanisms, the contributions schemes (levy) inherently and the trading schemes through auctioning; would generate funds the greater part of which would be used for climate change purposes in developing countries.

18 MEPC 59 noted that there was a general preference for the greater part of any funds generated by a market-based instrument under the auspices of IMO, to be used for climate change purposes in developing countries through existing or new funding mechanisms under the UNFCCC or other international organizations (such as IMO or organizations established under its auspices).

19 In March 2010 MEPC 60 agreed that an expert group should be established to undertake a feasibility study and impact assessment of the proposed mechanisms. The Committee agreed on Terms of Reference for the group including the methodology and criteria to be applied and the Secretary-General was requested to establish the group in close consultation with the Chairman.

20 The scope of the work of the Expert Group was to evaluate the various MBM proposals, with the aim of 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 (LDCs) and Small Island Developing States (SIDS).

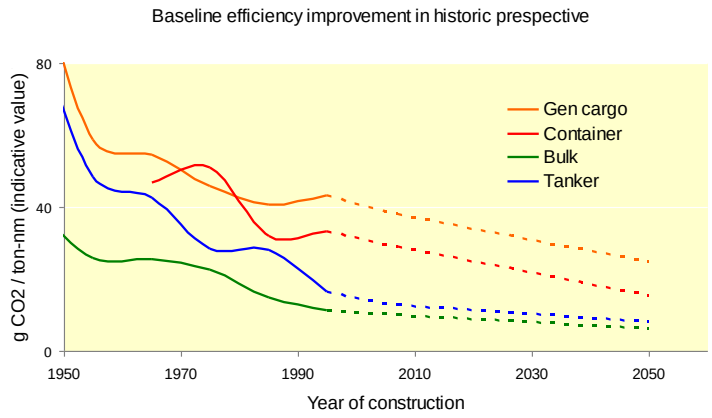
21 MEPC 61 (September/October 2010) was notably assisted by the comprehensive MBM Expert Group report and held an extensive debate on how to progress the development of a suitable MBM for international shipping. The Executive Summary of the report by the Expert Group on Feasibility Study and Impact Assessment of Possible Market-based Measures is set out as annex 2.

22 The Committee agreed to hold an intersessional meeting of the Working Group on GHG Emissions from Ships, to be held in March 2011, tasking the group with providing an opinion on the compelling need and purpose of MBMs as a possible mechanism to reduce GHG emissions from international shipping. The meeting is also tasked to further evaluating the proposed MBMs considered by the Expert Group, including the impact of the proposed MBMs on, among others, international trade, the maritime sector of developing countries, as well as the corresponding environmental benefits. A report from the intersessional group will be submitted to MEPC 62 in July 2011 enabling the Committee to make further progress in accordance with its work plan.

**Efficiency improvements and reduction target for international shipping**

23 Reduced emissions from ships and a significant increase in fuel efficiency have been achieved over the past decades through improvements in engine and propeller efficiency and hull design, as well as by economy of scale as almost every new ship have been larger than the one it replaced. Thanks to technological developments and associated industry initiatives, a modern container ship is using only a quarter of the energy per cargo unit than another container ship did in the 1970s, although the former may well dwarf the latter in size and carrying capacity. A modern large crude oil tanker (VLCC) for example, is able to transport the same amount of cargo twice the distance as of 20 years ago using the same amount of energy. Marine diesel engines, the prime mover of the world merchant fleet, has undergone similar efficiency improvements and modern engines installed today use about 10 to 15% less fuel per kilowatt-hour as compared with engines installed 20 years ago.

24 In parallel with development of the reduction measures and moving the issue of a suitable MBM for international shipping forward, the Committee has considered the issue of establishing a reduction target for international shipping as a vital part of the Organization's GHG work. The aim is to conclude the debate on reduction target concurrently with the culmination of the work plan for further consideration of market-based measures at MEPC 62 in July 2011. The Committee is considering whether the international maritime sector should be subject to an explicit emission ceiling (cap) or a reduction target comprising the entire world fleet of merchant vessels. The paramount questions are by which international organization (e.g. IMO or UNFCCC) such a cap or reduction target should be established and on what criteria, the need for reductions or technical capability. Other questions related to a cap or a target line are the methodology by which the cap/target is set and maintained as well as the relation to other transport modes (e.g. civil international aviation and road transport) and how they are regulated internationally.




**Baseline improvements in efficiency and indicated historic improvements**

**Source: Second IMO GHG Study 2009**

25 A target for the entire fleet may be expressed as a maximum amount (xx million tonnes) of $CO_2$ emissions per year by an established target year (20yy), or as an annual percentage reduction (xx%) from a fixed year and onwards (20yy). Both methods would require an agreed baseline year, e.g. 2005. Another approach under consideration would be to set an efficiency improvement target for the entire fleet or separate targets for each segment of the fleet (e.g. for bulk carriers from 60,000 to 100,000 DWT or for container vessels of a certain capacity range) where the efficiency improvements would be expressed per capacity mile (e.g. grams of $CO_2$ per tonne mile) as a percentage improvement per year.

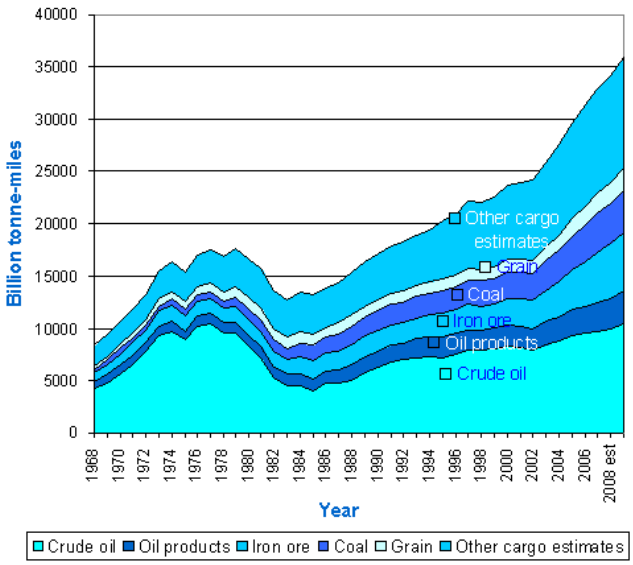
26 Another principal question in this respect is how much of future *carbon space* an industry that moves 90% of world trade and underpins the global economy and sustainable development in the entire world should be allocated.

**Regulation of international shipping – IMO's role**

27 IMO was established by governments as a specialized agency under the United Nations to provide machinery for intergovernmental cooperation in the field of regulation of ships engaged in international trade. To encourage and facilitate on a non-discriminatory basis, the general adoption of the highest practicable standards in maritime safety, efficiency of navigation and prevention and control of marine pollution from ships. IMO is also empowered to deal with administrative and legal matters related to these purposes and to promote the availability of shipping services to the commerce of the world without discrimination. IMO's role is primarily to enact international legislation, which normally applies to the ship itself, while the Contracting Governments assume the responsibility for implementing and enforcing the legislation on ship flying their flag or calling their ports.

28 When an IMO instrument has entered into force, countries that have ratified it can apply it not only to ships of their own flag but also to all other ships as a condition of entering their ports or internal waters, regardless of flag. This is an important principle, commonly referred to as the principle of "no more favourable treatment". Flag States are responsible for implementing and enforcing legislation on ships in their registries. Additionally, IMO's most important conventions contain provisions to allow ships to be inspected through port State control to ensure that they meet IMO requirements.

**World Seaborne trade 1668 – 2008**




Source: Fearnley's Review 2009

**How to measure progress through the IMO machinery**

29 The 52 IMO treaty instruments and hundreds of other measures, such as codes, guidelines and recommended practices, influence almost every non-commercial aspect of shipping and ship operations, including ship design, construction, equipment, operation, maintenance and manning. IMO has in recent years been successful in developing and adopting new conventions or updating existing ones to protect the environment, e.g., the Organization has achieved the delivery of the BWM (Ballast Water Management) Convention in 2004; the revision of MARPOL Annex VI in 2007; the Wreck Removal Convention in 2008; the Ship Recycling Convention in 2009; and good progress is currently being made on control of GHG emissions from international shipping.

30 These are significant examples of IMO's most recent successes on the environmental front, highlighting, at the same time, the Organization's, its Member States and the shipping industry's concern and sensitivity about the environment, both marine and atmospheric. IMO's strenuous work to protect and preserve the environment from all sorts of ship-sourced pollution are all credentials that IMO has the ability and will to put in place a robust and efficient control regime targeting specific sources of ship pollution. For example, while seaborne trade increased by around 135% between 1985 and 2006, oil spills were reduced by 85% during the same period.

31 The numbers of ships lost in maritime casualties has decreased significantly over the past decades due to IMO regulations: between 1966 and 1985 there were no fewer than 300 ships lost annually. The number and percentage of losses began to dip significantly in 1980 and have continued on a downward curve ever since. In 1990, the number of annual losses dipped to under 200, at 2.4 per thousand vessels. By 2000 the figure had decreased to 167, at 1.9 per thousand ships.

**IMO's Integrated Technical Cooperation Programme**

32 IMO adopts international shipping regulations but it is the responsibility of member governments to implement those regulations in the world fleet. IMO has an Integrated Technical Co-operation Programme which is designed to assist governments that lack the resources needed to operate a maritime administration successfully for ships flying its flag (Flag State) and to control ships calling their ports or transiting their waters (port and coastal State). The emphasis of this programme is on training and capacity building, and perhaps the best example is the World Maritime University in Malmö, Sweden, which was established in 1983 and provides advanced training for the men and women involved in maritime administration, education and management. Also under the auspices of IMO is the International Maritime Law Institute in Malta.

33 The aim of IMO's Integrated Technical Co-operation Programme is to help developing countries improve their ability to comply with international rules and standards relating to maritime safety and the prevention and control of marine pollution from ships, giving priority to technical assistance programmes that focus on human resources development and institutional capacity-building. IMO recognises that not all of its Members have the same capacity to fulfil their obligations as parties to the various conventions, often because they lack resources and expertise. The technical co-operation programme aims at redressing this resource imbalance by assessing the needs of countries and matching them to expertise, funding and training made available by the IMO regular budget, the IMO Printing Fund, donor countries and organizations.

**The way ahead post-COP 16**

34 The 169 IMO Member Governments, all of which are also Parties to the UNFCCC, are heavily engaged in the fight to protect and preserve the environment – both marine and atmospheric. IMO's work on the limitation or reduction of GHGs from international shipping stems from the genuine concerns for the environment of all IMO Member States in the pursuit of the Organization's objectives – Safe, Secure and Efficient Shipping on Clean Oceans. To that end, IMO is working towards a robust regime that will regulate shipping at the global level and thus contribute to the stemming of climate change and ocean acidification and at the same time contribute financially towards the efforts to combat climate change in developing countries.

35 Ships are competing in a single global market and must be regulated at the global level for the regulations to be environmentally effective (avoid carbon leakage). A future GHG regime for international shipping must not negatively affect sustainable development and should not lead to distortion of international competition and create new barriers in international trade.

36 There is no precedent in any of the fifty-two IMO international treaty instruments currently in existence where measures are applied selectively to ships according to their flag. On the other hand, there are several international environmental treaties which have a differentiated approach, such as the Montreal Protocol (on substances that deplete the ozone layer) and the Basel Convention (on transboundary movement of waste) yet, when IMO successfully dealt with the same issues at the request of the international community, the principle of a differentiated approach (according to flag) was not taken on board.

37 The principle of common but differentiated responsibilities (CBDR) is one agreed for the sharing of burdens between States and to place obligations for reductions in emissions principally on countries with historic responsibility for the current and projected climate effects. With most ships registered in developing country registers, historic emission responsibilities have another meaning for the global shipping industry compared with land-based industrial sources of GHG emissions.

38 Under IMO's regulatory framework, the individual ships of the world's fleet are the legal subject and the obligations for the flag State refer to implementation in their domestic legislation and enforcement through flag and port State controls in line with all other IMO instruments and regulations. It will not be the countries where ships are registered that bear the cost of more energy-efficient ships and ship operations, it will be the shipowners and ship operators as well as other stakeholders in the global shipping industry and the supply chain.

39 The interests of developing countries can be duly taken into account as is customary in relation with development of mandatory instruments as covered in IMO resolution A.998(25) 'Need for capacity-building for the development and implementation of new, and amendments to existing, instruments'. The global efforts to control GHG emissions from ships are no exception and IMO is sparing no efforts to contribute its fair share.

40 Recognizing the fundamental importance of the principle of CBDR under the UNFCCC regime - consequent with its own philosophy of assisting developing countries - and at the same time conscious of its international obligation, enshrined in its constitutive Convention, to regulate ships without discrimination on account of the flag they fly, IMO and its Member Governments are working hard to address the special needs of developing counties and to satisfy the CBDR principle. Creative and innovative means are under consideration, which would see substantial funds, obtained from carbon offsetting or trading measures (market-based mechanisms) applied by shipping, being dedicated to climate change mitigation and adaptation in developing countries and may also include other ways to secure that a control regime for international shipping do not have unwanted implications for developing countries.

## Conclusions

41 Being fully aware of the ultimate objective of the UNFCCC, which is to achieve stabilization of greenhouse gas concentrations at a level that prevents dangerous interference in the global climate system, IMO is seeking a solution where a GHG control regime for international shipping, once enacted, will deliver real emission reductions and, at the same time, will contribute financially towards the wider efforts to combat climate change in developing countries. The interests of mankind and the global climate would be best served if the Parties to the UNFCCC at the Cancun Conference (COP 16 and CMP 6), most of which are also IMO Member States, decided to continue entrusting IMO as the relevant United Special Agency, with the development and enacting of the global regulatory regime needed to limit or reduce greenhouse gas emissions from international shipping, based on the above premises.

42 Technical reduction measures are in the process of being introduced as mandatory for all new ships built from 2013 and onwards and will lead to significant emission reductions. By 2020, up to 50 million tonnes of $CO_2$ reduction from the introduction of the EEDI for new ships is identified, a figure that by 2030 will increase to 240 million tonnes of $CO_2$ annually. In addition, a 20% improvement in energy efficiency by 2020 on a tonne mile basis is envisaged from the introduction of operational measures.

43 MEPC 61 further developed and finalized the regulatory text which is now being circulated by the Secretary-General on behalf of a group of Parties as possible amendments to MARPOL Annex VI – *Regulations for the prevention of air pollution from ships.* MEPC 62 will consider in July 2011 the regulatory text with a view to its adoption. The new regulations would then be expected to enter into force on at the beginning of 2013.

44 Further work is needed on market-based measures but the foundations are in place and a work plan, culminating in 2011, has been agreed. All the necessary mechanisms are thereby in place or well underway and formal agreements on their application is the only aspect pending before a robust and efficient GHG regime, complementing IMO's regime of 52 international treaties regulating all non-commercial aspects of shipping, may be agreed to the benefit of the global environment and future generations.

45 IMO will continue its endeavours to reduce any environmental impacts from international shipping, a transport industry that is vital to world trade and sustainable development. IMO is ready to take technical and regulatory action as soon as a decision at the Cancun Conference is taken on a post-2012 regime to combat climate change.

## Concluding remarks

46 It is for the strong reasons outlined above, undeniable as they are, that IMO participates in the Cancun Conference expecting that, as the Kyoto Conference did thirteen years ago, the global community will, once again, place its confidence, for an effective contribution, from the shipping point of view, to the objectives this Conference pursues, on the Organization. Once this is done, IMO will spare no effort to do its duty within any target or timeframe the present Conference decides.

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# ANNEX 1

## TECHNICAL AND OPERATIONAL ENERGY EFFICIENCY MEASURES FOR SHIPS

1 The following circulars were issued (17 August 2009) following MEPC 59 and may be found on the IMO website: www.imo.org:

.1 the EEDI formula was circulated as MEPC.1/Circ.681, Interim Guidelines on the method of calculation of the Energy Efficiency Design Index for new ships (annex 17 to MEPC 59/24);

.2 the EEDI verification procedure was circulated as MEPC.1/Circ.682, Interim guidelines for voluntary verification of the EEDI (annex 18 to MEPC 59/24);

.3 the SEEMP was circulated as MEPC.1/Circ.683, Guidance for the development of a SEEMP (annex 19 to MEPC 59/24); and

.4 the EEOI was circulated as MEPC.1/Circ.684, Guidelines for voluntary use of the ship EEOI (annex 20 to MEPC 59/24).

### 2 IMO's Energy Efficiency Design Index (EEDI)

2.1 The maritime industries have continuously endeavoured to optimize ships' fuel consumption, e.g., through the development of more efficient engines and propulsion systems, optimized hull designs and larger ships, and thereby achieved a noteworthy reduction in fuel consumption and resulting $CO_2$ emissions on a capacity basis (tonne-mile). Although ships are the most fuel efficient mode of mass transport, the Second IMO GHG Study 2009 identified a significant potential for further improvements in energy efficiency mainly by the use of already existing technologies. Additional improvements in hull, engine and propeller designs, together with reduction in operational speed, may lead to considerable reductions as illustrated in the figure below.

***Potential reductions of $CO_2$ emissions by using existing technology and practices***

<table>
<tr><th>DESIGN (New ships)</th><th>Saving of $CO_2$/tonne-mile</th><th>Combined</th><th>Combined</th></tr>
<tr><td>Concept, speed and capability</td><td>2% to 50%+</td><td rowspan="6">10% to 50%+</td><td rowspan="10">25% to 75%+</td></tr>
<tr><td>Hull and superstructure</td><td>2% to 20%</td></tr>
<tr><td>Power and propulsion systems</td><td>5% to 15%</td></tr>
<tr><td>Low-carbon fuels</td><td>5% to 15%*</td></tr>
<tr><td>Renewable energy</td><td>1% to 10%</td></tr>
<tr><td>Exhaust gas $CO_2$ reduction</td><td>0%</td></tr>
<tr><td>OPERATION (All ships)</td><td colspan="2"></td></tr>
<tr><td>Fleet management, logistics and incentives</td><td>5% to 50%+</td><td rowspan="3">10% to 50%+</td></tr>
<tr><td>Voyage optimization</td><td>1% to 10%</td></tr>
<tr><td>Energy management</td><td>1% to 10%</td></tr>
</table>

+ Reductions at this level would require reductions of operational speed.
* $CO_2$ equivalent, based on the use of LNG.

**Source: Second IMO GHG Study 2009**

***Purpose of the EEDI***

2.2 MEPC has developed the Energy Efficiency Design Index for new ships (MEPC.1/Circ.681) to create stronger incentives for further improvements in ships' fuel consumption. The purposes of IMO's EEDI are:

- to require a minimum energy efficiency level for new ships;
- to stimulate continued technical development of all the components influencing the fuel efficiency of a ship;
- to separate the technical and design based measures from the operational and commercial measures (they will/may be addressed in other instruments); and
- to enable a comparison of the energy efficiency of individual ships to similar ships of the same size which could have undertaken the same transport work (moved the same cargo).

2.3 The EEDI establishes a minimum energy efficiency requirement for new ships depending on ship type and size and is a robust mechanism to increase the energy efficiency of ships step-wise for many decades to come. The EEDI is a non-prescriptive, performance-based mechanism that leaves the choice of technologies to use in a specific ship design to the industry. As long as the required energy-efficiency level is attained, ship designers and builders would be free to use the most cost-efficient solutions for the ship to comply with the regulations. The reduction level in the first phase is set to 10% and will be tightened every five years to keep pace with technological developments of new efficiency and reduction measures. IMO has set reduction rates until the period 2025 to 2030 when a 30% reduction is mandated for most ship types calculated from a reference line representing the average efficiency for ships built between 1999 and 2009.

***EEDI coverage***

2.4 The EEDI is developed for the largest and most energy intensive segments of the world merchant fleet and will embrace 72% of emissions from new ships covering the following ship types: oil and gas tankers, bulk carriers, general cargo and container ships. For ship types not covered by the current formula, suitable formulas will be developed in the future addressing the largest emitters first.

***The EEDI formula***

2.5 The EEDI provides a specific figure for an individual ship design, expressed in grams of $CO_2$ per ship's capacity-mile (a smaller EEDI value means a more energy-efficient ship design) and calculated by the following formula based on the technical design parameters for a given ship:

$$\frac{\left(\prod_{j=1}^{M} f_j\right)\left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)}\right) + \left(P_{AE} \cdot C_{FAE} \cdot SFC_{AE} *\right) + \left(\left(\prod_{j=1}^{M} f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AEeff(i)}\right) C_{FAE} \cdot SFC_{AE}\right) - \left(\sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME}\right)}{f_i \cdot Capacity \cdot V_{ref} \cdot f_w}$$

That can be illustrated by the following simplified formula:

$$EEDI = \frac{CO_2\ emission}{transport\ work}$$

2.6 The $CO_2$ emission represents total $CO_2$ emission from combustion of fuel, including propulsion and auxiliary engines and boilers, taking into account the carbon content of the fuels in question. If shaft generators or innovative mechanical or electrical energy efficient technologies are incorporated on board a ship, these effects are deducted from the total $CO_2$ emission. The energy saved by the use of wind or solar energy will also is deducted from the total $CO_2$ emissions, based on actual efficiency of the systems.

2.7 The transport work is calculated by multiplying the ship's capacity as designed with the ship's design speed measured at the maximum design load condition and at 75% of the rated installed shaft power. Speed is the most essential factor in the formula and may be reduced to achieve the required index.

***Status of the EEDI***

2.8 The EEDI was circulated in August 2009 for trial purposes to ensure its feasibility and for further improvement of the calculation method. The regulatory text introducing the EEDI as a mandatory measure for all ships under MARPOL Annex VI was finalized by MEPC 61 in October 2010 and circulated in November on the request of a number of Parties with the view to formal adoption by MEPC 62 in July 2011. The amendments to MARPOL Annex VI are expected to enter into force on 1 January 2013.

***Future developments***

2.9 The current EEDI formula is not suitable for all ship types or all types of propulsion systems, e.g., ships with diesel-electric, turbine or hybrid propulsion systems will need additional correction factors and MEPC will consider the matter in detail at future sessions.

***Conclusions EEDI***

2.10 The EEDI establish a minimum energy efficiency requirement for new ships depending on ship type and size and is a robust mechanism that may be used to increase the energy efficiency of ships stepwise to keep pace with technical developments for many decades to come. The EEDI is a non-prescriptive mechanism that leaves the choice of what technologies to use in a ship design to the stakeholders as long as the required energy-efficiency level is attained enabling the most cost-efficient solutions to be used.

2.11 Introduction of the EEDI as a mandatory measure for all ships will mean, provided it enters into force as expected on 1 January 2013; that between 45 and 50 million tonnes of $CO_2$ will be removed from the atmosphere annually by 2020 compared with business as usual depending on the growth in world trade. For 2030, the reduction will be between 180 and 240 million tonnes annually from the introduction of the EEDI.

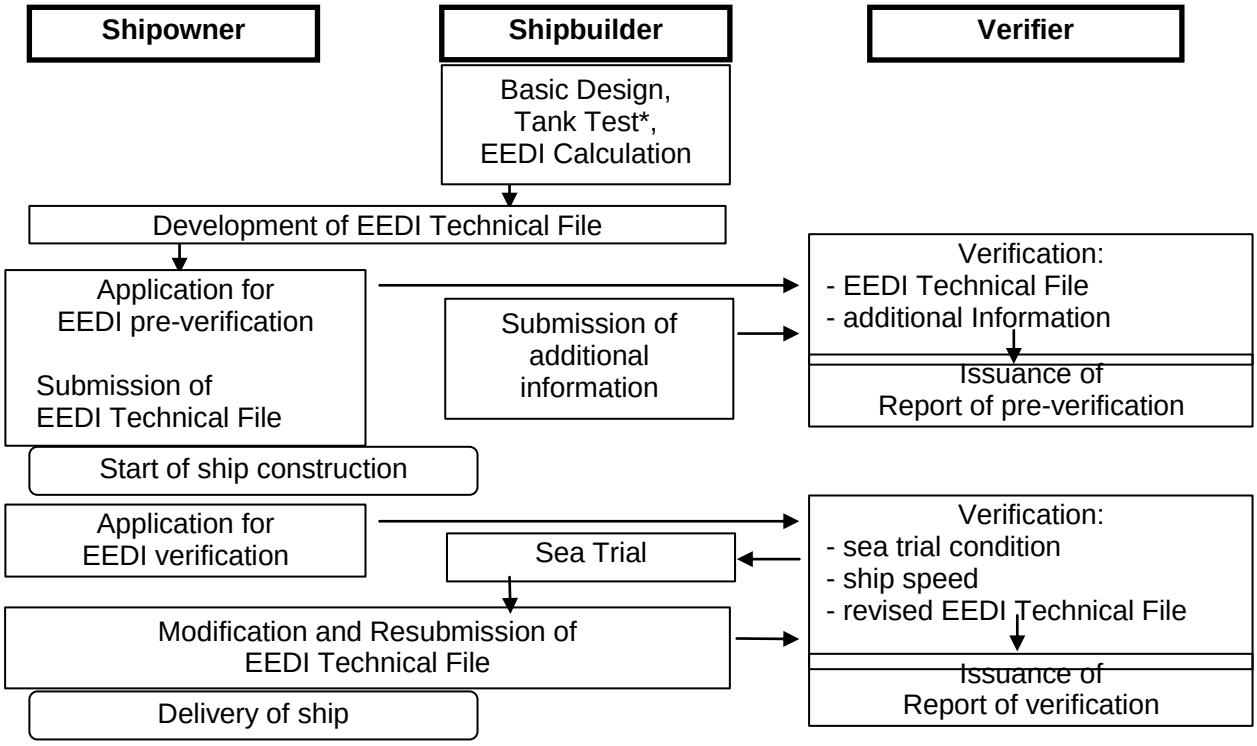
2.12 The regulatory text is circulated by the Secretary-General to the 169 IMO Member States with a view to their adoption in July 2011 when the Committee meets for its sixty-second session and the regulations are expected to enter into force on 1 January 2013.

## 3 Voluntary verification of the EEDI

3.1 The purpose of the interim guidelines on voluntary verification of the EEDI is to assist verifiers of the EEDI in conducting the verification in a uniform manner. Uniform application of voluntary verification will capitalize on the experience from trials and will assist MEPC in its further consideration of possible mandatory application of the EEDI to new ships. The guidelines will also assist shipowners, shipbuilders as well as engine and equipment manufacturers, and other interested parties, in understanding the procedures of EEDI verification.

***Verification in two stages***

3.2 The attained EEDI should be calculated in accordance with the EEDI Guidelines (MEPC.1/Circ.681). Voluntary EEDI verification should be conducted on two stages: preliminary verification at the design stage, and final verification at the sea trial, before issuance of the final report on the verification of the attained EEDI. The basic flow of the verification process is presented in figure 1.




* to be conducted by a test organization or a shipbuilder itself.

**Figure 1 – Basic Flow of EEDI Verification Process**

***Preliminary verification at the design stage***

3.3 For the preliminary verification at the design stage, a shipowner should submit to a verifier (e.g., a Maritime Administration or a Classification Society) an application for the verification and an EEDI Technical File containing the necessary information for the verification and other relevant background documents as required by the guidelines.

***Final verification of the Attained EEDI at sea trial***

3.4 Prior to the sea trial, a shipowner should submit the application for the verification of the EEDI together with the final displacement table and the measured lightweight, as well as other technical information as necessary. The verifier should attend the sea trial and confirm compliance in accordance with the guidelines and the EEDI guidelines.

***Issuance of the EEDI verification report***

3.5 The verifier should issue the Report on the Preliminary Verification of EEDI after it verified the Attained EEDI at design stage in accordance with the guidelines. Following the sea trial, the verifier should issue the final report on the verification of the attained EEDI after it verified the Attained EEDI at the sea trial in accordance with the guidelines.

***Status of the verification guidelines***

3.6 The guidelines are applied on a voluntary basis to new ships for which an application for EEDI verification has been submitted to a verifier. When the EEDI is made mandatory, the guidelines will form part of the regulatory framework governing the scheme.

## 4 Guidance for the development of a SEEMP

4.1 The purpose of the Ship Energy Efficiency Management Plan (SEEMP) is to establish a mechanism for a company and/or a ship to improve the energy efficiency of ship operations. Preferably, the ship-specific SEEMP is linked to a broader corporate energy management policy for the company that owns, operates or controls the ship. It should be recognized that the international fleet of merchant vessels comprises a wide range of ship types and sizes that differ significantly in their design and purpose, and that ships operate under a broad variety of different conditions.

4.2 Sea transport has a justifiable image of conducting its operations in an energy-efficient way, and in a manner that creates little impact on the global environment. It is nevertheless the case that enhancement in efficiencies can reduce fuel consumption, save money, and decrease the environmental impacts from ships. While the yield of individual measures may be small, the collective effect across the entire fleet will be significant. In global terms it should be recognized that operational efficiencies delivered by a large number of ships will make a valuable contribution to reducing global carbon emissions.

***Practical approach***

4.3 Mandatory management plans are used to regulate a range of ship operations where traditional command and control regulations would not work, and is also the chosen option for reduction of GHG emissions from operation of ships engaged in international trade. To regulate ship operations by traditional prescriptive regulations (as is the customary practice for technical regulations) is not feasible, e.g., to determine the most energy-efficient speed, optimum ship handling practices or the preferred ballast conditions for all ships in a set of regulations could hardly be done and keeping it updated would not be possible. A management plan is a familiar tool for the shipping industry and provides a flexible mechanism where shipowners and operations can choose the most cost-effective solutions for their ships and their operations.

4.4 The SEEMP provides an approach for monitoring ship and fleet efficiency performance over time and forces the responsible persons and entities to consider new technologies and practices when seeking to optimize the performance of the ship. The Second IMO GHG Study 2009 indicates that a 20% reduction on a tonne-mile basis by mainly operational measures is possible and would be cost-effective even with the current fuel prices, and the SEEMP will assist the shipping industry in achieving this potential.

4.5 The circular provides guidance for the development of a SEEMP that should be adjusted to the characteristics and needs of individual companies and ships. The SEEMP is a management tool to assist a company in managing the ongoing environmental performance of its vessels and, as such, it is recommended that the plan be implemented in a manner which limits any onboard administrative burden to the minimum necessary.

***Ship-specific plan***

4.6 The SEEMP should be developed as a ship-specific plan by the shipowner, operator or any other party concerned, e.g., the charterer. The SEEMP seeks to improve a ship's energy efficiency through four steps: *planning*, *implementation*, *monitoring*, and *self-evaluation and improvement*. These components play a critical role in the continuous cycle to improve ship energy management.

***Guidance on best practices for fuel-efficient operation of ships***

4.7 The circular contains guidance on best practices related to voyage performance, optimized ship handling, hull and propulsion system maintenance, the use of waste heat recovery systems, improved fleet management, improved cargo handling and energy management. It also covers areas such as fuel types, compatibility of measures, age and operational service life of a ship as well as trade and sailing area.

***A sample form of a SEEMP is presented below for illustrative purposes***

| | | | |
|---|---|---|---|
| Name of Vessel: | | GT: | |
| Vessel Type: | | Capacity: | |
| Date of Development: | | Developed by: | |
| Implementation Period: | From:<br>Until: | Implemented by: | |
| Planned Date of Next Evaluation: | | | |

**1 Measures**

| **Energy Efficiency Measures** | **Implementation** (including the starting date) | **Responsible Personnel** |
|---|---|---|
| Weather Routeing | <Example><br>Contracted with [Service providers] to use their weather routeing system and start using on trial basis as of 1 July 2012. | <Example><br>The master is responsible for selecting the optimum route based on the information provided by [Service providers]. |
| Speed Optimization | While the design speed (85% MCR) is 19.0 kt, the maximum speed is set at 17.0 kt as of 1 July 2012. | The master is responsible for keeping the ship speed. The log-book entry should be checked every day. |

**2 Monitoring**

- Description of monitoring tools (e.g. the EEOI, or another suitable indicator or MRV tool)

**3 Goal**

- Measurable goals

**4 Evaluation**

- Procedures of evaluation

## 5 The Energy Efficiency Operational Indicator (EEOI)

5.1 Although ships are the most fuel efficient mode of mass transport, the Second IMO GHG Study 2009 identified a significant potential for further improvements in energy efficiency by operational measures, such as fleet management, voyage optimization and energy management. The Study estimated that 10 to 50% reductions of $CO_2$ emissions (on a capacity mile basis) are possible through the combined use of these measures. Saving energy at the operational stage is presently addressed by the SEEMP where the Energy Efficiency Operational Indicator (EEOI) will be used as the monitoring tool and to establish benchmarks for different ship segments of the world fleet categorized by ship type and size.

***Purpose of the EEOI***

5.2 MEPC has developed Guidelines for voluntary use of the ship Energy Efficiency Operational Indicator to establish a consistent approach for measuring ships energy-efficiency at each voyage or over a certain period of time, which will assist shipowners and ship operators in the evaluation of the operational performance of their fleet. As the amount of $CO_2$ emitted from ships is directly related to the consumption of bunker fuel oil, the EEOI can also provide useful information on a ship's performance with regard to fuel efficiency.

5.3 The EEOI enables continued monitoring of individual ships in operation and thereby the results of any changes made to the ship or its operation. The effect of retrofitting a new and more efficient propeller would be reflected in the EEOI value and the emissions reduction could be quantified. The effect on emissions by changes in operations, such as introduction of just in time planning or a sophisticated weather routing system, will also be shown in the EEOI value.

***EEOI coverage***

5.4 The EEOI can be applied to almost all ships (new and existing) including passenger ships, however it cannot be applied to ships that are not engaged in transport work, such as service and research vessels, tug boats or FPSOs, as it is the transport work that is the input value together with emissions (fuel consumed x $CO_2$ factors for different fuel types).

***The EEOI formula***

5.5 The EEOI provides a specific figure for each voyage. The unit of EEOI depends on the measurement of cargo carried or the transport work done, e.g., tonnes $CO_2$/(tonnes·nautical miles), tonnes $CO_2$/(TEU·nautical miles) or tonnes $CO_2$/(person·nautical miles), etc. The EEOI is calculated by the following formula, in which a smaller EEOI value means a more energy efficient ship:

$$EEOI = \frac{actual\ CO_2\ emission}{peformed\ transport\ work}$$

5.6 The actual $CO_2$ emission represents total $CO_2$ emission from combustion of fuel on board a ship during each voyage, which is calculated by multiplying total fuel consumption for each type of fuel (distillate fuel, refined fuel or LNG, etc.) with the carbon to $CO_2$ conversion factor for the fuel(s) in question (fixed value for each type of fuel).

5.7 The performed transport work is calculated by multiplying mass of cargo (tonnes, number of TEU/cars, or number of passengers) with the distance in nautical mile corresponding to the transport work done.

***Status of the EEOI***

5.8 The EEOI is circulated to encourage shipowners and ship operators to use it on a voluntary basis and to collect information on the outcome and experiences in applying it. The EEOI will be used as a monitoring tool in the SEEMP and to establish benchmarks.

***GHG module in GISIS***

5.9 To collect EEOI data and make them accessible to Member States and the shipping industry, a GHG module was established in GISIS (IMO's central database) to enable further research work and the establishment of benchmarks for different ship segments (type and size). A sample data in the GHG module is presented below. When fuel consumption data, cargo quantity and voyage distance are completed, the $CO_2$ emission and the voyage index will be calculated automatically:

| HFO (tonnes) | LNG (tonnes) | MDO (tonnes) | Cargo unit | Distance (n.miles) | $CO_2$ emission | Voyage index |
|---|---|---|---|---|---|---|
| 44.46 | --- | 2 | 475.2 | 967 | 145 | 315 |
| 108.78 | --- | 0.8 | 1051.2 | 1861 | 341 | 174 |

***

## ANNEX 2

## REPORT ON THE OUTCOME OF THE WORK UNDERTAKEN BY THE EXPERT GROUP ON FEASIBILITY STUDY AND IMPACT ASSESSMENT OF POSSIBLE MARKET-BASED MEASURES (MBM-EG) PROPOSED TO MEPC 60

## EXECUTIVE SUMMARY OF THE FULL REPORT (MEPC 61/INF.2)

### BACKGROUND

1 The Marine Environment Protection Committee, at its sixtieth 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.

2 In order to undertake this study, the Committee authorized the Secretary-General to establish 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 (appendix 1), 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.

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.

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.

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.

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.

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.

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**

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.

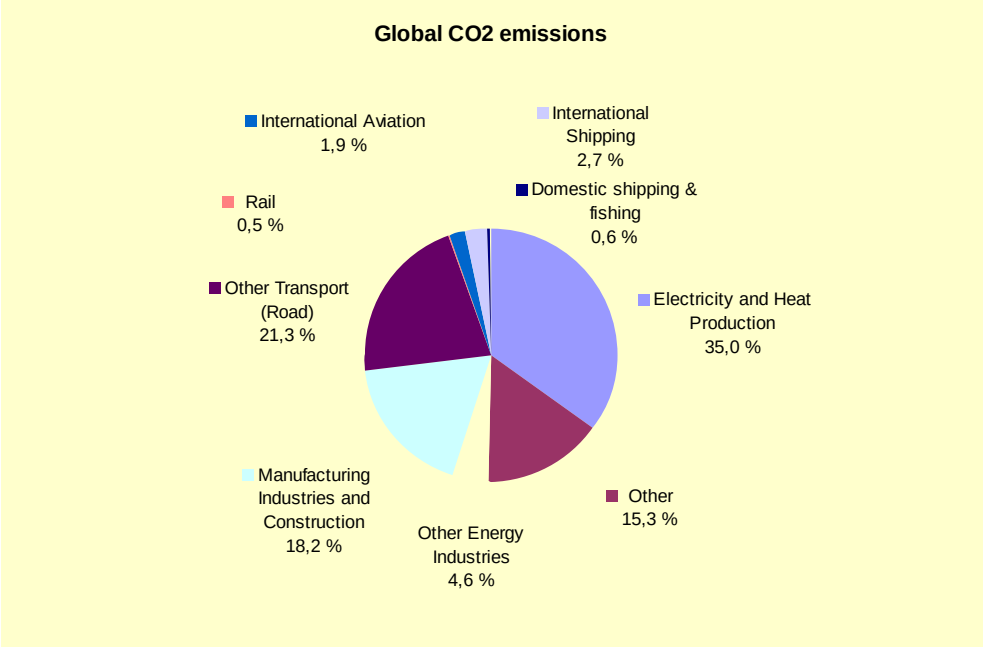
.6 **The Global Emission Trading System (ETS) for international shipping proposal by Norway (MEPC 61/4/22)** – would set a sector-wide cap on net emissions from international shipping and establish a trading mechanism to facilitate the necessary emission reductions, be they in-sector or out-of-sector. 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 document MEPC 60/4/55).




**Emissions of $CO_2$ from shipping compared with global total emissions for 2007 (Source: Second IMO GHG Study 2009)**

## ENVIRONMENTAL OVERVIEW

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

### Reduction mechanism employed by the proposals

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***

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.

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.

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.

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.

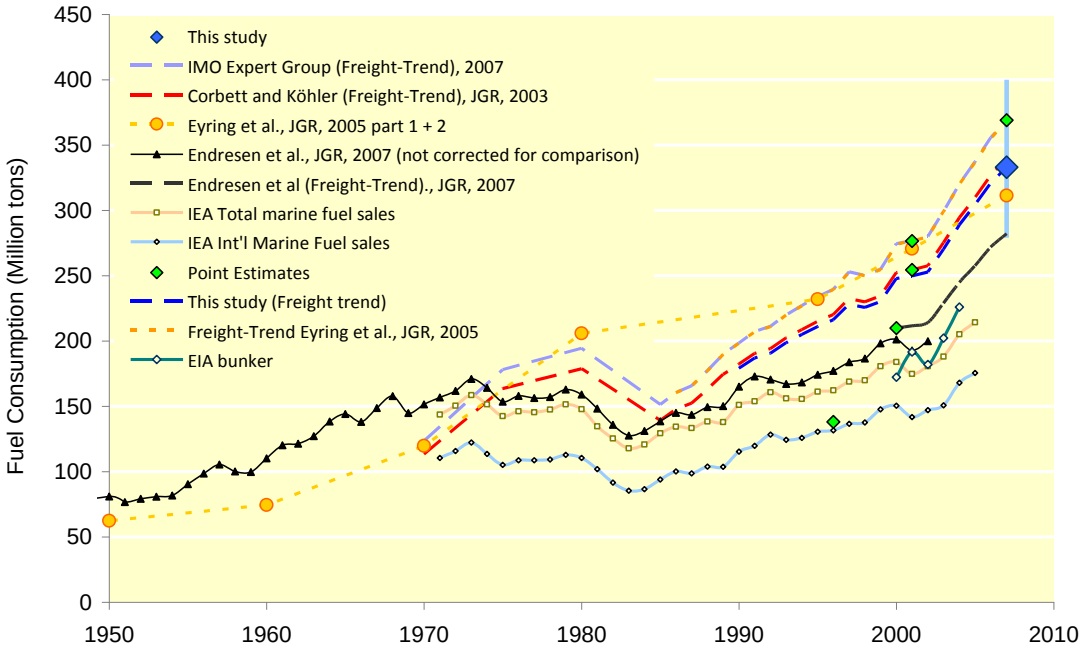
16 **Leverage refund incentive**: Ships that meet certain 'good performance' criteria would be eligible to receive a full or partial refund on a levy (price signal) they are required to pay on fuel. This increases the incentive for in-sector reductions over a standard price signal by directing revenues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

***Out-of-sector mechanisms***

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.

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.

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 political 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.




**World fleet fuel consumption (except naval vessels) from different activity-based estimates and statistics. Symbols indicate the original estimates for individual years and the solid lines show the original estimates of trend. Dashed lines show the backcast and forecast, calculated from the time evolution of freight tonne-miles with the point estimates. The blue square shows the activity-based estimate from the Second IMO GHG Study 2009study and the blue range bar indicates the high and low bound estimates (Source: Second IMO GHG Study 2009)**

## Emission reduction and other benefits

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 scenario; 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% |
| 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] |

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.

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.

## Certainty of emission reductions

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.

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.

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) is 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.

.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.

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

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

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.

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**

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**

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.<br><br>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:<br><br>.1 inherent stability of fixing the price for a given time period; and<br>.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.<br><br>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.<br><br>The amount of funds collected for other purposes is \$24 billion.<br><br>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.<br><br>The amount of funds collected for other purposes is \$49 billion.<br><br>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:<br><br>.1 inherent stability of basing the price on the carbon price; and<br><br>.2 volatility of the carbon price. | Neutral | \$0.8 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 |
|---|---|---|---|---|
| **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.<br><br>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. | High | Not priced. |
| **VES (WSC)** | The cost-of reductions is estimated to be 247 \$/tonne $CO_2$ abated.<br><br>The amount of funds generated for other purposes is \$7.4 billion.<br><br>The maximum cost-effectiveness potential of the proposal is 34 \$/tonne $CO_2$ | The Vessel Efficiency System is based on the EEDI.<br><br>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 on board 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.<br><br>The amount of funds collected for other purposes is \$31 billion.<br><br>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. |
| **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.<br><br>The amount of funds generated for other purposes is \$21 billion.<br><br>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 [4] 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 document MEPC 60/4/55.

**ADMINISTRATIVE AND LEGAL**

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**

31 The administrative and legal task-group was successful in highlighting some of the political 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**

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 political considerations.

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**

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.

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.

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.

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.

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.

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.

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.

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.

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**

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

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**

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.

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.

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

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.

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.

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.

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**

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**

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 section 2.5.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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## APPENDIX 1

## TERMS OF REFERENCE FOR THE EXPERT GROUP ON FEASIBILITY STUDY AND IMPACT ASSESSMENT OF POSSIBLE MARKET-BASED MEASURES (MBM-EG)

**As agreed by MEPC 60**

### Introduction

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 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 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).

3 The Committee agreed that the MBM proposals to be assessed are those listed in appendix, 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

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 3 above.

.2 The study and assessment referred to in paragraph 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**

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 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 greenhouse gas 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.

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

**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 |

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## APPENDIX 2

## COMPOSITION OF THE EXPERT GROUP

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| Chairman<br>(appointed by the<br>Secretary-General) | Mr. Andreas I. Chrysostomou<br>Department of Merchant Shipping, Cyprus<br>Chairman of the Marine Environment Protection Committee |

| **Nominating country/organization** | **Expert name** |
|---|---|
| Australia | Dr. Andrew Pankowski<br>Department of Climate Change and Energy Efficiency |
| Bahamas | Dr. Phillip Belcher<br>The Bahamas Maritime Authority |
| Brazil | Mr. Adriano Santhiago de Oliveira<br>Secretariat of Research and Development Policies and Programs<br>General Coordination on Global Climate Change<br>Ministry of Science and Technology of Brazil |
| Canada | Dr. Leigh Mazany<br>Environmental Policy Directorate<br>Transport Canada |
| Chile | Mr. Sebastian Marambio Cathalifaud<br>Ministry of Finance |
| China | Mr. Sun Jun<br>Department of Dangerous Goods Control and Pollution Prevention<br>Zhejiang Maritime Safety Administration of People's Republic of CHINA |
| Cyprus | Mr. Philippos Philis<br>Lemissoler Group PCL |
| Denmark | Mr. Jesper Loldrup<br>Centre for Shipping Policy<br>Danish Maritime Authority |
| France | Mr. Philippe Maler<br>Transport Services in the Ministry of Ecology, Energy, Sustainable Development and the Sea<br>MEEDDM –DGITM |
| Germany | Ms. Petra Bethge<br>Economic Affairs Department |
| Greece | Professor Harilaos Psaraftis<br>School of Naval Architecture and Marine Engineering<br>National Technical University of Athens |
| India | Mr. Indra Nath Bose<br>The Great Eastern Shipping Co. Ltd. |
| Italy | Dr. Giulia Dramis<br>Ministry of Environment |
| Jamaica | Mr. Eric E. Deans<br>College of Earth, Ocean and Environment<br>University of Delaware |
| Japan | Mr. Hideaki Saito<br>Japan Ship Centre (JETRO) |
| Liberia | Mr. Matthias Rentsch<br>LISCR(Deutschland) GmbH |
| Marshall Islands | Rear Admiral Robert C. North<br>North Start Maritime Inc. |
| Nigeria | Dr. Victor Ayodeji Fodeke<br>Special Climate Change Unit<br>Federal Ministry of Environment |

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|---|---|
| Norway | Mr. Sveinung Oftedal<br>Royal Ministry of the Environment |
| Panama | Ambassador Gilberto Arias<br>Embassy of the Republic of Panama |
| Singapore | Mr. Cheong Keng Soon<br>Maritime and Port Authority of Singapore |
| South Africa | Mr. Sobantu Tilayi<br>Centre for Ships<br>South African Maritime Safety Authority (SAMSA) |
| United Kingdom | Dr. Anne-Marie Warris<br>Lloyd's Register |
| United States | Mr. Drew Nelson<br>Bureau of Oceans Environment and Scientific Affairs<br>US Department of State |

| | |
|---|---|
| BIMCO | Mr. Lars Robert Pedersen<br>BIMCO<br>Denmark |
| IACS | Mr. Paul Sadler<br>International Association of Classification Societies Ltd.<br>United Kingdom |
| ICS | Mr. David Tongue<br>International Chamber of Shipping<br>United Kingdom |
| INTERCARGO | Mr. Robert Lomas<br>International Association of Dry Cargo Shipowners<br>United Kingdom |
| INTERTANKO | Mr. Dragos Rauta<br>International Association of Independent Tankers Owners<br>Norway |
| IPTA | Ms. Janet Strode<br>International Parcel Tankers Association<br>United Kingdom |
| ITF | Ms. Penny Howard<br>Seafarers Section<br>International Transport Workers' Federation<br>United Kingdom |
| IUCN | Dr. Andre Stochniol<br>International Union for the Conservation of Nature<br>United Kingdom |
| OCIMF | Mr. Ken G. Reid<br>Oil Companies International Marine Forum<br>United Kingdom |
| WSC | Mr. Bryan C. Wood Thomas<br>World Shipping Council<br>United States |
| WWF | Mr. Peter Lockley (to 16/07/10)<br>World Wide Fund for Nature, United Kingdom |

| | |
|---|---|
| EC | Mr. Mark Major<br>European Commission<br>DG Climate Action<br>Directorate B – European and International Carbon Market<br>Unit B3 – International Carbon Market, Aviation and Maritime<br>Belgium |
| ICAO | Mr. Lorenzo Gavilli<br>International Civil Aviation Organization<br>Canada |
| UNFCCC | Dr. Florin Vladu<br>Adaptation, Technology and Science Programme<br>[Manager, Analysis and Methods Subprogramme]<br>United Nations Framework Convention on Climate Change<br>Germany |

| **IMO Secretariat** |
|---|
| The Secretary-General<br><br>Mr. Miguel Palomares<br>Director, Marine Environment Division<br><br>Mr. Eivind Sanden Vågslid<br>Head, Chemical and Air Pollution Prevention Section<br>Sub-Division for Pollution Prevention<br>Marine Environment Division<br><br>Dr. Gillian Reynolds<br>Consultant, Chemical and Air Pollution Prevention Section<br>Sub-Division for Pollution Prevention<br>Marine Environment Division<br><br>Ms. Lucy Essuman<br>Principal Secretary, Chemical and Air Pollution Prevention Section<br>Sub-Division for Pollution Prevention<br>Marine Environment Division<br><br>Ms. E. Patricia Henriques Santos<br>Secretary, Chemical and Air Pollution Prevention Section<br>Sub-Division for Pollution Prevention<br>Marine Environment Division |

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## APPENDIX 3

## FOCAL POINTS

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|---|---|---|
| MEPC 60/4/8 | Cyprus, Denmark, the Marshall Islands, Nigeria and IPTA | Mr. Christian Breinholt<br>Danish Maritime Authority |
| MEPC 60/4/10 | Bahamas | Capt. Douglas Bell<br>Bahamas Maritime Authority |
| MEPC 60/4/12 | United States | Mr. Michael Samulski<br>National Vehicle and Fuel Emissions Laboratory<br>US Environment Protection Agency |
| MEPC 60/4/22 | Norway | Mr. Sveinung Oftedal<br>Royal Ministry of the Environment |
| MEPC 60/4/26 | United Kingdom | Mr. Oliver Chadwick<br>Shipping and the Marine Environment<br>Department for Transport |
| MEPC 60/4/37 | Japan | Mr. Masahiro Samitsu<br>GHG Task Force of the Japanese Shipowners' Association<br>Ministry of Land, Infrastructure, Transport and Tourism |
| MEPC 60/4/39 | WSC | Mr. Bryan C. Wood Thomas<br>World Shipping Council<br>United States |
| MEPC 60/4/40 | Jamaica | Mr. Eric E. Deans<br>College of Earth, Ocean and Environment<br>University of Delaware |
| MEPC 60/4/41 | France | Mme Marie Claire LHENRY<br>Département Climat<br>Département de la lutte contre l'effet de serre<br>MEEDDM – Direction Générale Énergie et Climat<br>Ministère de l'Écologie, de l'Énergie, du Développement Durable et de la Mer |
| MEPC 60/4/54 | Germany | Mr. Falk Heinen<br>Federal Ministry for the Environment<br>Nature Conservation and Nuclear Safety |
| MEPC 60/4/55 | IUCN | Dr. Andre Stochniol<br>International Union for the Conservation of Nature<br>United Kingdom |

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