Breakthrough at IMO
Adoption of mandatory Energy Efficiency measures for ships leading to significant emission reductions worldwide

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Deputy director/Head
Air Pollution and Climate Change Section
Marine Environment Division
IMO
IMO – specialised UN agency

- 170 Member States
- IGOs and NGOs
- London headquarters
- Annual budget £30+ M
- Secretariat: 300+ staff
- 50+ Nationalities
- Secretary-General: E. E. Mitropoulos, Greece

53 treaties covering all aspects of international shipping
Design – Construction - Equipment – Operation – Maintenance – Manning
Prevention – Response – Liability - Compensation

Safe, secure and efficient shipping on clean oceans!
Range of typical CO₂ efficiencies for various cargo carriers

Data: Second IMO GHG Study 2009
World seaborne trade 1968-2008

Baseline efficiency improvement in historic perspective

Efficiency improvements

Fuel Consumption World Fleet
Second IMO GHG Study 2009

2007 International shipping’s CO2 emissions 870 million tons/2.7%

Future CO2 emissions:
- Significant increase predicted: 200 - 300% by 2050 in the absence of regulations
- Demand is the primary driver
- Technical and operational efficiency measures will provide significant improvements but will not be able to provide real reductions if demand continues
Potential reductions of CO2 emissions

<table>
<thead>
<tr>
<th>DESIGN (New ships)</th>
<th>Saving of CO₂/tonne-mile</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept, speed &amp; capability</td>
<td>2% to 50%</td>
<td></td>
</tr>
<tr>
<td>Hull and superstructure</td>
<td>2% to 20%</td>
<td></td>
</tr>
<tr>
<td>Power and propulsion systems</td>
<td>5% to 15%</td>
<td></td>
</tr>
<tr>
<td>Low-carbon fuels</td>
<td>5% to 15%*</td>
<td></td>
</tr>
<tr>
<td>Renewable energy</td>
<td>1% to 10%</td>
<td></td>
</tr>
<tr>
<td>Exhaust gas CO₂ reduction</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>OPERATION (All ships)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet management, logistics &amp; incentives</td>
<td>5% to 50%</td>
<td>10% to 50%+</td>
</tr>
<tr>
<td>Voyage optimization</td>
<td>1% to 10%</td>
<td></td>
</tr>
<tr>
<td>Energy management</td>
<td>1% to 10%</td>
<td></td>
</tr>
</tbody>
</table>
IMO’s work on GHG control and Energy efficiency

Work on air pollution prevention from late 1980s

In 1991 the IMO Assembly called for the development of MARPOL Annex VI

The 1997 MARPOL Conference’s resolution 8 calling for GHG action by IMO

First IMO GHG Study published in 2000

IMO’s GHG policy adopted by Assembly 23 in December 2003

Development of T&O measures, including EEOI, EEDI, SEEMP: 2000 – 2009

Voluntary application and testing by administrations and industry

Basic principles adopted by MEPC 57 (April 2008)

Second IMO GHG Study 2009 published

Development of an MBM from 2007, Expert Group reported in 2010

Regulatory text developed 2009 - 2011

2011 Adoption of new chapter to MARPOL Annex VI; mandatory T&O measures

Technical - mainly applicable to new ships - EEDI

Operational - applicable to all ships in operation – SEEMP and EEOI

Market-based Measures (MBM) – carbon price for shipping, incentive, may generate funds
Draft regulatory text, developed by MEPC 61, circulated on behalf of nine Annex VI Parties

A number of submissions providing comments on and input to regulatory text and specific proposals

Compromise text on application proposed by Singapore attracted interest and support

Additional text on Technical Assistance/Capacity Building proposed by several delegations
Breakthrough at IMO
MEPC 62 (11 – 14 July 2011)

Mandatory technical and operational measures adopted

Mandatory energy efficiency measures adopted (EEDI and SEEMP) for all ships by inclusion of new chapter 4 in MARPOL Annex VI

Further development of supporting guidelines on:
  Calculation of EEDI
  EEDI Reference Lines (average of ships built 1999 – 2009)
  EEDI Survey and Certification
  Development and implementation of SEEMP
  EEOI - Energy Efficiency Operational Indicator (MRV tool and benchmark)

Work on EEDI formulas for ship types not yet covered

Intersessional meeting January 2012 to prepare guidelines for adoption at MEPC 63 in February/March 2012
New Chapter 4 to Annex VI

- **Regulation 19 – Application**
  - Ship types: bulk carriers, tankers, container ships, general cargo ships, gas carriers, reefers and combination carriers
  - Covers 71% of international shipping CO2
  - 4 years waiver clause for Administrations in need of more time

- **Regulation 20 Attained EEDI**

- **Regulation 21 Required EEDI**

- **Regulation 22 SEEMP for all ships (400 GT)**

- **Regulation 23 Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships**
Energy Efficiency Design Index - EEDI

Main Engine(s)  Auxiliary Engine(s)  Energy Saving Technologies

\[ \left( \prod_{j=1}^{M} f_j \left( \sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)} \right) + \left( \prod_{j=1}^{M} f_j \left( \sum_{i=1}^{nPIT} P_{PIT(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AE,eff(i)} \right) C_{FAE} \cdot SFC_{AE} \right) - \left( \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME} \right) \right) \]

\[ f_i \cdot \text{Capacity} \cdot V_{ref} \cdot f_w \]

\[ g \text{ of } CO_2 \text{ emitted} \]

\[ \text{cargo capacity} \times \text{speed} \]

-10% ships built between 2015 – 2020
-20% ships built between 2020 – 2025
-30% ships built between 2025 – [2030]

Attained EEDI \( \leq \) Required EEDI values
## Required EEDI – Regulation 21

Reduction factors (in percentage) for the EEDI relative to the EEDI Reference line

<table>
<thead>
<tr>
<th>Ship Type</th>
<th>Size</th>
<th>Phase 0 1 Jan 2013 – 31 Dec 2014</th>
<th>Phase 1 1 Jan 2015 – 31 Dec 2019</th>
<th>Phase 2 1 Jan 2020 – 31 Dec 2024</th>
<th>Phase 3 1 Jan 2025 and onwards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carrier</td>
<td>20,000 DWT and above</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>10,000 – 20,000 DWT</td>
<td>n/a</td>
<td>0-10*</td>
<td>0-20*</td>
<td>0-30*</td>
</tr>
<tr>
<td>Gas carrier</td>
<td>10,000 DWT and above</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>2,000 – 10,000 DWT</td>
<td>n/a</td>
<td>0-10*</td>
<td>0-20*</td>
<td>0-30*</td>
</tr>
<tr>
<td>Tanker</td>
<td>20,000 DWT and above</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>4,000 – 20,000 DWT</td>
<td>n/a</td>
<td>0-10*</td>
<td>0-20*</td>
<td>0-30*</td>
</tr>
<tr>
<td>Container ship</td>
<td>15,000 DWT and above</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>10,000 – 15,000 DWT</td>
<td>n/a</td>
<td>0-10*</td>
<td>0-20*</td>
<td>0-30*</td>
</tr>
<tr>
<td>General Cargo ships</td>
<td>15,000 DWT and above</td>
<td>0</td>
<td>10</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>3,000 – 15,000 DWT</td>
<td>n/a</td>
<td>0-10*</td>
<td>0-15*</td>
<td>0-30*</td>
</tr>
<tr>
<td>Refrigerated cargo carrier</td>
<td>5,000 DWT and above</td>
<td>0</td>
<td>10</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>3,000 – 5,000 DWT</td>
<td>n/a</td>
<td>0-10*</td>
<td>0-15*</td>
<td>0-30*</td>
</tr>
<tr>
<td>Combination carrier</td>
<td>20,000 DWT and above</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>4,000 – 20,000 DWT</td>
<td>n/a</td>
<td>0-10*</td>
<td>0-20*</td>
<td>0-30*</td>
</tr>
</tbody>
</table>

*Note: 0-30* indicates a range of reduction factors between 0% and 30%*
Ship Energy Efficiency Management Plan (SEEMP) - Onboard management tool

- Monitoring of emissions and energy performance of individual ships and encouraging continuous improvement, using the operational indicator (EEOI) as monitoring tool and benchmarking.
- Improved voyage planning (Weather routeing/Just in time)
- Speed and power optimization (single most important issue)
- Optimized ship handling (ballast/trim/use of rudder and autopilot)
- Improved fleet and ship management - utilization
- Improved cargo handling
- Energy management
2030 – abatement potential

Average marginal CO₂ reduction cost per option - World shipping fleet in 2030 (existing and newbuilds)

Note: abatement potential for individual ship types and size segments vary widely
Energy Efficiency Operational Indicator - EEOI

- MRV tool and benchmark for individual ships
- A ship specific efficiency indicator to be used by all ships in operation (new and existing) obtained from fuel consumption, voyage data (miles) and cargo data (tonnes)

\[
\text{Actual Fuel Consumption Index} = \frac{\text{Fuel Consumption in Operation}}{\text{Cargo Onboard} \times \text{Distance traveled}}
\]
Guidelines to be finalized at MEPC 63 (March 2012)

- Guidelines on the method of calculation of the Energy Efficiency Design Index (EEDI) for new ships
- Guidelines for the development of the Ship Energy Efficiency Management Plan (SEEMP)
- Guidelines on Survey and Certification of the EEDI
- Guidelines for determining minimum propulsion power and speed to enable safe manoeuvring in adverse weather conditions
Effects of amendments

Following the adoption, IMO commissioned a study from LR/DNV to estimate the effects, document MEPC 63/INF.2

- **2020** – combined effects of EEDI and SEEMP
  - 103 - 200 million tonnes of CO2
  - 10 – 17% reduction over BAU
  - US$ 20 – 80 billion annual fuel cost savings

- **2030**
  - 237 - 423 million tonnes of CO2
  - 18 – 26% over BAU
  - US$ 90 – 310 fuel cost savings

- **2050**
  - 706 – 1320 million tonnes of CO2
  - 35 – 41% reduction over BAU
Breakthrough at IMO

“This is a landmark for the Organization, which has now made a positive contribution to worldwide efforts to stem climate change and, indeed, a landmark for the international community since, for the first time in history, it has been possible to legislate GHG emission reductions for an entire industry sector”

E.E. Mitropoulos
IMO Secretary-General

“…..this underscores the fact that IMO is best positioned to play a leadership role in addressing greenhouse gas emissions from international shipping.”

Ban Ki-Moon
UN Secretary-General

“I would like to congratulate IMO on this outstanding result….The adoption of mandatory efficiency standards for international shipping is a major step and a substantial contribution…."

Christiana Figueres
UNFCCC Executive Secretary
Planned Technical Cooperation and Capacity Building activities planned for 2011 – 2013 related to EEDI and SEEMP

Model course for energy efficient ship operation developed by WMU – Finalized and issued in 2011. To be used for officers training by education institutes and the industry, important for future training

Capacity building:
$650,000 for training activities (e.g. EEDI verifiers)
$200,000 for fellowships and $200,000 for workshops

First awareness raising workshop in Durban 24 – 25 November

Agreement with KOICA for a South East Asian Climate Capacity Building Partnership in Maritime Transport - $700.000 for 2011 - 2013.

First workshop held in Singapore 16 – 18 November 2011

A total of 12 workshops in the region 2011 – 2013

Dialog with donors for a global project: $5 – 10 millions
## MARPOL Annex VI coverage

<table>
<thead>
<tr>
<th></th>
<th>Number of flag States</th>
<th>Gross tonnage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>World total</td>
<td>162</td>
<td>957,981,010</td>
<td>100%</td>
</tr>
<tr>
<td>Annex VI countries</td>
<td>64</td>
<td>861,474,101</td>
<td>89.96%</td>
</tr>
</tbody>
</table>
Breakthrough at IMO

Adopted by majority as full consensus could not be reached despite strenuous efforts, however no division between developing and developed countries (Non-Annex I/Annex I).

The majority of developing countries eligible to vote supported the adoption, including all LDC and SIDS.

<table>
<thead>
<tr>
<th></th>
<th>Number of countries</th>
<th>Gross tonnage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>49</td>
<td>757,412,533</td>
<td>79.06%</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>97,083,482</td>
<td>10.13%</td>
</tr>
<tr>
<td>Abstain</td>
<td>2</td>
<td>4,877,396</td>
<td>0.51%</td>
</tr>
<tr>
<td>Not present</td>
<td>8</td>
<td>4,448,076</td>
<td>0.46%</td>
</tr>
<tr>
<td>Non-Annex VI countries</td>
<td>98</td>
<td>96,506,909</td>
<td>10.04%</td>
</tr>
<tr>
<td>World total</td>
<td>162</td>
<td>957,981,010</td>
<td>100%</td>
</tr>
</tbody>
</table>
Market-based reduction measures – MBM – for international shipping

An MBM would serve two main purposes:

- An economic incentive for the shipping industry to invest in more fuel-efficient ships & technologies and to operate ships more energy-efficient (in-sector reductions)
- Off-setting in other sectors of growing ship emissions (out-of-sector reduction)

10 MBM proposals under review:

Contribution scheme (Levy), Port State levy, Efficiency based MBMs, ETS, Incentive Schemes, Rebate Mechanism
MBM Expert Group established by MEPC 60

Developed methodology to assess, *inter alia*, possible impacts on end consumers and selected industries, in particular in developing countries, and analyzed 10 MBMs proposed by Governments/NGOs.

Selected commodities and trades:

Iron ore (Dirty Bulk) – Crude oil (Tankers) – Grains (Clean Bulk) – Clothing and furniture (Container)

Assumptions and growth scenarios:

Size and composition of world fleet – growth scenarios (IPCC A1B: 1.65% and B2: 2.8%) – fuel and carbon prices – uptake of technology – etc.

Elasticity estimates of freight rate to fuel price increase:

<table>
<thead>
<tr>
<th>Source</th>
<th>Clean Bulk</th>
<th>Dirty Bulk</th>
<th>Tanker</th>
<th>Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMO (MBM-EG)</td>
<td>0.25</td>
<td>0.959</td>
<td>0.324</td>
<td>0.116</td>
</tr>
<tr>
<td>UNCTAD</td>
<td>-</td>
<td>1.0</td>
<td>0.28</td>
<td>0.19 – 0.36</td>
</tr>
<tr>
<td>OECD</td>
<td>0.28</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Impacts of an MBM – Conclusions:

Impacts on consumers depend on stringency of MBM, e.g. the carbon price, if it is equal to a 10% increase in fuel price, it translates into a 2 – 10% increase in transport costs and means an increase of 0.0 – 0.2% on end prices and 0.02 – 0.8% of GDP:

Trading distances - Market share

Domestic production - Value-to-weight ratio

**Impacts on developing countries:**

Will vary by country independent of level of economic development

As a result, developing countries, especially SIDS and LDCs, should not be treated as a collective bloc in assessing impacts

Those that are closer to their trading partners or have large exporters will, in general, be less affected than countries that are further away or have many small exporters
IMO’s MBM impact study to continue

MEPC 63 (March 2012) to continue work on MBMs and to agree on further impacts studies

Impact on import costs = 10% fuel price

<table>
<thead>
<tr>
<th></th>
<th>Australia</th>
<th>Chile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.16%</td>
<td>0.26%</td>
<td></td>
</tr>
</tbody>
</table>

MBM cost in relation to world imports

<table>
<thead>
<tr>
<th>Emissions (Mt)</th>
<th>Costs ($billion)</th>
<th>Seaborne Imports ($billion)</th>
<th>Costs/Imports (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>870</td>
<td>17.4</td>
<td>9.393</td>
<td>0.19%</td>
</tr>
</tbody>
</table>

Ship Traffic Pattern:
- Low
- High
- Very Low
- Medium
- Very High

Derived from 1983-2002 ICOADS.
Shipping under UNFCCC

Consultations in the lead up to and at Copenhagen were constructive but did not lead to an agreed text. In 2010/11 negotiations have not moved much as there are three challenging obstacles:

• How should the balance between the basics principles under the two conventions be expressed in the new treaty text (UNFCCC and its fundamental CBDR principle, and on the other hand, the IMO constitutive Convention with its non discriminatory approach)?

• Should the new UNFCCC treaty state how revenues from a market-based instrument for international shipping under IMO should be distributed and used (climate change purposes in developing countries)?

• Should a reduction target be set for international shipping, and if so, what should the target be and should it be set by UNFCCC or IMO?

No text on international shipping in the Cancun Agreements

Will the Durban outcome ensure progress?
Links with and effects on UNFCCC negotiations

As the regulations address ships and not States, and as they do not impose any reduction obligations, quantified or otherwise, on States, as well as the fact that the cost of introducing EEDI/SEEMP will be borne by the industry, there are no incompatibility issues with UNFCCC

Kyoto Protocol’s Article 2.2 is still interpreted differently by Parties

Did adoption of mandatory T&O by MEPC 62 settle the issue?

Disbursement of revenues from an MBM for international shipping under IMO is seen by many as a way to accommodate both sets of principles under the two conventions:
- CBDR under UNFCCC and non-discrimination under IMO

An MBM for international shipping could be a predictable source to the Green Climate Fund and thereby facilitate the UNFCCC negotiations
Summary - IMO’s GHG Work

- Mandatory technical and operational measures adopted in July 2011 – in force 1 January 2013
  Important step - Energy efficiency standard for new ships, operational measures for all ships - Significant reductions

- MBM for international shipping under IMO
  Continued development - Possible adoption of treaty 2014 – 2015

- Climate Finance and the Green Climate Fund may be the key to unlock the UNFCCC/IMO deadlock
  Application to all ships via IMO is the only way to raise revenues from international maritime transport (precedence in IOPC)

www.imo.org
Thank you for your attention!

For more information please see: www.imo.org