IMO activities on control of GHG emissions from ships
International Maritime Organization (IMO)

- The IMO Convention was adopted in 1948 and IMO first met in 1959
- A specialized agency of the UN
- 169 Member States
- Develop and maintain a comprehensive regulatory framework for shipping
- Safety, environment, legal matters, technical co-operation, security and the efficiency of shipping

Safe, secure and efficient shipping on cleaner oceans!
Ship emissions one of the last major ship pollutants to be regulated

Work started at IMO in the late 1980’s

Revised Annex VI in force 1 July 2010

• Prohibits ODS in line with the Montreal Protocol
• Regulates exhaust gas: NOx & SOx (PM), and cargo vapours from tankers (VOC)
• Energy Efficiency or CO₂ emissions not covered
Resolution A.963(23)


IMO’s GHG Work has three distinct routes: **Technical** - mainly applicable to new ships - EEDI, **Operational** - applicable to all ships in operation – SEEMP and EEOI, and **Market-based Instruments (MBI)** - carbon price for shipping, incentive, may generate funds.

A.963(23) requests MEPC to:
- develop a work plan with timetable – (technical/operational culminated at MEPC 59, the work plan for MBIs culminates at MEPC 62 (Assembly 27))
- establishment of GHG baseline and develop CO2 indexing methodology
World seaborne trade 1968-2008

Baseline efficiency improvement in historic perspective

Efficiency improvements

Fuel Consumption World Fleet
Second IMO GHG Study 2009

2007 shipping CO2 emissions 870 million tons

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 can provide significant improvements but will not be able to provide real reductions if demand continues
**Distribution of the world fleet March 2008**

<table>
<thead>
<tr>
<th>Flag States</th>
<th>Number of ships</th>
<th>GT</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annex I</td>
<td>33.4%</td>
<td>26.1%</td>
<td>22.82%</td>
</tr>
<tr>
<td>Non-Annex I</td>
<td>66.6%</td>
<td>73.9%</td>
<td>77.18%</td>
</tr>
</tbody>
</table>

Lloyd’s Register Fairplay

**Article 1(b) of the IMO Convention**

Encourage removal of discriminatory actions .... promote the availability of shipping without discrimination ...... not be based on measures designed to restrict the freedom of shipping of all flags ....;
# 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>10% to 50%+</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>
Energy Efficiency Design Index - EEDI

\[ EEDI = \frac{\text{Environmental cost}}{\text{Benefit for society}} \]

Requires a minimum efficiency level (grams CO2/tonne-mile)
Will stimulate continued technology development
Complex formula to accommodate most ship types and sizes
Enables comparison of ships able to move the same cargo

10% reduction for ships built between 2015 – 2020
20% reduction for ships built between 2020 – 2025
30% reduction for ships built between 2025 – 2030
<table>
<thead>
<tr>
<th>Ship type</th>
<th>Cut-off limit</th>
<th>Estimated CO₂ emissions (tonnes)</th>
<th>Contribution ratio from same ship type</th>
<th>Contribution ratio to total CO₂ emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk carrier</td>
<td>10,000 DWT</td>
<td>175,520,816</td>
<td>98.52%</td>
<td>15.70%</td>
</tr>
<tr>
<td>Gas tanker</td>
<td>2,000 DWT</td>
<td>46,871,129</td>
<td>98.50%</td>
<td>4.19%</td>
</tr>
<tr>
<td>Tanker</td>
<td>4,000 DWT</td>
<td>213,145,106</td>
<td>95.72%</td>
<td>19.06%</td>
</tr>
<tr>
<td>Container ship</td>
<td>10,000 DWT</td>
<td>254,812,434</td>
<td>96.54%</td>
<td>26.07%</td>
</tr>
<tr>
<td>General cargo ship (Including combination carrier)</td>
<td>3,000 DWT</td>
<td>87,274,101</td>
<td>90.00%</td>
<td>7.80%</td>
</tr>
<tr>
<td>Refrigerated cargo carrier</td>
<td>3,000 DWT</td>
<td>18,767,755</td>
<td>97.64%</td>
<td>1.68%</td>
</tr>
<tr>
<td><strong>Total coverage</strong></td>
<td>---</td>
<td>796,391,341</td>
<td>96.11%</td>
<td>71.22%</td>
</tr>
</tbody>
</table>
190 – 240 million tonnes CO2 reduced annually compared with BAU by 2030
Ship Energy Efficiency Management Plan - SEEMP

Onboard management tool to include:

• **Improved voyage planning** (Weather routeing/Just in time)
• Speed and power optimization
• **Optimized ship handling** (ballast/trim/use of rudder and autopilot)
• **Improved fleet management**
• **Improved cargo handling**
• **Energy management**
Energy Efficiency Operational Indicator - EEOI

- An efficiency indicator for all ships (new and existing) obtained from fuel consumption, voyage (miles) and cargo data (tonnes)

\[
\text{Actual Fuel Consumption Index} = \frac{\text{Fuel Consumption in Operation}}{\text{Cargo Onboard} \times (\text{Distance traveled})}
\]
MEPC 61 – 27 September to 1 October

Further progress made on all three elements of IMO’s GHG work

Technical and operational measures
Intersessional meeting on energy efficiency measures (June/July 2010)
Regulatory text on EEDI and SEEMP finalized
Adoption by MEPC 62 (July 2010)?
In force 1 January 2013?

Market-based measures
Report by MBM Expert Group
Intersessional meeting in March/April 2011
MBM Expert Group established by MEPC 60

- The Experts’ analysis of the proposed MBM should address the following nine criteria:
  
  1. Environmental effectiveness
  2. Cost-effectiveness and potential impact on trade and sustainable development
  3. The potential to provide incentives to technological change and innovation
  4. Practical feasibility of implementing 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)
MBM-EG

.6 The relation with other relevant conventions (UNFCCC, Kyoto Protocol and WTO) and the compatibility with customary international law

.7 The potential additional administrative burden and the legal aspects for National Administrations to implement and enforce 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 MBM

.9 The compatibility with the existing enforcement and control provisions under the IMO legal framework.
Options reviewed by the MBM-EG

- Ten MBM proposals were analyzed by the Experts. These were:
  - 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)
  - Leveraged Incentive Scheme (LIS) to improve the energy efficiency of ships based on the International GHG Fund proposed by Japan (MEPC 60/4/37)
  - Achieving reduction in greenhouse gas emissions from ships through port-State arrangements utilizing the ship traffic, energy and environment model, STEEM (PSL) proposed by Jamaica (MEPC 60/4/40)
Options reviewed by the MBM-EG (2)

- The United States proposal to reduce greenhouse gas emissions from international shipping, the Ship Efficiency and Trading (SECT) (MEPC 60/4/12)
- Vessel Efficiency System (VES) proposed by World Shipping Council (MEPC 60/4/39)
- The Global Emission Trading System (ETS) for international shipping proposed by Norway (MEPC 60/4/22)
- Global Emissions Trading System (ETS) for international shipping proposed by the United Kingdom (MEPC 60/4/26)
- Further elements for the development of an Emissions Trading System (ETS) for international shipping proposed by France (MEPC 60/4/41)
Options reviewed by the MBM-EG (3)

- Market-based Instruments: a penalty on trade and development proposed by Bahamas (MEPC 60/4/10)
- A Rebate Mechanism (RM) for a market-based instrument for international shipping proposed by IUCN (MEPC 60/4/55)

All proposals describe programmes that would target GHG reductions through:

- In-sector emissions reductions from shipping; or
- Out-of-sector reductions through the collection of funds to be used for mitigation activities in other sectors that would contribute towards global reduction of GHG emissions
### Emission reductions in 2030

Modelled emission reductions across various scenarios

<table>
<thead>
<tr>
<th></th>
<th>SECT</th>
<th>VES</th>
<th>Bahamas</th>
<th>GHG Fund</th>
<th>LIS</th>
<th>PSL</th>
<th>ETS (Norway)</th>
<th>ETS (UK)</th>
<th>RM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mandatory EEDI (Mt)</strong></td>
<td>123 - 299</td>
<td>123 - 299</td>
<td>123 - 299*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MBM In sector (Mt)</strong></td>
<td>106 - 142</td>
<td>14 - 45</td>
<td>1 - 31</td>
<td>32 - 153</td>
<td>29 - 119</td>
<td>27 - 114</td>
<td>27 - 114</td>
<td>29 - 68</td>
<td></td>
</tr>
<tr>
<td><strong>MBM Out of Sector (Mt)</strong></td>
<td></td>
<td></td>
<td>152 - 584</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total reductions (% BAU)</strong></td>
<td>19 - 31%</td>
<td>13 - 23%</td>
<td>10 - 20%</td>
<td>13 - 40%</td>
<td>3 - 10%</td>
<td>2 - 8%</td>
<td>13 - 40%</td>
<td>13 - 28%</td>
<td></td>
</tr>
<tr>
<td><strong>Potential supplementary reductions (Mt)</strong></td>
<td>45 - 454</td>
<td>104 - 143</td>
<td>232 - 919</td>
<td>917 - 1232</td>
<td>696 - 870</td>
<td>187 - 517</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Included if the mandatory EEDI is adopted by the committee
Potential climate change financing*
Modelled “remaining proceeds” across various scenarios

<table>
<thead>
<tr>
<th>MBM</th>
<th>2020 ($ billion)</th>
<th>2030 ($ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG Fund</td>
<td>2 - 5</td>
<td>4 - 14</td>
</tr>
<tr>
<td>LIS</td>
<td>6 - 32</td>
<td>10 - 87</td>
</tr>
<tr>
<td>PSL</td>
<td>24 - 43</td>
<td>40 - 118</td>
</tr>
<tr>
<td>SECT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VES (Norway, France)</td>
<td>8 - 41</td>
<td>5 - 18</td>
</tr>
<tr>
<td>ETS (Norway, France)</td>
<td>17 - 35</td>
<td>28 - 87</td>
</tr>
<tr>
<td>ETS (UK)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bahamas</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RM</td>
<td>10 - 13</td>
<td>17 - 23</td>
</tr>
</tbody>
</table>

* Excludes financing of out-of-sector emission reductions
IMO Side Event

Panel
Moderator: Mr. Miguel Palomares, Director of IMO’s Marine Environment Division
Ms. Anne-Marie Watt, Australia
Mr. Andreas Chrysostomou, Cyprus, Chairman of IMO’s Marine Environment Protection Committee
Ms. Kelly Kizzier, European Commission
Mr. Simon Brown, International Chamber of Shipping
Mr. Eivind S. Vagslid, Head of IMO’s Chemical and Air Pollution Prevention Section