



# IMO activities on control of GHG emissions from ships



**CLIMATE CHANGE:**  
A CHALLENGE FOR IMO TOO!

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# 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!**

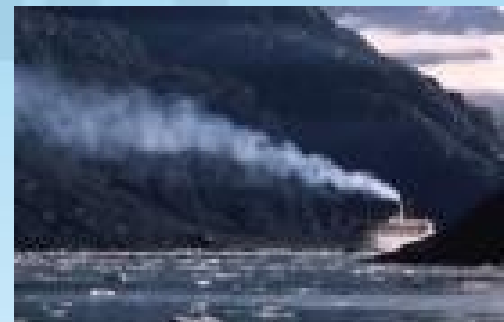




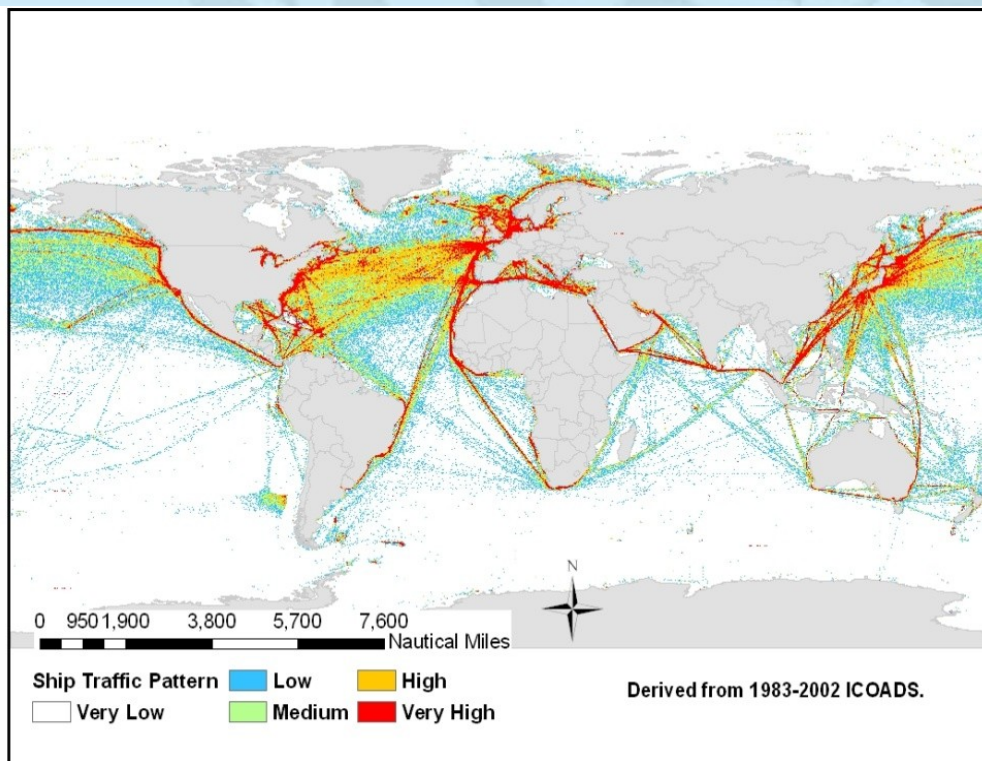
# Ship emissions one of the last major ship pollutants to be regulated

Work started at IMO in the late 1980's

Annex VI adopted in 1997, in force in May 2005,  
revised 2005 – 2008



Revised Annex VI in force 1 July 2010



- Prohibits ODS in line with the Montreal Protocol
- Regulates exhaust gas: NO<sub>x</sub> & SO<sub>x</sub> (PM), and cargo vapours from tankers (VOC)
- Energy Efficiency or CO<sub>2</sub> emissions not covered



# Resolution A.963(23)

**IMO Policies and Practices Related to the Reduction of Greenhouse Gas Emissions from Ships, adopted by Assembly 23 in December 2003**

**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 Measures (MBM) – carbon price for shipping, incentive, may generate funds.**



**A.963(23) requests MEPC to:**

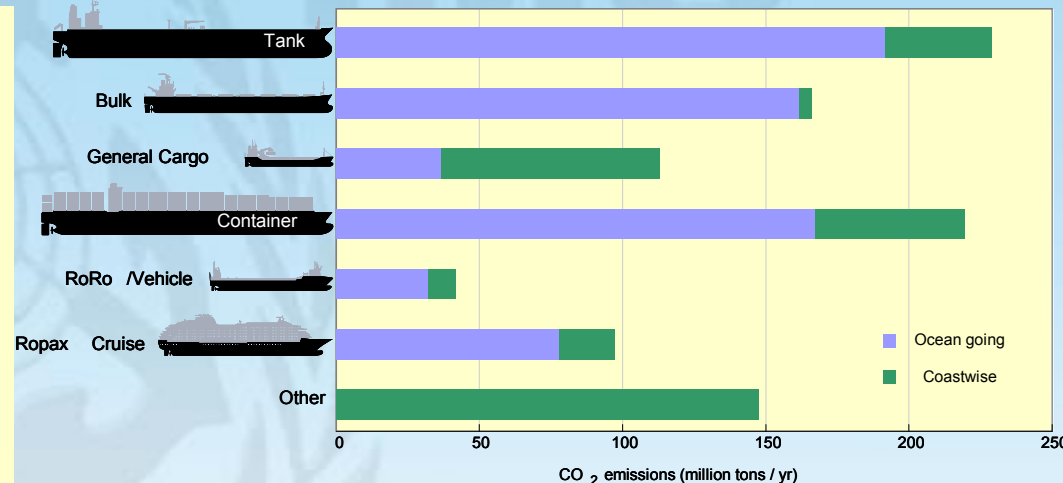
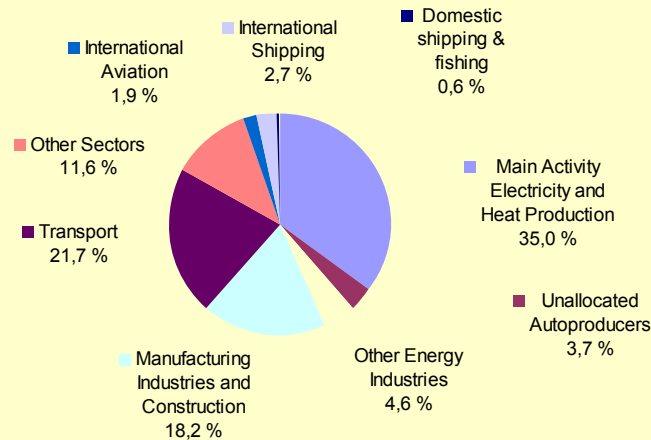
- develop a work plan with timetable – (technical/operational culminated at MEPC 59, the work plan for MBIs culminates at MEPC 62 (Assembly 27))**
- establishment of GHG baseline and develop CO2 indexing methodology**



# Second IMO GHG Study 2009



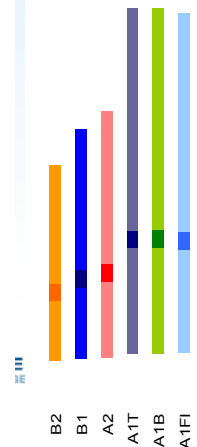
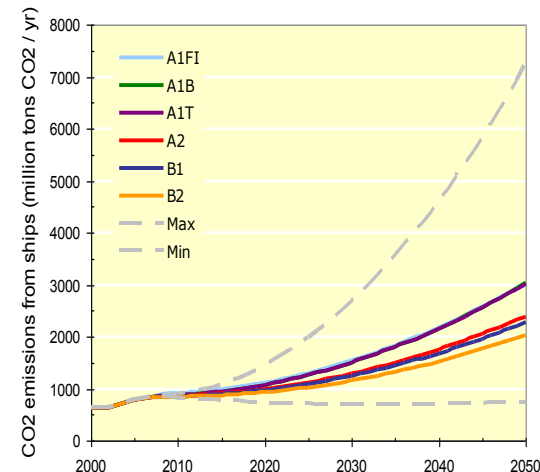
## 2007 shipping CO<sub>2</sub> emissions 870 million tons



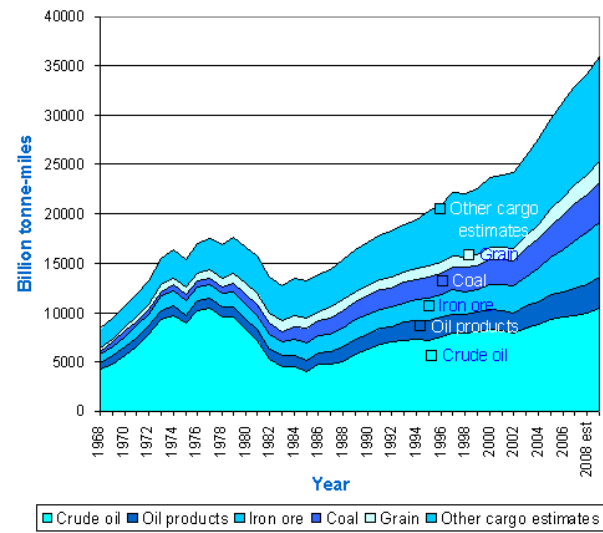
## Future CO<sub>2</sub> emissions:

- 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

Scenarios for CO<sub>2</sub> emissions from International Shipping from 2007 to 2050 in the absence of climate policies



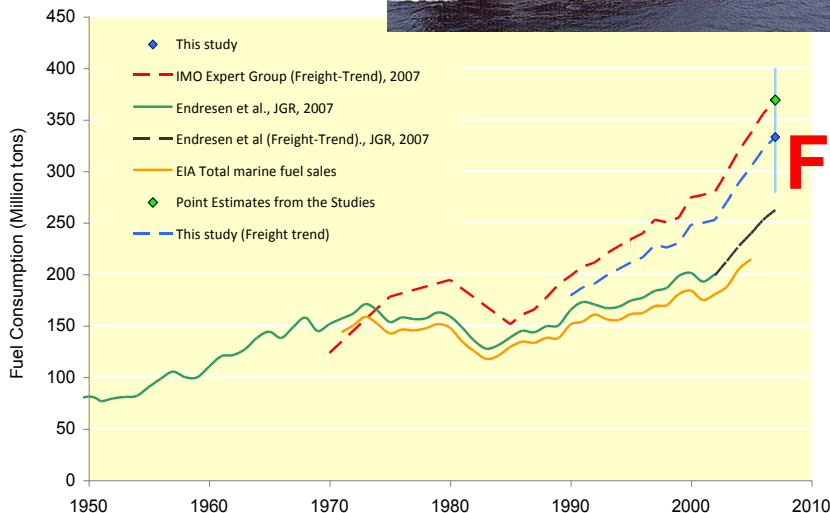
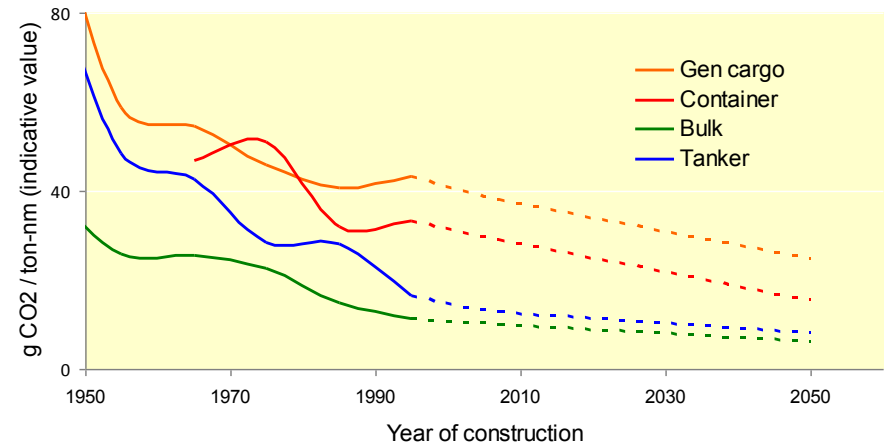
# World seaborne trade 1968-2008



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Baseline efficiency improvement in historic perspective

## Efficiency improvements



## Fuel Consumption World Fleet



# Distribution of the world fleet March 2008

ships above 400 GT

Flag States	Number of ships	GT	DW
Annex I	33.4%	26.1%	22.82%
Non-Annex I	66.6%)	73.9%	77.18%

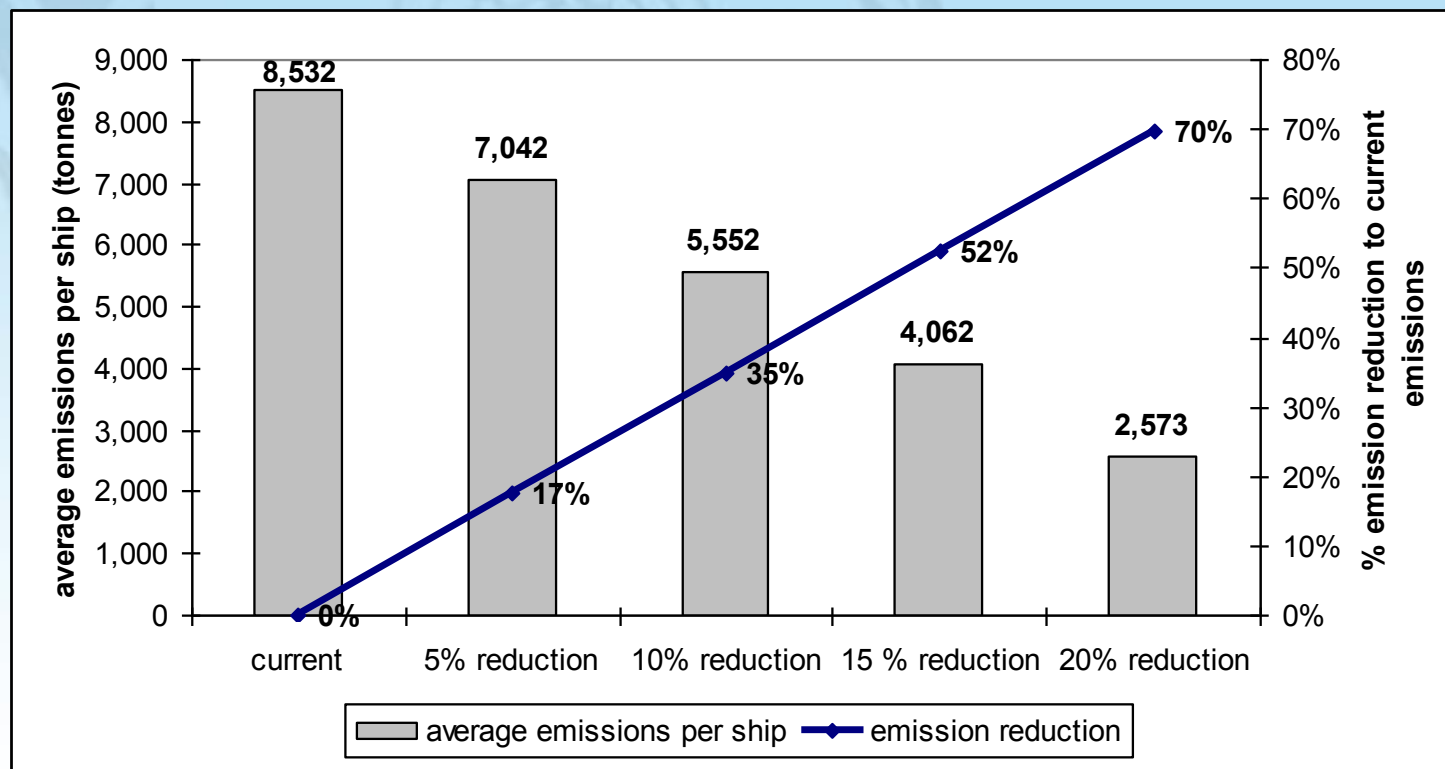
Lloyd's Register Fairplay

## 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 ....;



# Reduction by Annex I flags only







# Potential reductions of CO<sub>2</sub> emissions

<b>DESIGN (New ships)</b>	<b>Saving of CO<sub>2</sub>/tonne-mile</b>	<b>Combined</b>
Concept, speed & capability	2% to 50% <sup>+</sup>	10% to 50% <sup>+</sup>
Hull and superstructure	2% to 20%	
Power and propulsion systems	5% to 15%	
Low-carbon fuels	5% to 15%*	
Renewable energy	1% to 10%	
Exhaust gas CO <sub>2</sub> reduction	0%	
<b>OPERATION (All ships)</b>		
Fleet management, logistics & incentives	5% to 50% <sup>+</sup>	10% to 50% <sup>+</sup>
Voyage optimization	1% to 10%	
Energy management	1% to 10%	



# Technical and **operational** measures agreed at MEPC 59

- Energy Efficiency Design Index (EEDI) for new ships – MEPC.1/Circ.681
- Voluntary verification of the EEDI – MEPC.1/Circ.682
- **Ship Energy Efficiency Management Plan (SEEMP) – MEPC.1/Circ.683**
- **Energy Efficiency Operational Indicator (EEOI) – MEPC.1/Circ.684**



# Energy Efficiency Design Index - EEDI

$$EEDI = \frac{\textit{Environmental cost } t}{\textit{Benefit for society}}$$

- Cost: Emissions of CO<sub>2</sub>
- Benefit: Cargo capacity & transport work

Complex formula to accommodate most ship types and sizes



# Ship Energy Efficiency Management Plan - SEEMP

## Onboard management tool to include:

- **Improved voyage planning** (Weather routing/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)

**Actual Fuel  
Consumption  
Index**

=

**Fuel Consumption in Operation**

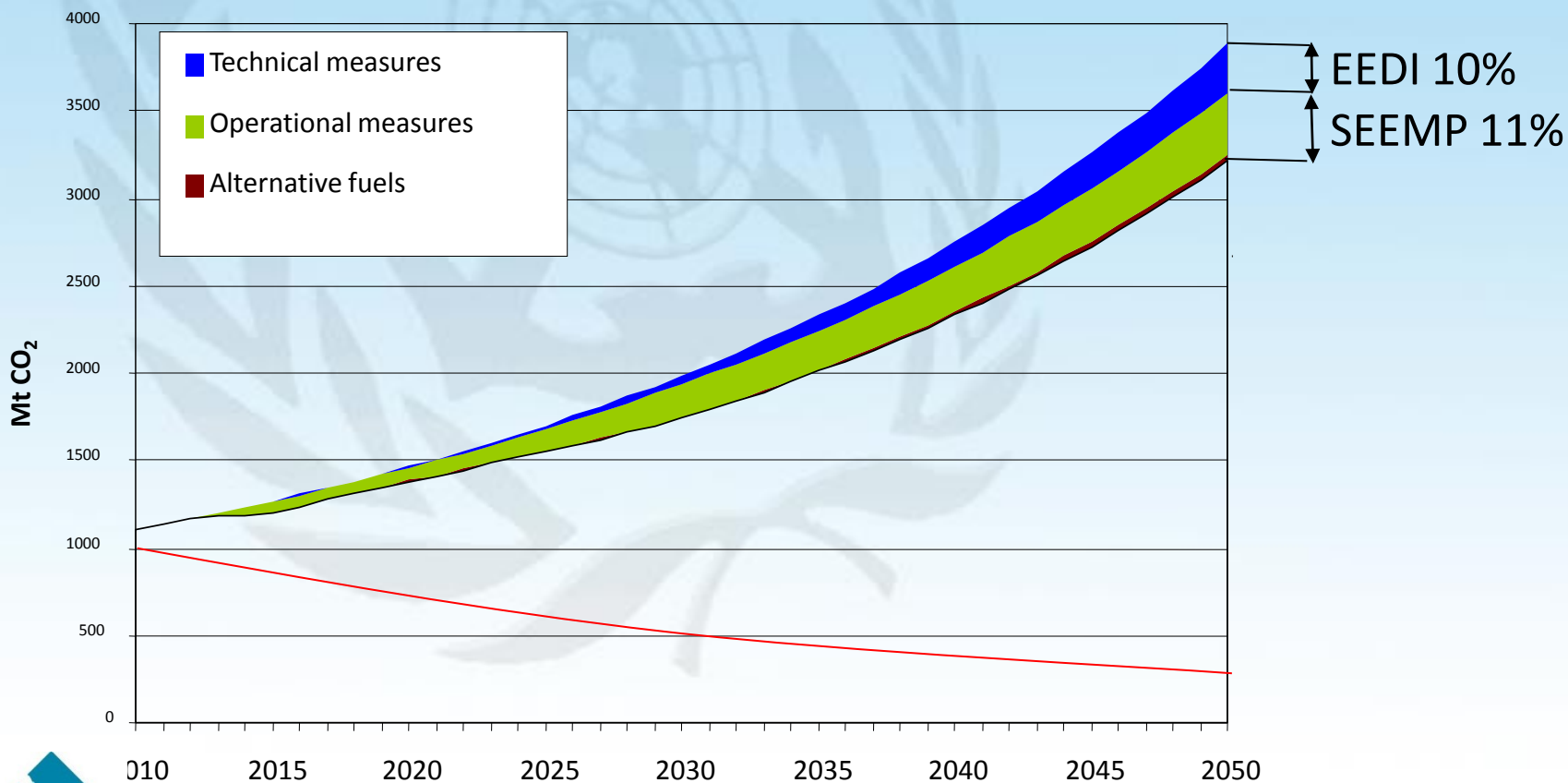
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**Cargo Onboard x (Distance traveled)**



# EEDI and SEEMP Effects

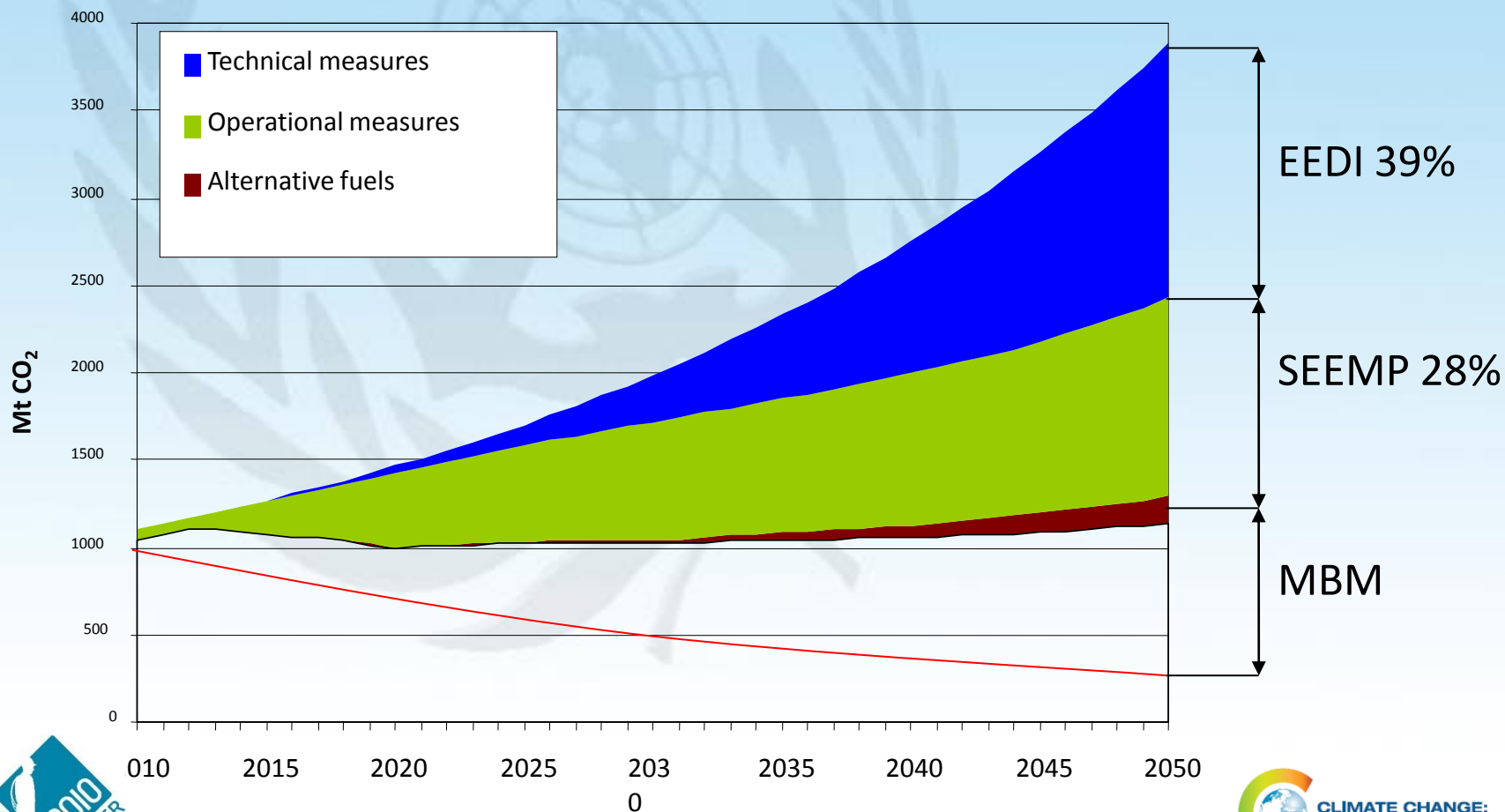
Scenario: A1B Low uptake





# EEDI and SEEMP Effects

Scenario: A1B Optimistic



# 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

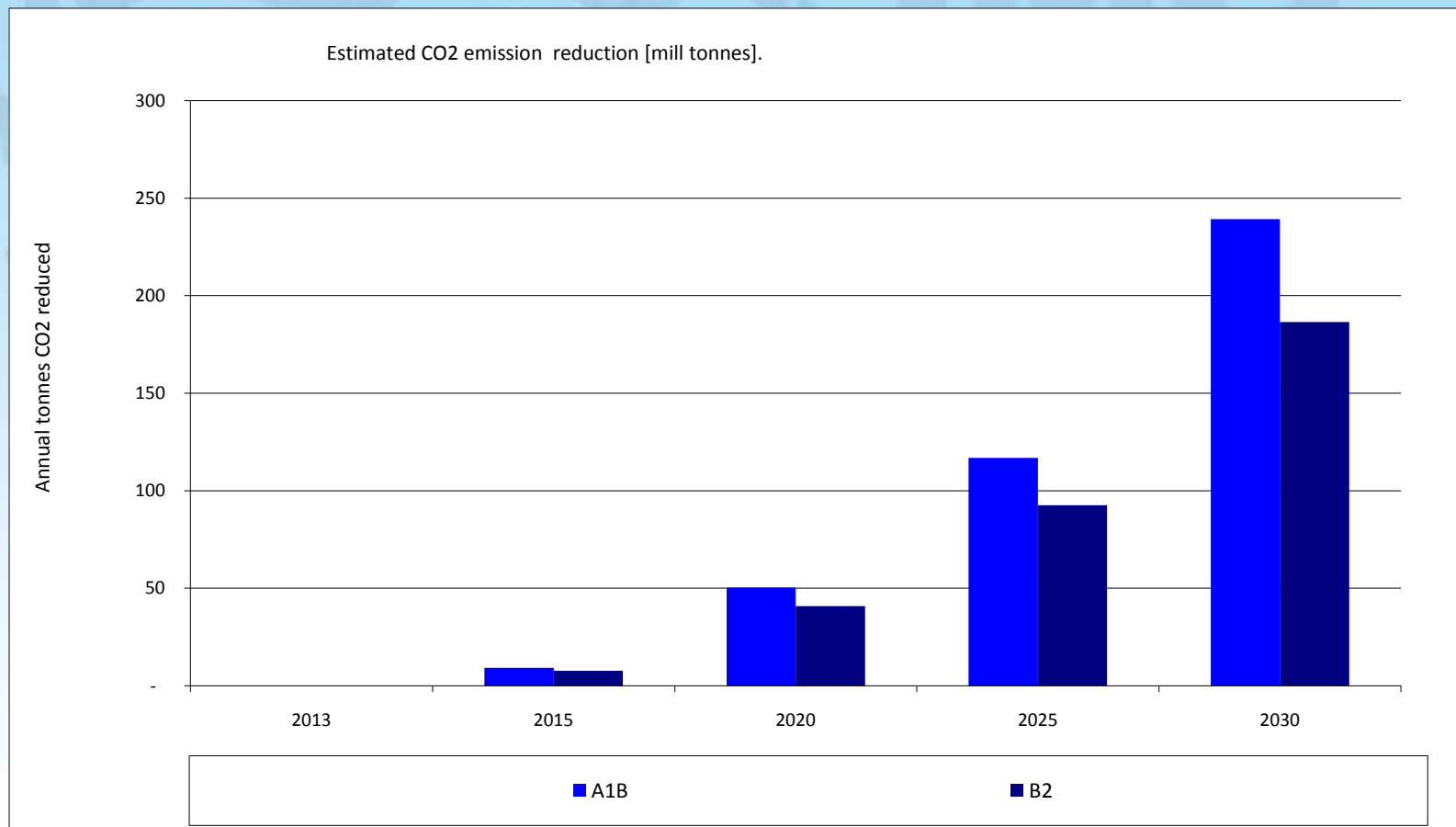
Intersessional meeting in March/April 2011





Ship type	Cut-off limit	Estimated CO <sub>2</sub> emissions (tonnes)	Contribution ratio from same ship type	Contribution ratio to total CO <sub>2</sub> emissions
Bulk carrier	10,000 DWT	175,520,816	98.52%	15.70%
Gas tanker	2,000 DWT	46,871,129	98.50%	4.19%
Tanker	4,000 DWT	213,145,106	95.72%	19.06%
Container ship	10,000 DWT	254,812,434	96.54%	26.07%
General cargo ship (Including combination carrier)	3,000 DWT	87,274,101	90.00%	7.80%
Refrigerated cargo carrier	3,000 DWT	18,767,755	97.64%	1.68%
<b>Total coverage</b>	---	<b>796,391,341</b>	<b>96.11%</b>	<b>71.22%</b>

# 190 – 240 million tonnes CO<sub>2</sub> reduced annually compared with BAU by 2030





# Work undertaken by the MBM-EG





# 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





# Challenges

- ❑ Time constraints
  - simplified assumptions had to be made when modelling the MBM
- ❑ Different levels of maturity of proposals
  - environmental effectiveness is more easily assessed for proposals with clearly defined policy objectives
  - environmental effectiveness of some proposals is contingent on further policy development



# Scenarios

- ❑ Modelling scenarios (agreed by EG):
  - two growth rates (1.65% and 2.8%)
  - three targets lines /caps for GHG Fund and ETS (0%, 10% and 20% below 2007 level)
  - 28% revenue used for mitigation for Rebate Mechanism and 25%, 50%, and 75% revenue refunded for LIS
  - low, medium and high stringency standards for VES and SECT
  - two carbon price scenarios (medium and high) and two fuel price scenarios (reference and high)



# Emission reductions in 2030

Modelled emission reductions across various scenarios

	SECT	VES	Bahamas	GHG Fund	LIS	PSL	ETS (Norway France)	ETS (UK)	RM
<b>Mandatory EEDI (Mt)</b>	123 - 299	123 - 299	123 - 299*						
<b>MBM In sector (Mt)</b>	106 - 142	14 - 45		1 - 31	32 - 153	29 - 119	27 - 114	27 - 114	29 - 68
<b>MBM Out of Sector (Mt)</b>				152 - 584			190 - 539	190 - 539	124 - 345
<b>Total reductions (% BAU)</b>	19 - 31%	13 - 23%	10 - 20%	13 - 40%	3 - 10%	2 - 8%	13 - 40%	13 - 40%	13 - 28%
<b>Potential supplementary reductions (Mt)</b>		45 - 454		104 - 143	232 - 919	917 - 1232	696 - 870		187 - 517



\* Included if the mandatory EEDI is adopted by the committee



# Potential climate change financing\*

Modelled “remaining proceeds” across various scenarios

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



\* Excludes financing of out-of-sector emission reductions





# Certainty

- ❑ GHG Fund and ETS(x3) proposals would constrain “net emissions” to a agreed level
- ❑ SECT proposal aims for certainty over a relative efficiency target but absolute emissions would depend on sector growth
- ❑ Other proposals do not aim to deliver strict certainty over a relative or absolute target
  - policies that guide revenue use could have a significant influence on the certainty of outcome





# Impacts on consumers

- ☐ The larger the market share of domestic producers, the less likely it is that an exporter can pass on an increase in transportation costs to end consumers.
- ☐ If the good has a high value-to-weight ratio, less of the increase in freight costs will be passed on to end consumers.



# Impact on ship operators and technology transfer needs

- ☐ All proposals provide some form of incentives – price or performance standard – to improve ships technically or operational efficiencies.
- ☐ A number of measures could result in fuel savings, but there may be hurdles to adoption, including access to technologies or finance.
- ☐ There could therefore be a need for technology transfer to help improve ship and operational efficiencies.



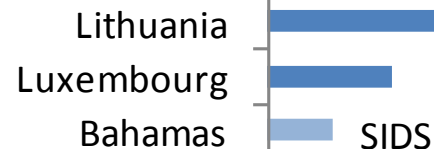
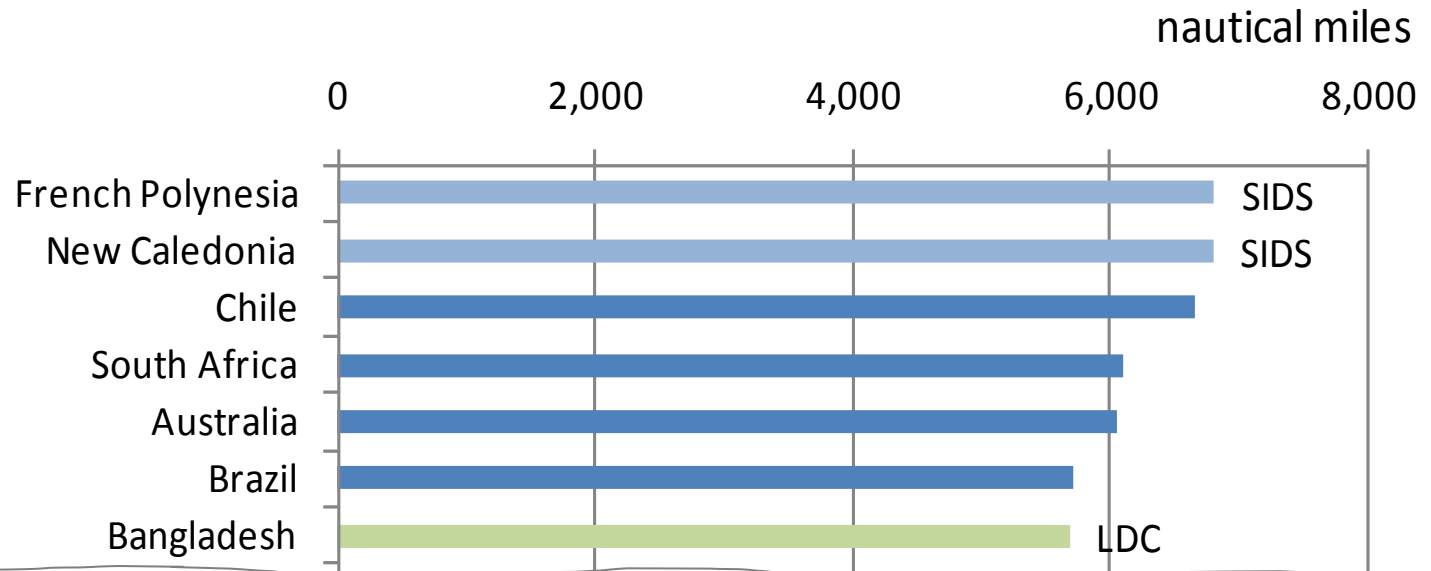
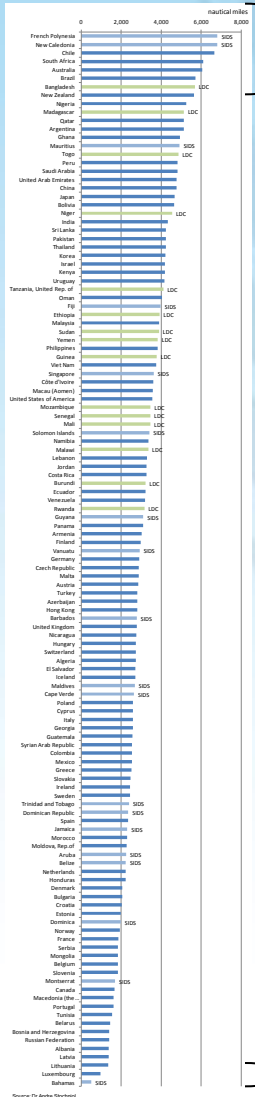


# Impacts on developing countries

- ❑ Analysis showed impacts 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

# Example of trade-weighted distances

Countries in the SIDS group have both the largest and the smallest nautical distances weighted by trade.





# OUTCOMES (MEPC 61/INF.2)

- ☐ All proposals could be implemented in a practical and feasible manner notwithstanding the challenges associated with the introduction of new measures.
- ☐ Policy sensitivities identified *vis-à-vis* compatibility with UNFCCC and KP.
- ☐ Administrative requirements vary, but all proposals will incur some additional administrative burden.





# FOR FURTHER CONSIDERATION

- ☐ Establishment of a supranational administrative body (paragraphs 8.49 to 8.51)
- ☐ 'carbon leakage' (paragraph 8.53)
- ☐ 'CO<sub>2</sub> as a pollutant' (paragraph 8.67)
- ☐ Collection of 'international' contributions being consistent with national law (paragraph 8.68).



# MBM-EG Conclusions

- ☐ In order to elaborate a full comparative analysis, there is the need for further elaboration and development of some elements of the proposed measure.
- ☐ All proposals address the reduction of GHG emissions from shipping.
- ☐ Some proposals also put forward a mechanism that provides for substantial financial contribution to address the adverse effects of Climate Change.



# MBM-EG Conclusions (2)

- ❑ The proposals suggested different ways of reducing GHG emissions, some focus on “in-sector” reductions and others in “out-of-sector” reductions.
- ❑ 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.
- ❑ This study identified that the implications of implementing the different MBM proposals for international shipping are directly related to the stringency of the proposed measures.



# MBM-EG Conclusions (3)

- ❑ Nevertheless, this study concludes that all proposals could be implemented notwithstanding the challenges associated with the introduction of new measures.
- ❑ 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.
- ❑ Some of the proposed measures include mechanism aiming to provide means to mitigate negative impacts.



# MBM-EG Conclusions (4)

- ❑ 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.
- ❑ The above issues require further policy considerations in order to be properly addressed.