



# IMO's work on control of GHG emissions from ships



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

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**IMO Side Event SB 34, Bonn 7 June 2011**





# IMO – specialised UN agency

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



**Safe, secure and efficient shipping on  
clean oceans!**



# IMO Convention

- Adopted Geneva 1948
- Entered into force 1958
- First IMO meeting 1959

## The need for IMO

- Shipping is international and underpins world trade
- Assets move between jurisdictions
- Universally applicable standards are needed for a global industry that competes in a single market





# IMO's Treaty Instruments

## Safety and Security

SOLAS, STCW, Load lines, COLREGS, SUA

## Pollution Prevention

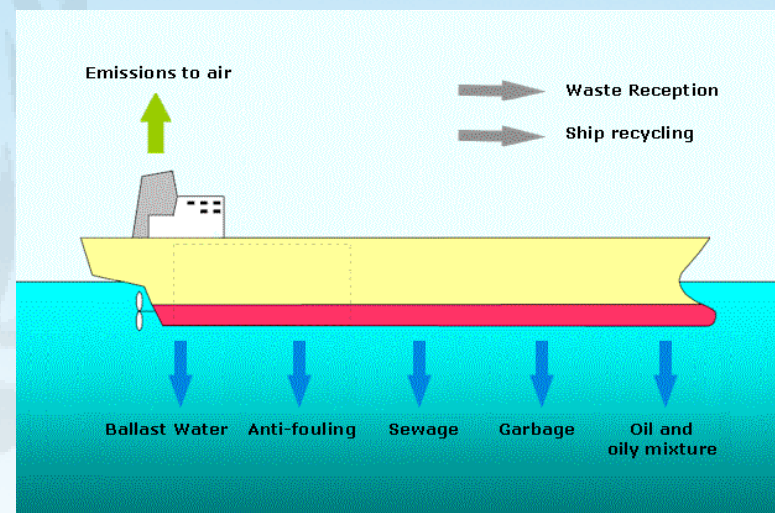
MARPOL, Dumping (LC/LP), Intervention,  
AFS, [Ballast Water Management,  
[Recycling]

## Response and Reaction

SAR, OPRC, HNS Protocol,  
[Wreck removal]

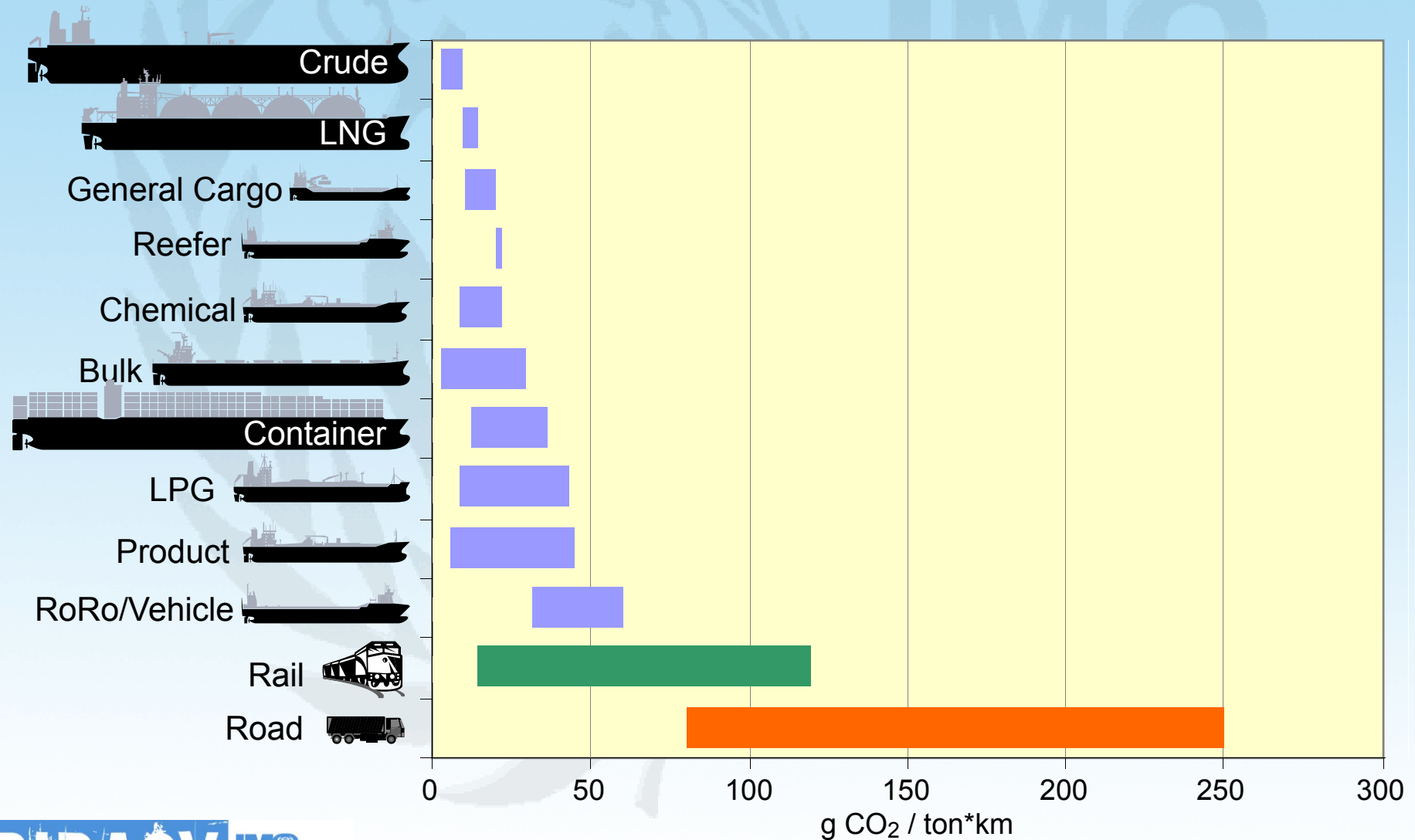
## Liability and Compensation

CLC, IOPC Fund, Athens, Bunkers, HNS

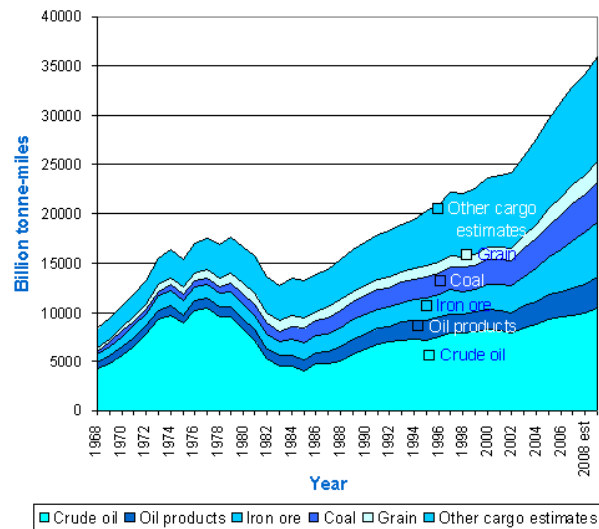




## Range of typical CO<sub>2</sub> efficiencies for various cargo carriers



Data: Second IMO GHG Study 2009



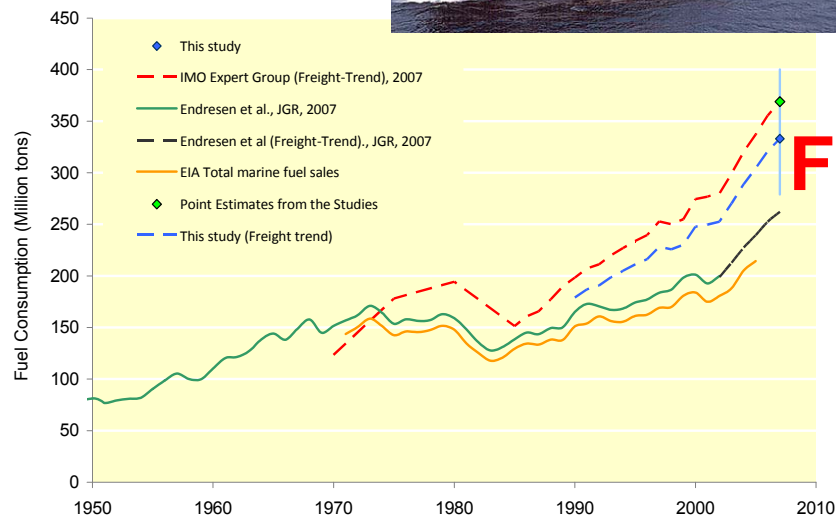
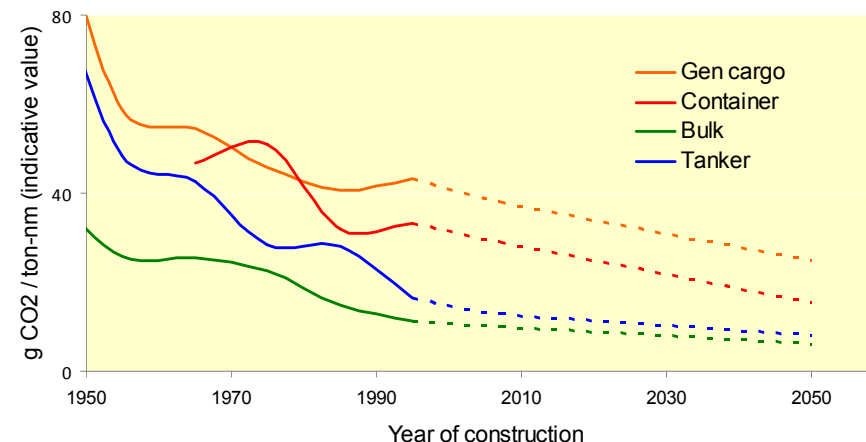
# World seaborne trade 1968-2008



**CLIMATE CHANGE:**  
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Baseline efficiency improvement in historic perspective

## Efficiency improvements



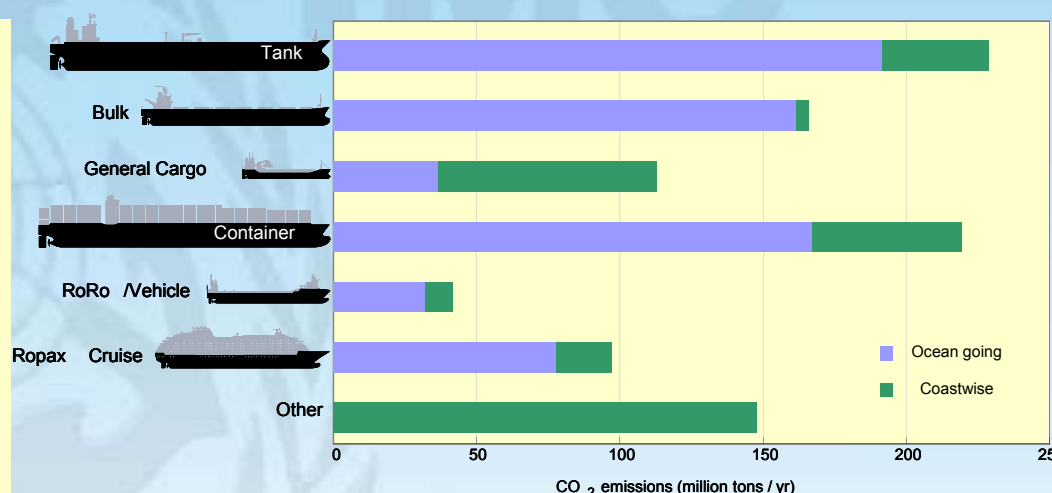
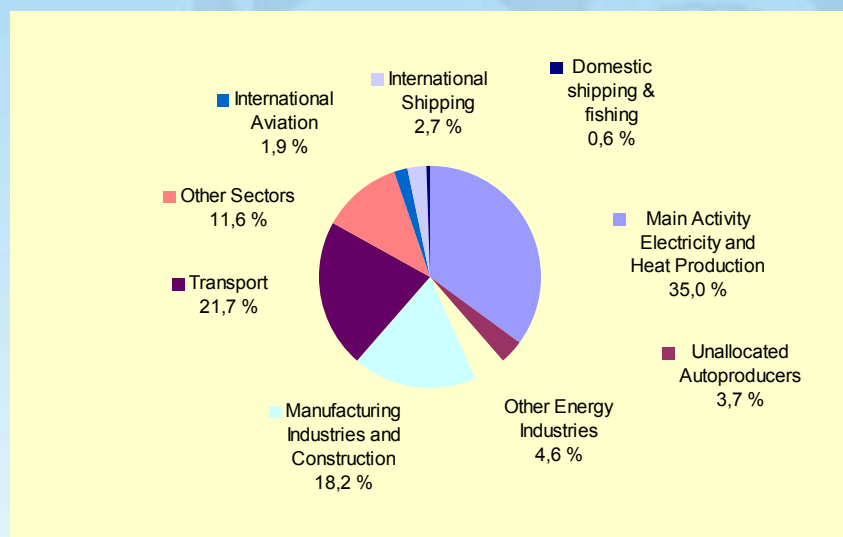
## Fuel Consumption World Fleet



# Second IMO GHG Study 2009

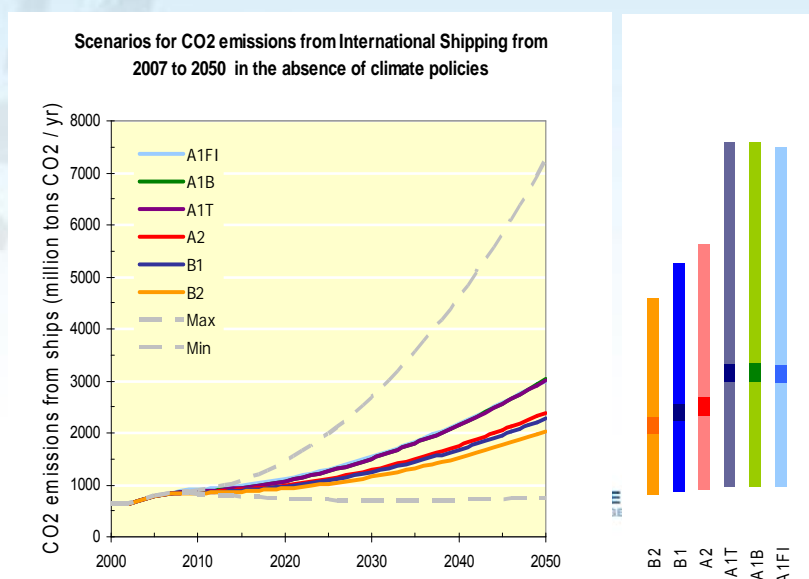


**2007 shipping CO<sub>2</sub> emissions 870 million tons**



## 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**





## 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%	





## UNFCCC debate on allocation of ship emissions (1986) 1992 - 1997

- 1 No allocation
- 2 Proportional to national emissions
- 3 Fuel sales
- 4 Nationality of company
- 5 Flag
- 6 Route of vessel
- 7 Route of cargo
- 8 Country of origin of cargo
- 9 Emissions in territorial waters



### Kyoto Protocol Article 2.2

“The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from ... marine bunkers fuels, working through ..... the International Maritime Organization, ...”



# 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

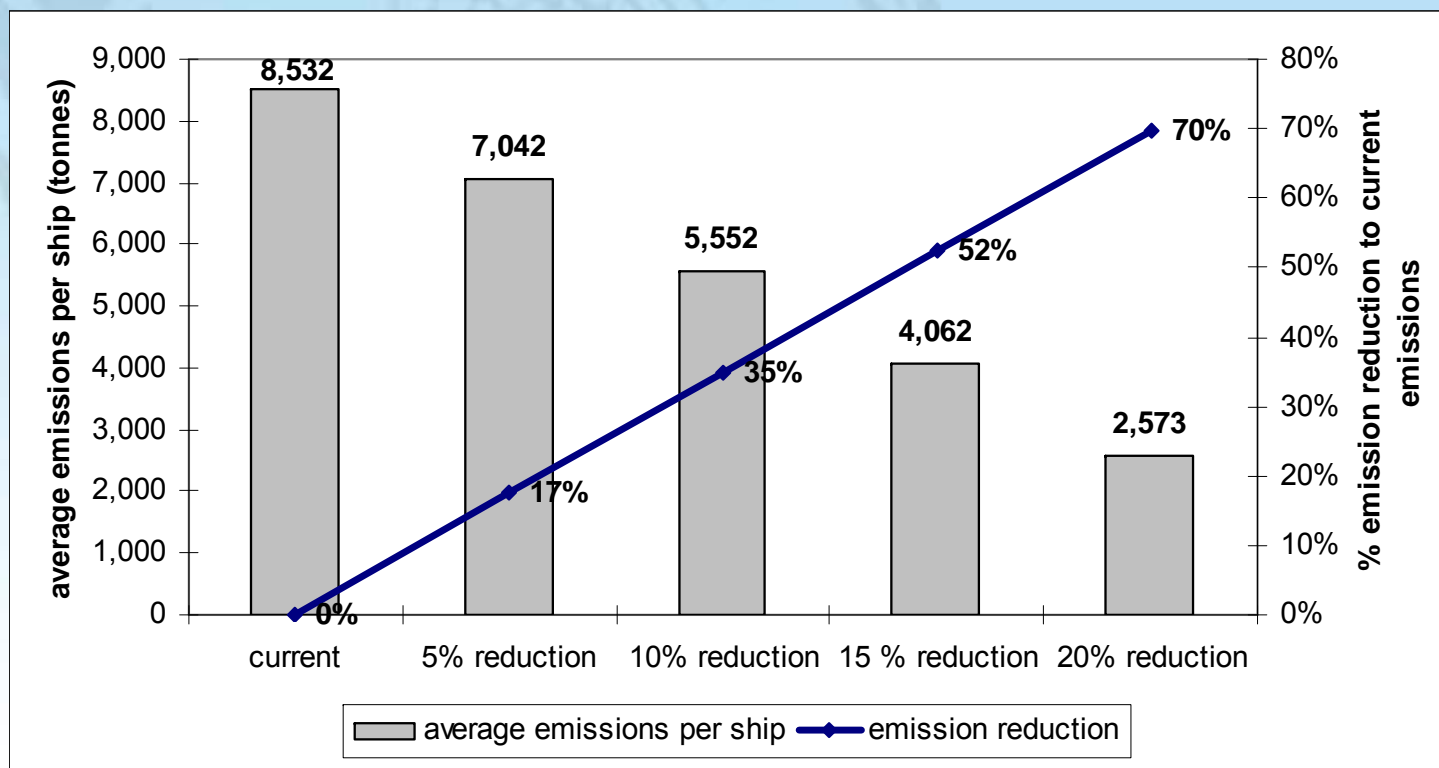
## Article 1(b) of the IMO Convention

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



IMO  
ORCHESTRATING  
THE RESPONSE



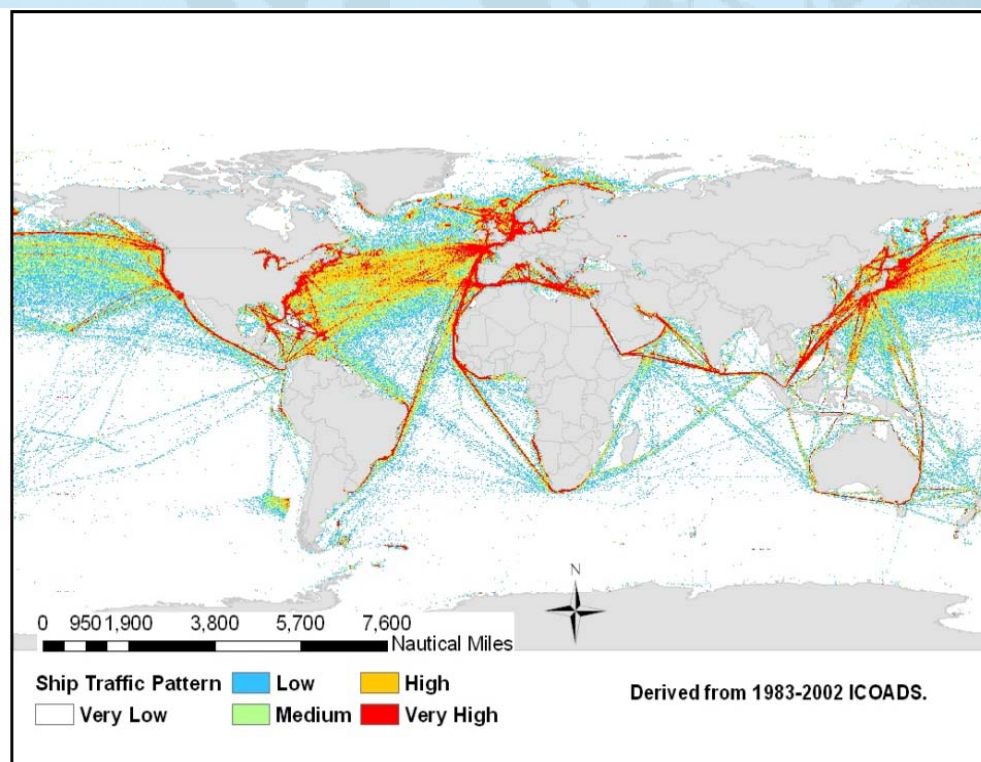
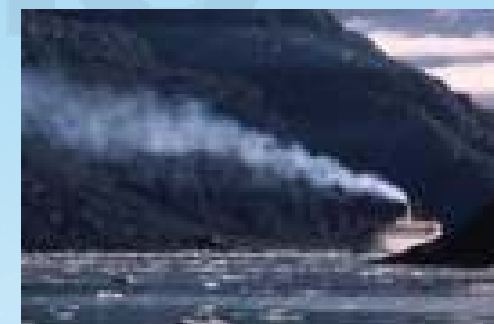


# Ship emissions one of the last major ship pollutants to be regulated

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))**
- establish GHG baseline(s) and develop CO2 indexing methodology**



# Energy Efficiency Design Index - EEDI

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

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





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>





# Ship Energy Efficiency Management Plan - SEEMP

## Onboard ship specific 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 (utilization of cargo capacity)
- Improved cargo handling
- Energy management
- Hull and propeller maintenance
- Alternative fuels





## Energy Efficiency Operational Indicator - EEOI



- A monitoring tool and efficiency indicator for individual ships obtained from fuel consumption, voyage (miles) and cargo data (tonnes). Monitoring and benchmarking

**Actual Fuel  
Consumption  
Index**

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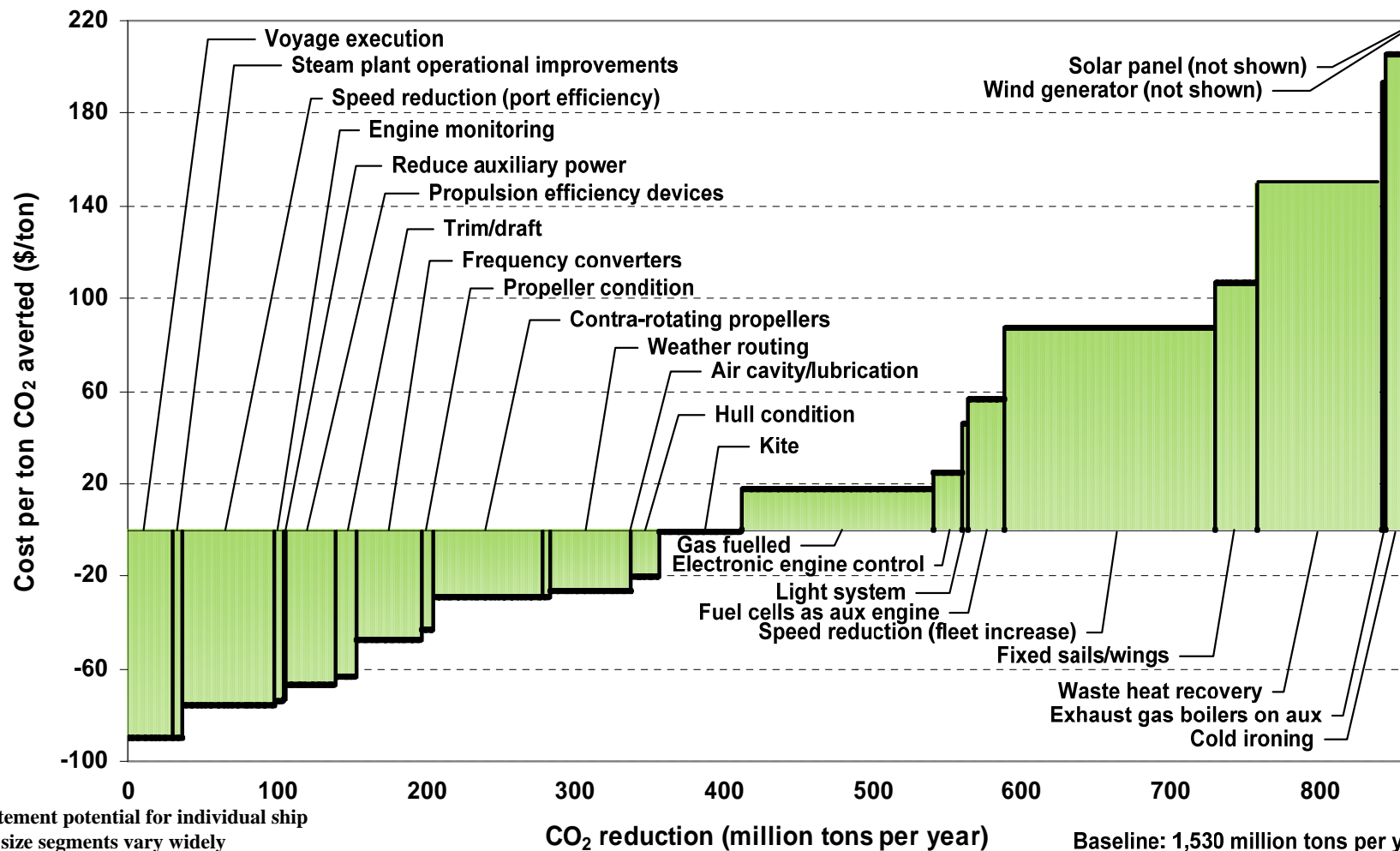
**Fuel Consumption in Operation**

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**Cargo Onboard x (Distance traveled)**

# 2030 – abatement potential

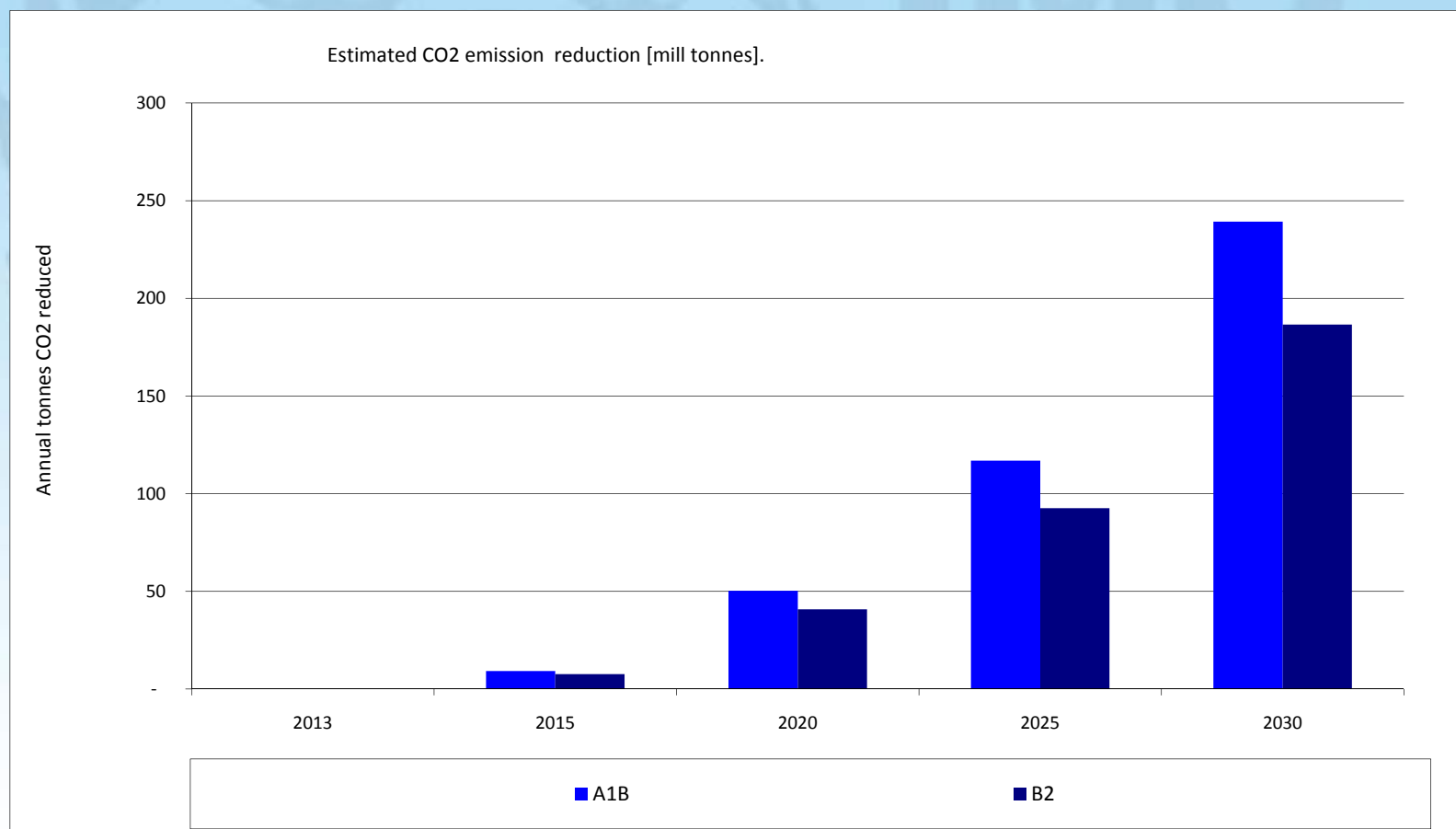
Average marginal CO<sub>2</sub> reduction cost per option - World shipping fleet in 2030 (existing and newbuilds)



Note; abatement potential for individual ship types and size segments vary widely



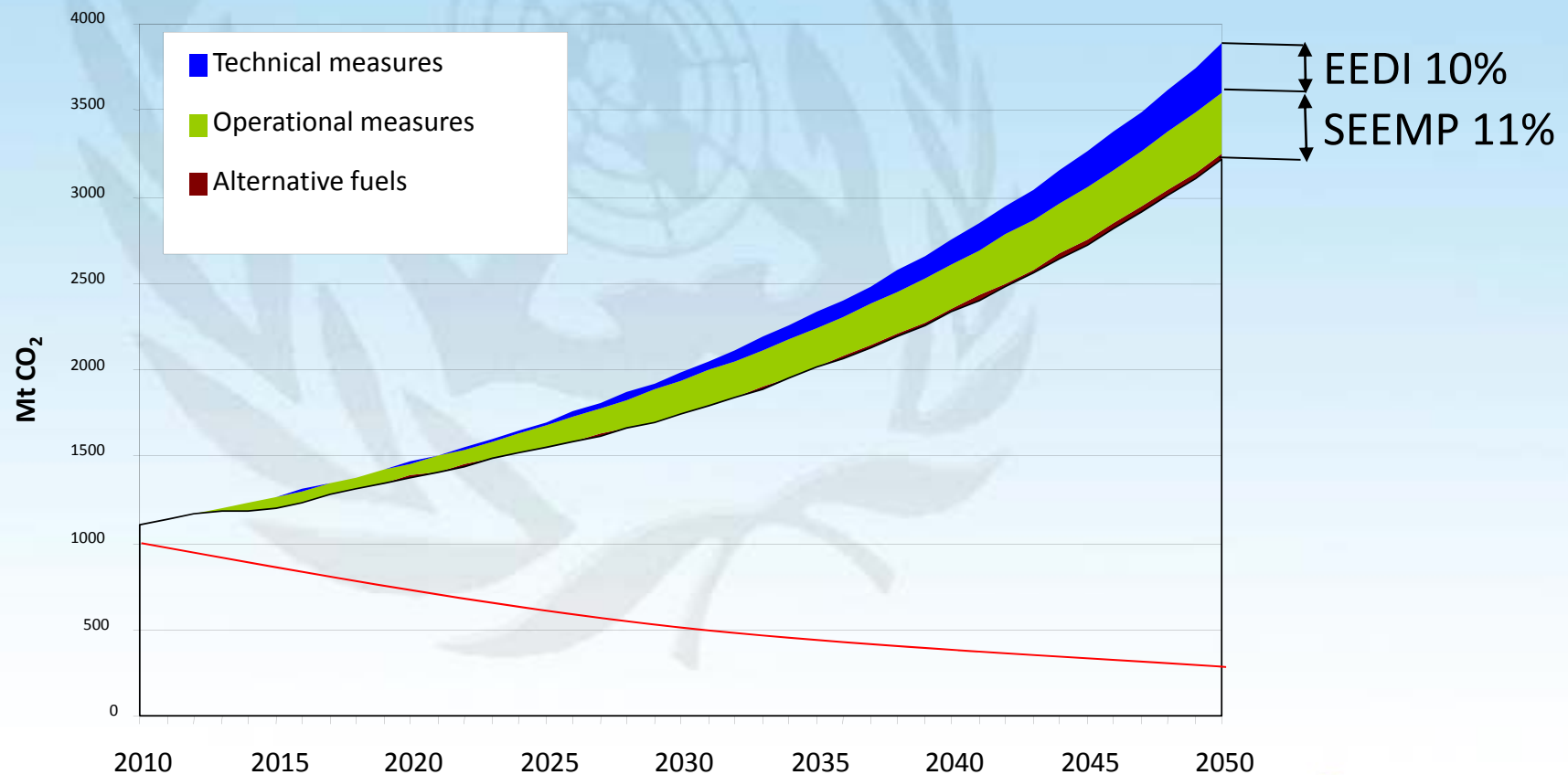
# 190 – 240 million tonnes CO<sub>2</sub> reduced annually compared with BAU by 2030





# EEDI and SEEMP Effects

Scenario: A1B Low uptake

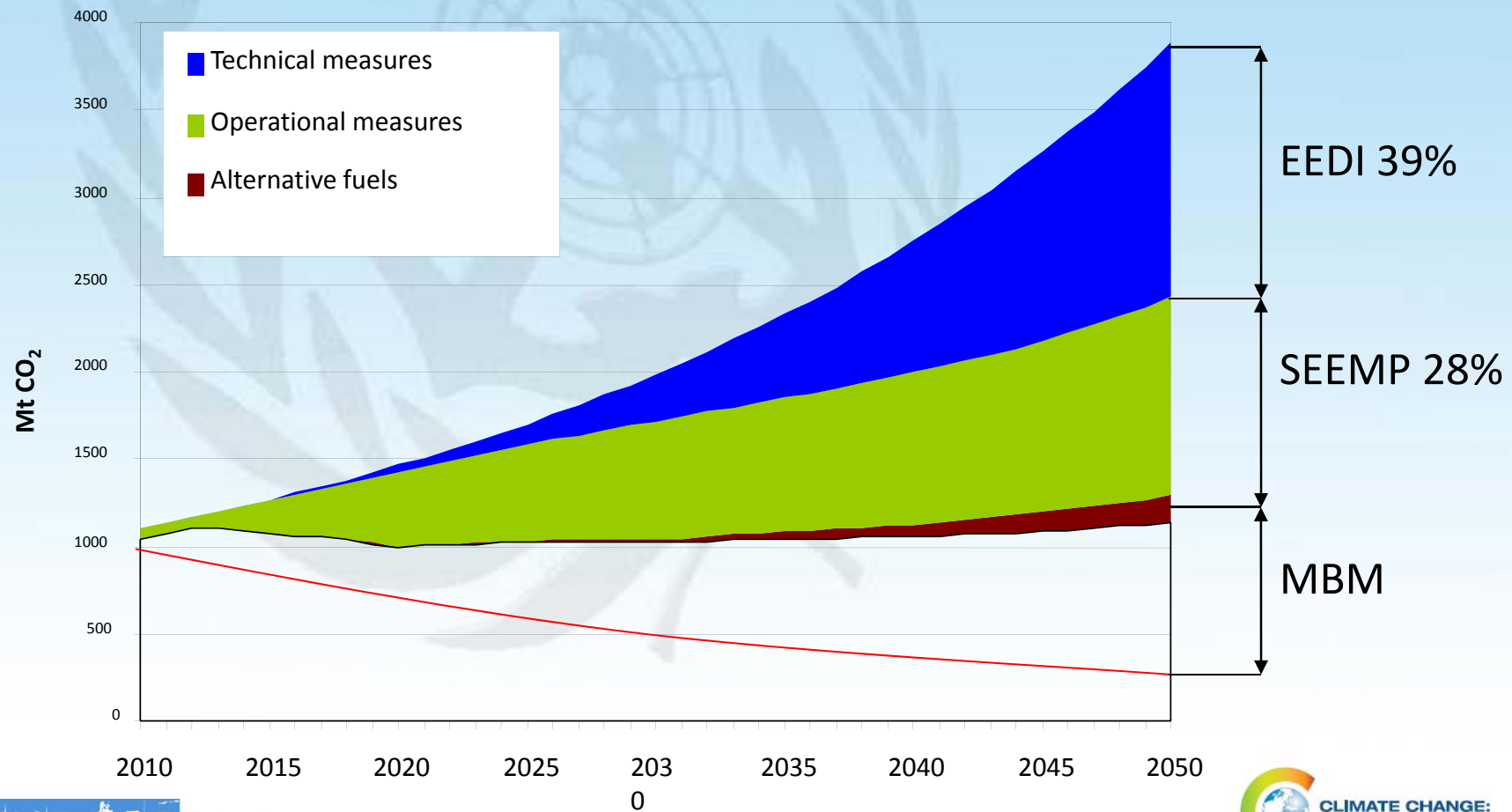






# EEDI and SEEMP Effects

Scenario: A1B Optimistic



# Energy Efficiency in MARPOL Annex

- **New part to MARPOL Annex VI to incorporate energy efficiency measures:**
  - Energy Efficiency Design Index (EEDI) new ships
  - Ship Energy Efficiency Management Plan (SEEMP) for all ships using the EEOI as monitoring tool
- **Regulatory text finalized by MEPC 61 (Sept 2010)**
- **No agreement on circulation at MEPC 61**
- **Circulated on behalf of nine Parties**
- **To be considered for possible adoption at MEPC 62**

Requires two third majority of Parties present and voting

- **In force 1 January 2013**

# **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, Refunding.



## **MBM Expert Group established by MEPC 60**

### **□ The analysis of the proposed MBM addressed, inter alia:**

Environmental effectiveness, cost-effectiveness and potential impact on trade and sustainable development

Incentives to technological change and innovation

Practical feasibility and the need for technology transfer to and capacity building within developing countries, mobilizing climate financing

Relation with other conventions (UNFCCC, Kyoto Protocol and WTO) and compatibility with international law and IMO's regulatory framework

Additional administrative burden and legal aspects for National Administrations

The potential additional workload, economic burden and operational impact for individual ships, the shipping industry and the maritime sector



## MBM-EG 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.





# Impacts of an MBM

Impacts on consumers depend on stringency of MBM, generally less than one per cent increase in transport costs and:

Market share and 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





# Impact Study by MBM-EG

**Cost pass-through can range from around 10 per cent to over 100 per cent**

Product market	Cost pass-through (%)	Product market	Cost pass-through (%)	Shipping market	Vivid Economics estimates (average for all routes)	UNCTAD estimates
Wheat South Africa	10–40	Iron ore China*	52	Shipping market	Vivid Economics estimates (average for all routes)	UNCTAD estimates
Wheat Kenya	50–75	Furniture EU	60–90			
Wheat Algeria	50–75	Apparel EU	10–40			
Barley China	10–25	Crude oil South Korea*	111			
Rice Philippines	5–20	Crude Oil US*	73			
Maize Saudi Arabia	90–100					
				Panamax grain	0.19	N/A
				Capesize ore	0.96	1.00
				Containers	0.12	0.19-0.36
				VLCC	0.37	0.28



# The Bali Plan of Action



**International shipping emissions not covered separately but under Sectoral Approaches in the Bali Plan of Action.**

- The negotiations under the Bali Action Plan is considering how all types of emissions will be treated in the future, including ship emissions.
- UNFCCC 2-tracks: AWG-KP and AWG-LCA
- **Will ship emissions still be left to IMO?**

# Shipping under UNFCCC

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

- 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?
- Should the new UNFCCC treaty state how revenues from a market-based instrument under IMO should be distributed and used (climate change purposes in developing countries)?
- How should the balance between the basic 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 -NMFT)?



**No text on international transport in the Cancun Agreements**

# **Shipping emissions and climate change financing under UNFCCC towards Durban (2011) and [South Korea/Qatar] (2012)**

**The Green Climate Fund established under the Cancun Agreements**

**Transitional Committee**

**Decisions to make GCF operative is expected by COP 17**

**Continued negotiations under KP and LCA**

**Subsidiary bodies to meet in June and Sept/Oct 2011**







# **MEPC 62      11 – 14 July 2011**

**Further progress expected to be made on all three elements of IMO's GHG work**

## **Technical and operational measures**

**Consider the technical and operational measures for adoption as mandatory measures for all ships by inclusion in MARPOL Annex VI**

Further development of supporting guidelines on:

Calculation of EEDI – Reference lines

Survey and Certification – development of SEEMP

## **Market-based measures**

Report from intersessional meeting held in March/April 2011

Agreement on further work – impact assessment





# Summary

- **Technical and operational measures likely to be adopted in July 2011 as amendments to Annex VI**

Important step - Energy efficiency standard for new ships, operational measures for all ships - Significant reductions

- **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

- **MBM for international shipping under IMO**

Continued development - Possible adoption of treaty 2013 - 2015



# **Expert Panel – Side event**

**Moderator: Mr. JO Espinoza-Ferrey**

**Director of IMO's Marine Environment Division**

**Mrs. Lolan M. Eriksson**

**Ministerial Counsellor – Ministry of Transport and  
Communication, Finland**

**Mr. Mark Lutes**

**Policy Coordinator**

**WWF – Global climate and energy initiative**