



IMO's work on prevention of air pollution and control of GHG emissions from ships

Mandatory Energy Efficiency measures for ships



CLIMATE CHANGE:
A CHALLENGE FOR IMO TOO!

IMO side event SBSTA 36

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IMO – specialised UN agency

- 170 Member States
- IGOs and NGOs
- London headquarters
- Annual budget £30+ M
- Secretariat: 300+ staff
- 50+ Nationalities
- Secretary-General: Koji Sekimizu, Japan



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!



IMO's Treaty Instruments

Safety and Security

SOLAS, STCW, Load lines, COLREGS, SUA

Pollution Prevention

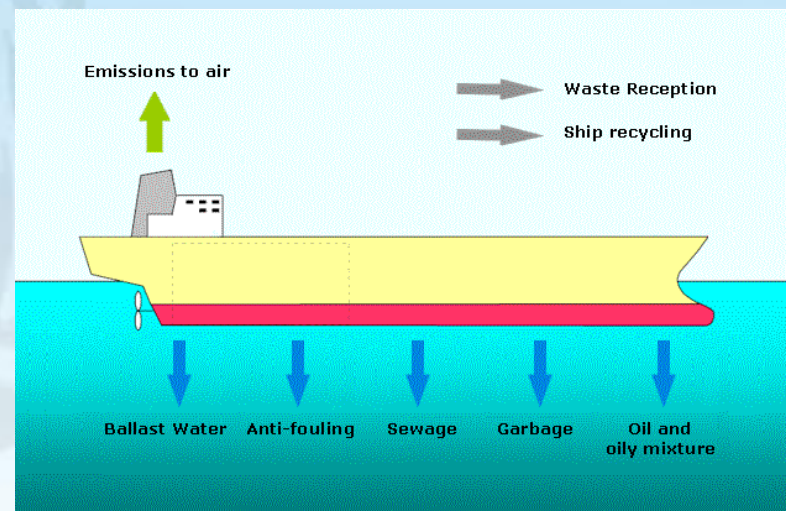
MARPOL Annexes I to VI, Dumping (LC/LP), Intervention, AFS, [Ballast Water Management,] [Recycling]

Response and Reaction

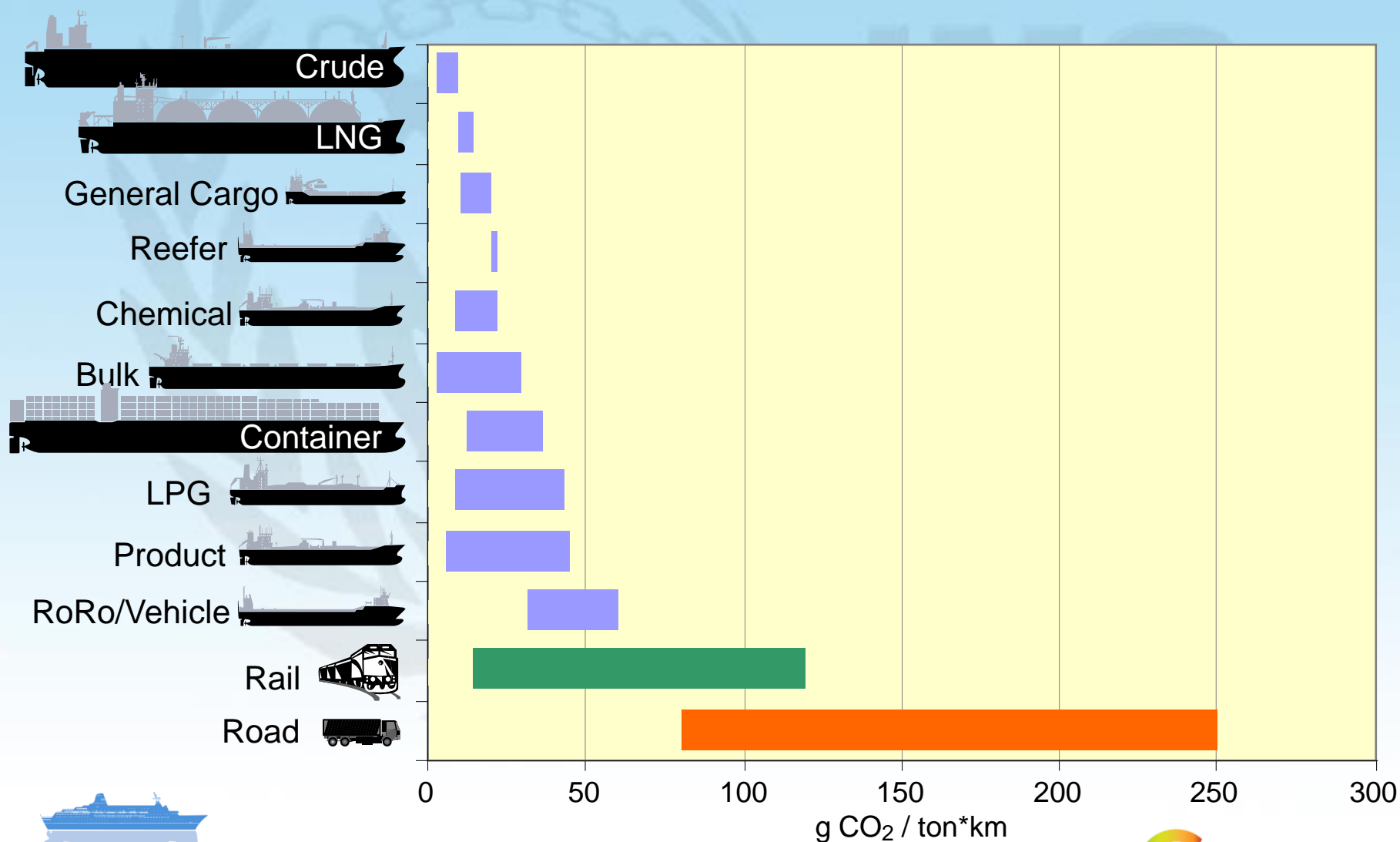
SAR, OPRC, HNS Protocol, [Wreck removal]

Liability and Compensation

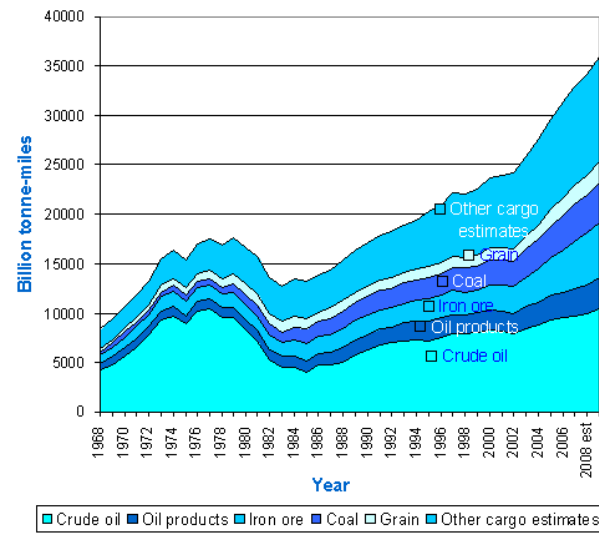
CLC, IOPC Fund, Athens, Bunkers, HNS



Range of typical CO₂ efficiencies for various cargo carriers



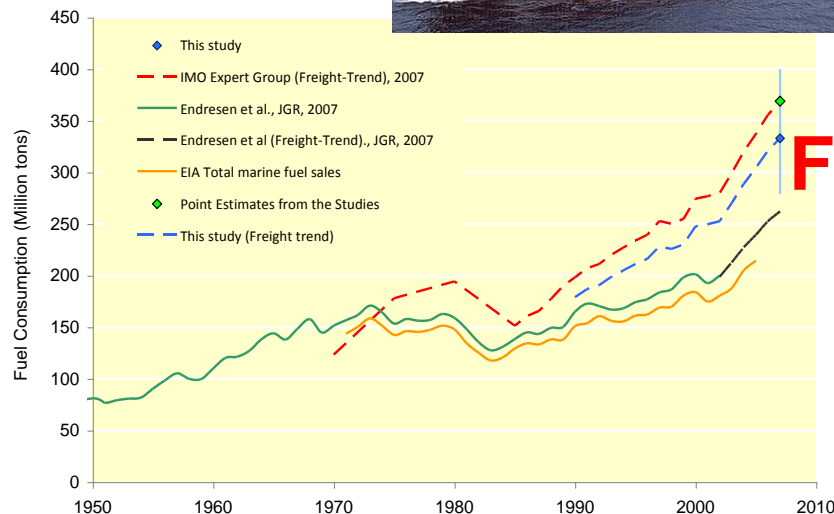
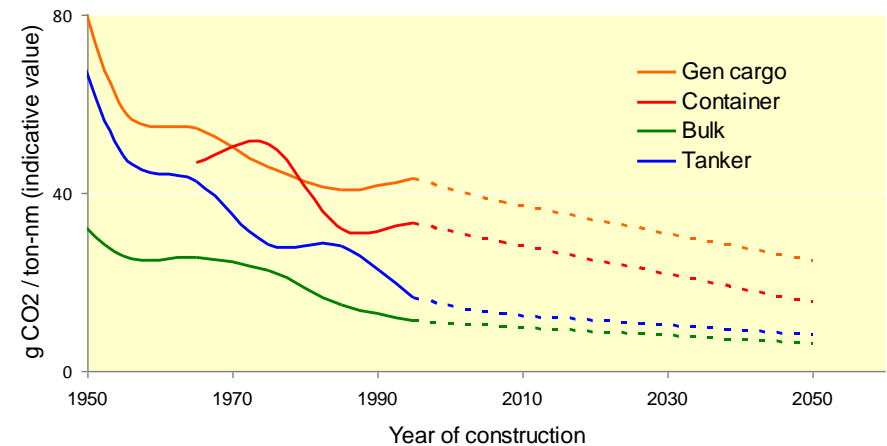
World seaborne trade 1968-2008



CLIMATE CHANGE:
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Baseline efficiency improvement in historic perspective

Efficiency improvements



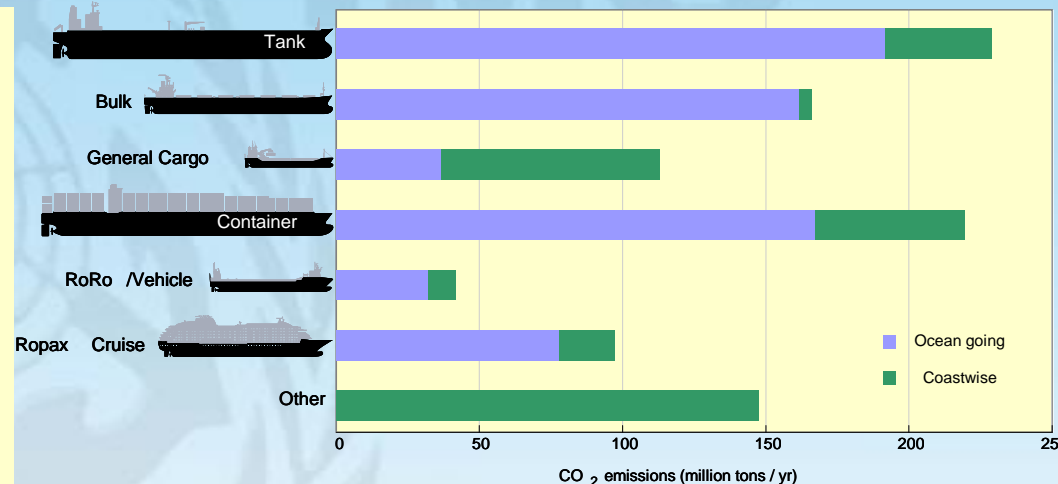
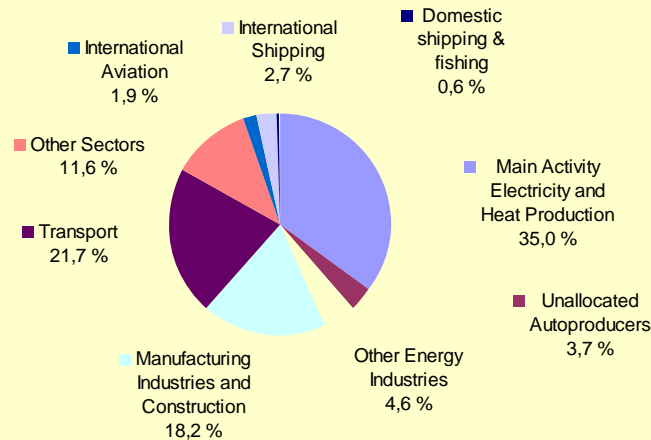
Fuel Consumption World Fleet



Second IMO GHG Study 2009



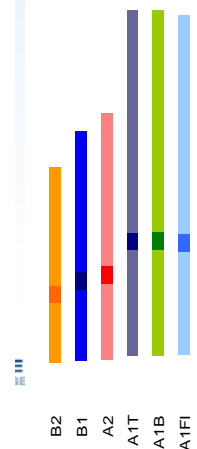
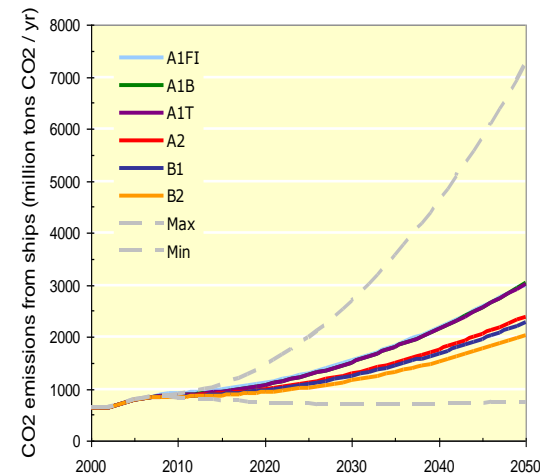
2007 shipping CO2 emissions 870 million tons



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 will provide significant improvements but will not be able to provide real reductions if demand continues

Scenarios for CO2 emissions from International Shipping from 2007 to 2050 in the absence of climate policies





Potential reductions of CO₂ emissions

DESIGN (New ships)	Saving of CO₂/tonne-mile	Combined
Concept, speed & capability	2% to 50% ⁺	10% to 50% ⁺
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 ₂ reduction	0%	
OPERATION (All ships)		
Fleet management, logistics & incentives	5% to 50% ⁺	10% to 50% ⁺
Voyage optimization	1% to 10%	
Energy management	1% to 10%	

Examples of efficiency measures:

Technical:

- Improved hull design and engine efficiency
- More efficient propellers and rudders
- Larger ships, combination carriers
- Reduce installed power (speed)
- Wind and solar power
- Alternative fuels

Operational:

- Speed and energy management
- Improved routeing & less waiting
- Enhanced fleet management and better utilization



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 on Annex VI called for GHG action by IMO

First IMO GHG Study published in 2000

IMO's GHG policy adopted by Assembly 23 in December 2003 (res.963(23))

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

Voluntary application and testing by administrations and industry: (2005) 2009 ----

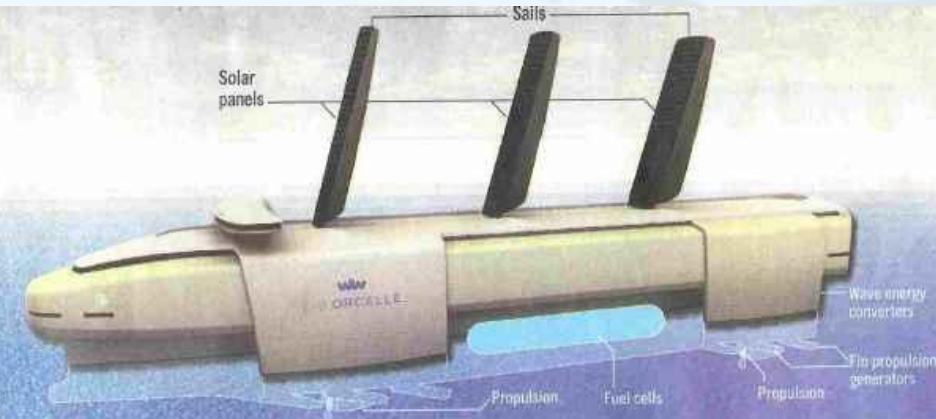
Regulatory text developed 2009 – 2011

2011: Adoption of new chapter 4 to MARPOL Annex VI: mandatory T&O measures

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



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, offsetting, incentive, may generate funds

Breakthrough at IMO

MEPC 62 (11 – 14 July 2011)



Mandatory energy efficiency

**Measures adopted (EEDI and SEEMP) for all ships
by inclusion of new chapter 4 in MARPOL Annex VI**

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)

Workplan adopted on EEDI formulas for ship types not yet covered, agreement to develop more detailed guidelines on i.e., the effect of reduction measures and other areas

Development of guidelines for design and operation



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 LDCs and SIDS

	Number of countries	Gross tonnage	Total
Yes	49	757,412,533	79.06%
No	5	97,083,482	10.13%
Abstain	2	4,877,396	0.51%
Not present	8	4,448,076	0.46%
Non-Annex VI countries	98	96,506,909	10.04%
World total	162	957,981,010	100%

MARPOL Annex VI coverage



	Number of flag States	Gross tonnage	Total
World total	162	957,981,010	100%
Annex VI countries	64	861,474,101	89.96%



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

(Auxiliary Power)

(Main Power)

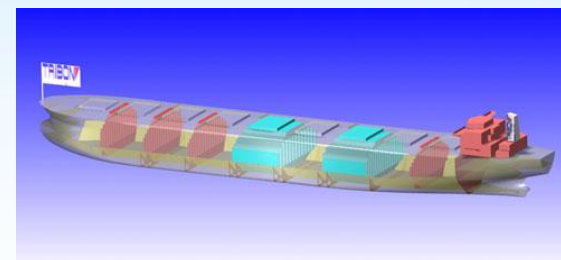
$$\frac{\left(\prod_{j=1}^M f_j \right) \left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)} \right) + (P_{AE} \cdot C_{FAE} \cdot SFC_{AE}^*) + \left(\left(\prod_{j=1}^M f_j \cdot \sum_{i=1}^{nPTI} P_{PTI(i)} - \sum_{i=1}^{neff} f_{eff(i)} \cdot P_{AE_{eff(i)}} \right) C_{FAE} \cdot SFC_{AE}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

g of CO₂ emitted

cargo capacity x speed

Attained EEDI ≤ Required EEDI values

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





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 routing/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**



Guidelines adopted by MEPC 63 (March 2012)

- 2012 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships
- 2012 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP)
- 2012 Guidelines on survey and certification of the EEDI
- Guidelines for calculation of reference lines for use with the EEDI

MEPC 63 also continued work in accordance with the work plan for technical and operational measures for ship types and propulsion systems not covered by the EEDI



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

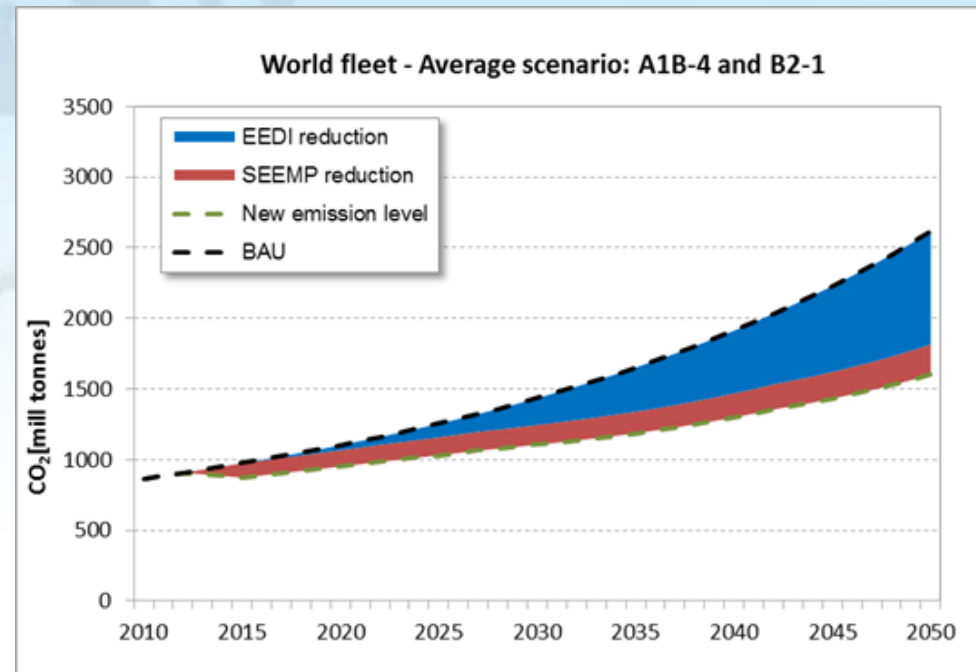
18 – 26% over BAU

US\$ 90 – 310 fuel cost savings

- **2050**

706 – 1320 million tonnes of CO₂

35 – 41% reduction over BAU



Capacity building needs

- Preliminary assessment presented to MEPC 61
- Training of flag State and port State control officers
- Training of seafarers in use of new technologies
- Instil in the industry an energy efficiency culture
- IMO's Integrated Technical Co-operation Programme for the 2012-2013 biennium allocated funding for the first round of training activities to be undertaken before the entry into force of the amendments

IMO- KOICA agreement

- IMO- KOICA signed an agreement on 21 April 2011
- Project focuses on building capacity and capability in East Asian countries with maritime interests
- 10 activities in total
- Part of the activities are national and sub-regional workshops
- Development of training and communication material

Capacity building activities

Workshops on CO₂ emissions from shipping

- Regional and national workshops on **awareness raising** and knowledge sharing to enhance global implementation and to enable States to take appropriate actions
- Regional and national workshops on **energy efficient ship operation** for ship and shore based personnel
- Regional and national workshops on **energy efficient ship design** for administrations, academia and industry
- Regional workshops **on port State control** procedures and regulations related to energy efficiency and air pollution regulations under MARPOL Annex VI

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 2012 – 2013

Dialog with donors for a global project: \$10 – 40 millions



Transfer of technology, technical assistance and capacity building on energy efficiency

Transfer of technology covered in many IMO instruments, regulation 23 of new Chapter 4 goes beyond similar obligations in other treaties as it encourages cooperation bilaterally, through IMO or other organizations

Transfer of technology outside IMO's ITCP

Work on draft resolution together with the regulatory text with the intention to adopt them as a package, not possible to reach consensus, still pending, needs to be resolved urgently





Will the EEDI and SEEMP be enough?

They probably would if demand for shipping stopped growing. BUT...

- World trade is likely to keep increasing
- Emerging economies generate need for shipping
- Developing countries depend on sea transport for development

So, the reductions achieved by EEDI and SEEMP may be offset by increase in world trade and need for sea transport

That's why we need a **market-based measures**

Smoother sailing

A number of innovations could see the ships of the future producing far fewer greenhouse gas emissions

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NATURAL GAS-FUELLED ENGINE
PLUS CANVAS SAILS
Smaller ships may soon
be propelled this way

20%
fuel decrease

SOLAR PANEL SAILS
Retrofitting tankers with
solar panels will allow ships
to charge a battery for
propulsion. The panels will
also act as rigid sails

40%
fuel decrease

HULL COATING



Market-based reduction measures – MBM

An MBM under IMO would serve two main purposes

- An economic incentive for enhanced energy-efficient both through design and operation (in-sector reductions)
- Off-setting in other sectors (out-of-sector reduction)

10 MBM proposals by governments and NGOs under review

Charges, ETS, Efficiency based, Incentive Schemes, Rebate Mechanism

Three main streams:

GHG Fund: Offsetting above a target line

ETS: 100% auctioning (global/national)

- remaining proceeds: R&D, TC, improve port/maritime infrastructure in developing countries, Climate Finance

Efficiency based (EEDI): Closed trading of credits

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 means a 2 – 10% increase in transport costs and an increase of 0.0 – 0.2% on end prices

Trading distances - Market share
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

MEPC 63 continued work on MBMs and on further impact studies and will continue to address the issue in October



The needs and circumstances of developing countries in the context of climate finance

There will be impacts from introducing and MBM, but they will be dwarfed by increases in fuel and food prices

Compensating affected consumers and industries cent by cent is not possible, a workable proxy is needed

An MBM is intended to drive behavioural change
– compensation will undermine this purpose

To use 25 – 40% of revenues to compensate all developing countries by the same key will deprive the most vulnerable countries/peoples for large climate finance opportunities

A targeted approach needed where only those most affected will be compensated (threshold/GDP per capita)



IMO's MBM impact study to continue

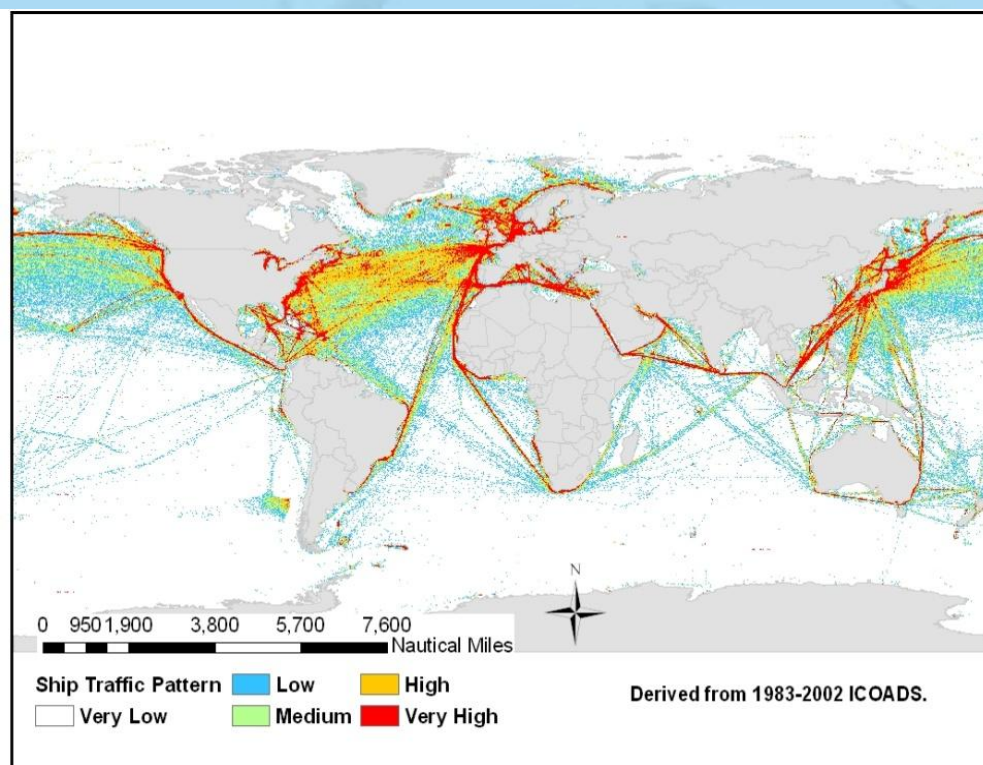
MEPC 63 (March 2012)
continued work on MBMs
and on further impact
studies, work will continue at
MEPC 64 in October

**Impact on import costs
= 10% fuel price**

Australia	Chile
0.16%	0.26%

MBM cost in relation to world imports

Emissions (Mt)	Costs (\$billion)	Seaborne Imports (\$billion)	Costs/Imports (%)
870	17.4	9.393	0.19%



UNFCCC debate on allocation of emissions from international shipping 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 bunker 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%

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 ..;



Shipping under UNFCCC

Consultations in UNFCCC is slow and has not lead to an agreed text 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 Durban outcome other than to continue address the issue

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



Durban outcome affecting IMO's work

Reported in MEPC 63/5/5

The mandate of AWG-LCA extended by another year

International transport part of mitigation under Sectoral Approaches

Seven options for text on international transport in new treaty or COP decision

Establishment of the Green Climate Fund

Work programme under LCA to identify sources (public and private)

Several proposals to use international shipping as source (AGF and G20)

Direct links with IMO's MBM work – proposed text on “no net incidence”

Agreement on Carbon Capture and Storage as CDM

Sub-seabed carbon storage regulated by the London Protocol



Climate Finance under UNFCCC



The Copenhagen Accord noted the need for climate finance
\$30 billion annually 2010 – 2019 and \$100 billion annually from 2020

The AGF report highlighted international shipping as a suitable and predictable source for climate change funding.
\$ 3 – 8 billion from international shipping – work should continue in IMO

The Cancun Agreements agreed to establish the Green Climate Fund which was formally established in Durban and operational by 2012 under the World Bank, process to identify funding sources in 2012, may include shipping

G-20 requested WB/IMF to explore potential sources

Elaborates on possible approaches but focuses on taxation (national collection) not on the combined effect of an MBM: reduction and finance

Considered by G-20 in November 2011 and noted by the Durban Conference

Universal application - Proportionality – Incidence avoidance





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)