Economics of mitigation for international shipping

“Economics of mitigation: energy sector, global trade, international maritime transport”

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International Maritime Organization

- The IMO Convention adopted in 1948 and IMO first met in 1959
- A specialized agency of the UN
- 170 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
“2. The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively.”
Shipping affects us all........

- ~90% of world trade is by sea
  - Raw materials and commodities
  - Finished goods
  - Foodstuffs
  - Fuel

- Underpins global economy, international trade and development

- ~3% global GHG emissions
Economic drivers for shipping

1. World economy / trade volumes
2. Economics of shipbuilding / ship operation
3. Changes to trades / types of vessels needed
4. Cost of fuel / energy efficiency
5. Regulatory drivers e.g. emission limits
6. Scrutiny by stakeholders e.g., carbon footprint
Efficiency of shipping

Source: International Council on Clean Transportation (ICCT), Long-term potential for increased shipping efficiency through the adoption of industry-leading practices, Wang & Lutsey, 2013
Historic bunker fuel prices

Graph source: NZ Ministry of Transport
http://www.transport.govt.nz/ourwork/tmif/transportpriceindices/ti008/
Efficiency of shipping

The Triple-Es will be able to move a tonne of cargo 184km using one kilowatt-hour of energy, the same amount of energy, a Boeing 747 can transport a tonne of cargo 0.5km.
IMO work to address GHG emissions from international shipping
Resolution A.963(23)


Three distinct routes identified:

**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.
Potential CO2 emission reductions

Operational
- Weather routing 1-4%
- Autopilot upgrade 1-3%
- Speed reduction 10-30%

Auxiliary power
- Efficient pumps, fans 0-1%
- High efficiency lighting 0-1%
- Solar panel 0-3%

Aerodynamics
- Air lubrication 5-15%
- Wind engine 3-12%
- Kite 2-10%

Thrust efficiency
- Propeller polishing 3-8%
- Propeller upgrade 1-3%
- Prop/rudder retrofit 2-6%

Engine efficiency
- Waste heat recovery 6-8%
- Engine controls 0-1%
- Engine common rail 0-1%
- Engine speed de-rating 10-30%

Hydrodynamics
- Hull cleaning 1-10%
- Hull coating 1-5%
- Water flow optimization 1-4%

Source: ICCT, 2013
Economics of CO2 emission reductions

Energy Efficiency Design Index (EEDI)

EEDI = \frac{\text{Impact to environment}}{\text{Benefit to society}} = \frac{\text{Power} \times \text{fuel consumption} \times \text{CO}_2 \text{ emission factor}}{\text{Capacity} \times \text{ship speed}}

- The EEDI is likely to promote innovation at the design stage of ships for a reduction of their energy consumption at full load
- The EEDI is applicable to ship types responsible for 71% of \text{CO}_2 \text{ emissions from international shipping}
SEEMP – operational management tool to include:

- Improved voyage planning (Weather routeing/Just in time arrival at port)
- Speed and power optimization
- Optimized ship handling (ballast/trim/use of rudder and autopilot)
- Improved fleet management
- Improved cargo handling
- Energy management
- Monitoring tools
  - EEOI (voluntary)
Economic impact of energy efficiency measures

- Appraised by LR/DNV in 2011 following adoption of Chapter 4 MARPOL Annex VI (MEPC 63/INF.2)

2020 (price of fuel US$ 628 HFO, US$1205 MGO)
- Reduction of 100-180 million tonnes of CO2
- US$ 34.1 - 61.4 billion annual fuel cost saving

2030 (US$ 716 HFO, US$1375 MGO)
- 220-390 million tonnes of CO2
- US$ 85.6 - 151.74 billion annual fuel cost saving
- Enable developing countries to develop and implement, at the national level, appropriate action on CO$_2$ emissions from shipping, whilst at the same time promote sustainable development.

- Establish permanent self-sustaining legal/regulatory, policy and institutional arrangements to ensure uniform application of IMO’s policies for the reduction of GHG emissions from ships.

- Resolution MEPC.229(65) *Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships*
IMO work going forward

- Update study for GHG emissions estimate from international shipping – due to be finalized in 2014
- Further technical and operational measures to enhance energy efficiency from international shipping
- Technical cooperation activities funded with aim of scaling up
- Action to support the development of a Sustainable Maritime Transport System
Thank you for your attention

For more information please see:
www.imo.org