

Multi-year Expert Meeting
On Transport and Trade Facilitation:

**Maritime Transport and
the Climate Change Challenge**

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Climate Change: A Challenge for IMO Too!

by

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CLIMATE CHANGE:
A CHALLENGE FOR IMO TOO!



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IMO



IMO – specialised UN agency

- London headquarters
- Secretary-General:
Efthimios E. Mitropoulos, Greece
- 168 Member States
- 3 Associated Members
- 51 IGOs and 66 NGOs
- Annual budget £24 Mill+
- Secretariat – 320 staff
- 50 Nationalities



Global regulation for a Global industry!



The IMO Convention

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



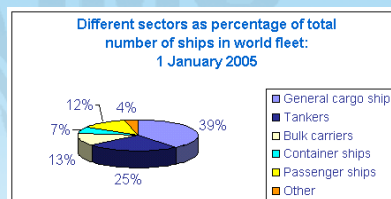
168 Member States representing 98.81 % of the world tonnage

Gives the legal basis for, and the purpose of IMO, describes membership, the functions to different bodies, the method of work, rules for voting, the functions of the SG and the Secretariat, their functions, finances, location, relation to other organisations etc



The need for IMO

- Shipping – international
- Underpins world trade
- Assets move between jurisdictions
- Universally applicable standards





Early international treaties

- Mid – 19th Century
- 1863 rules of the road – adopted by more than 30 countries



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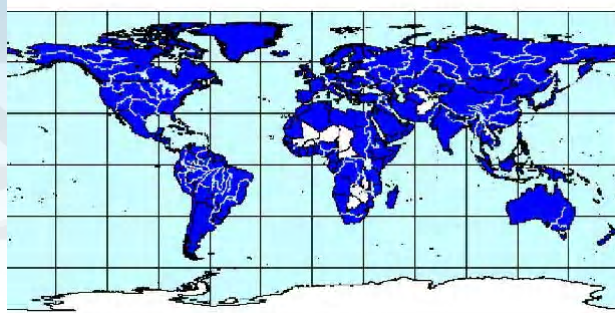


Global coverage

- 168 Member States
- All major ship owning nations
- All major coastal states
- 51 IGOs and 66 NGOs



CLIMATE CHANGE:
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IMO at work



- Assembly
- Council
- **Committees:**
 - **Maritime Safety**
 - **Marine Environment Protection**
 - **Legal**
 - **Technical Co-operation**
 - **Facilitation**



Sub-Committees

- **Fire Protection**
- **Bulk Liquids and Gases**
- **Carriage of Dangerous Goods, Solid Cargoes and Containers**
- **Flag State Implementation**
- **Radiocommunications and Search and Rescue**
- **Safety of Navigation**
- **Ship Design and Equipment**
- **Stability, Load Lines and Fishing Vessel Safety**
- **Standards of Training and Watchkeeping**



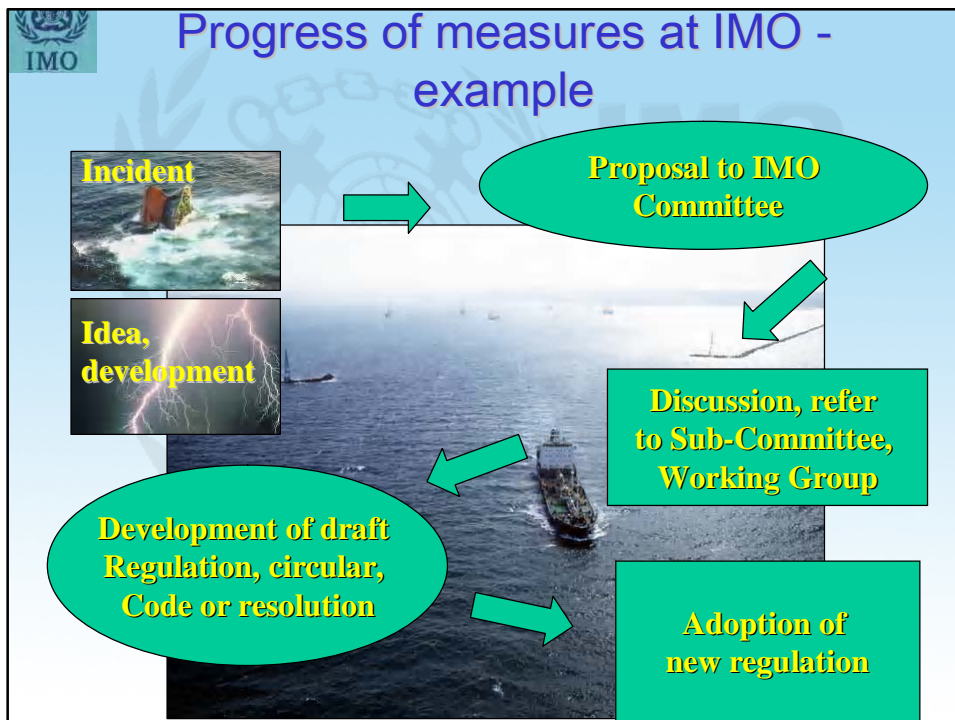


Marine Environment Protection Committee MEPC



MEPC that consists of all members, shall consider any matter within IMO's scope concerned with the prevention and control of marine pollution from ships and in particular:

- Perform functions such as adoption and amendments of regulations, in accordance with the conventions under its competence
- Consider measures to facilitate enforcement of the same conventions
- Provide scientific, technical and any other practical information for dissemination to states, in particular to developing countries
- Promote co-operation with regional organizations
- Consider and take action with respect to any other matters which would contribute to the prevention and control of marine pollution
- Meet at least once a year (three sessions bi-annually)



Application to real ships

- 48 IMO Conventions and Protocols
- Hundreds of codes, guidelines and recommendations
- Almost every aspect of shipping covered:
 - Design
 - Construction
 - Equipment
 - Maintenance
 - Crew



Safe, secure and efficient shipping on clean oceans!



Safety and security

- SOLAS
- STCW
- Load lines
- COLREGS
- SUA



 **Pollution prevention**

- MARPOL
- Dumping
- Intervention
- Anti-fouling
- Ballast water management
- Wreck removal
- Recycling



 **Response and reaction**

- SAR
- OPRC
- HNS Protocol





Liability and compensation

- CLC
- IOPC Fund
- Athens
- Bunkers
- HNS



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

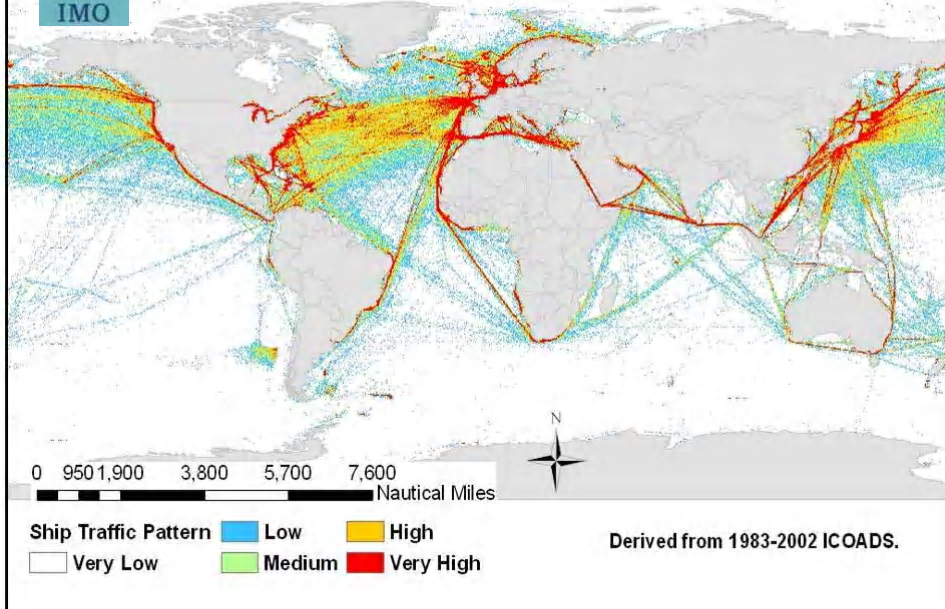
Work started at IMO in the 1980's
Annex VI adopted in 1997, in force in
May 2005, revised 2005 - 2008



- Prohibits ODS in line with the Montreal Protocol
- Regulates exhaust gas emissions: NO_x & SO_x and cargo vapours (VOC)
- Greenhouse gases not covered



Traffic pattern of international shipping



UNFCCC debate on allocation of ship emissions 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

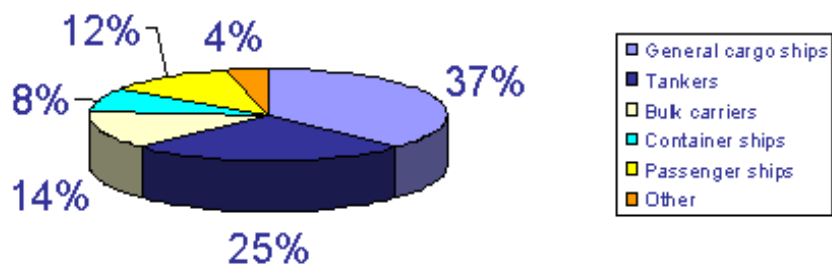
“The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from ... marine bunkers fuels, working through ... the International Maritime Organization, ...”



Distribution of the world fleet March 2008

ships above 400 GT

	Number of ships	GT	DW
Annex I flag States	20,872 (33.42%)	209,015,681 (26.08%)	263,820,104 (22.82%)
Non-Annex I flag States	41,119 (66.58%)	593,330,359 (73.92%)	892,384,249 (77.18%)
Total	61,862	801,346,040	1,156,204,353





Flag States and ownership of the world fleet 2007

Largest flag States

Flag State	1,000 DWT
Panama	232,148
Liberia	105,227
Bahamas	55,238
Greece	55,145
Marshall Islands	54,644
Hong Kong, China	54,341
Singapore	51,043
Malta	40,201
China	34,924
Cyprus	29,627

Largest ship-owning countries

Country of owner	1,000 DWT
Greece	170,181
Japan	147,507
Germany	85,043
China	70,390
Norway	48,697
United States	48,261
Hong Kong, China	45,053
Republic of Korea	32,287
United Kingdom	26,757
Singapore	25,723

Source: UNCTAD, 2007.

IMO's Work on Reduction of GHG from Ships

Resolution A.719(17) adopted in 1991

Recognized the urgent necessity of establishing a policy on the prevention of air pollution from ships, leading to the adoption of Annex VI to MARPOL

Air Pollution Conference in September 1997

Resolution 8 on "CO₂ emissions from ships", invites IMO to:

- co-operate with UNFCCC
- undertake a study on GHG emissions
- consider feasible GHG reduction strategies



2000 IMO GHG study Summary of conclusions

Significant potential for reduction from operational measures

- Implementation of some operational measures will require participation from others than shipowners

Technical measures easier to implement through regulations

- Implementing technical measures through new vessel more feasible than retrofitting existing ships

- Measures related to hull, engines and propeller are general measures for energy savings

Limited potential to prevent growth in the total emissions from ships if the increase in demand for sea-transport continues

Shipping is a significant contributor in the development of environmental sustainable transport



Resolution A.963(23)

IMO Policies and Practices Related to the Reduction of Greenhouse Gas Emissions from Ships, adopted on 5 December 2003



Requests MEPC to:

- develop a work plan with timetable
- establishment of GHG baseline
- develop CO2 indexing methodology



Requests the IMO Secretariat to continue the co-operation with UNFCCC and ICAO





Reduction of GHG from Ships



MEPC 53 (July 2005) approved IMO's "Interim Guidelines for Voluntary Ship CO₂ Emission Indexing for Use in Trials" (MEPC/Circ.471)

MEPC 55 (October 2006) approved a "Work plan to identify and develop the mechanisms needed to achieve the limitation or reduction of CO₂ emissions from international shipping", and agreed to update the 2000 IMO GHG Study














MEPC 56 (July 2007) adopted ToR for the updated GHG Study, established a Correspondence Group instructed to compile and consider different approaches on technical, operational and market based reduction measures

Update of the 2000 IMO GHG study

Phase 1, covering a CO₂ emission inventory and future emission scenarios, reported to IMO in August 2008 and considered by MEPC 58 in October.

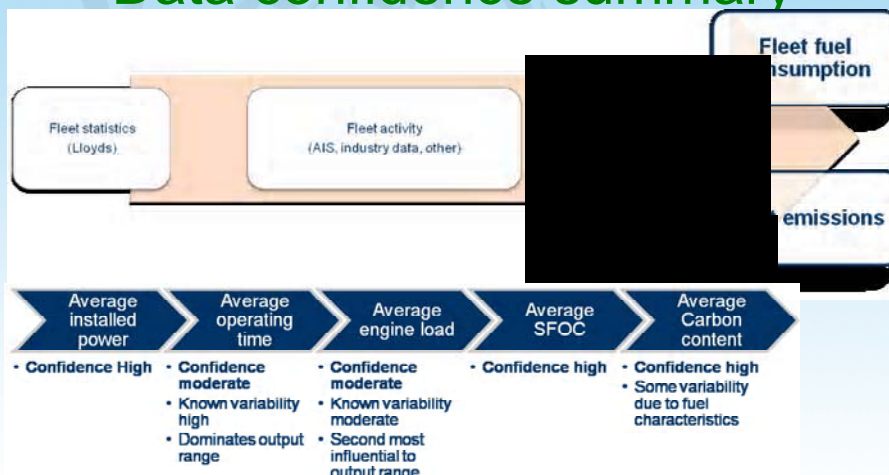


Phase 2, also covering greenhouse gases other than CO₂ and other relevant substances in accordance with the methodology adopted by UNFCCC, as well as the identification and consideration of future reduction potentials by technical, operational and market-based measures, will be submitted to IMO by February 2009 for consideration by MEPC 59.

	CE Delft	The Netherlands	Dr. Jasper Faber
	Dalian Maritime University	China	Professor Wu Wanqing
	Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR),	Germany	Dr. Veronika Eyring
	DNV	Norway	Alvar Mjelde Dr. Øyvind Endresen
	Energy and Environmental Research Associates (EERA)	USA	Dr. James Corbett Dr. James Winebrake
	Lloyd's Register-Fairplay Research,	Sweden	Christopher Pålsson
	Manchester Metropolitan University	UK	Professor David S. Lee
	MARINTEK	Norway	Dr. Øyvind Buhaug Haakon Lindstad
	Mokpo National Maritime University (MNMU),	Korea	Professor DonChool Lee
	National Maritime Research Institute (NMRI)	Japan	Koichi Yoshida
	Ocean Policy Research Foundation (OPRF)	Japan	Shinichi Hanayama

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Activity-based methodology Data confidence summary



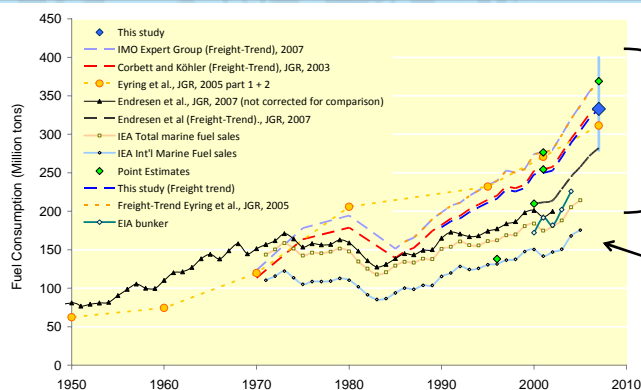
Activity-based 2007 CO₂ emissions for shipping

Million metric tonnes	Low bound	Consensus estimate	High bound
<i>Total fuel consumption</i>	<i>279</i>	<i>333</i>	<i>400</i>
Total ship CO₂ emissions¹	854	1019	1224
- Oceangoing	474	593	681
- Coastwise	240	275	357
- Other	140	150	186

All non-military vessels larger than 100 GT

World Fleet Consumption

2007	Low bound	Best	High bound
Total fuel consumption	279	333	400



Bottom-up
(Activity-based)
estimates

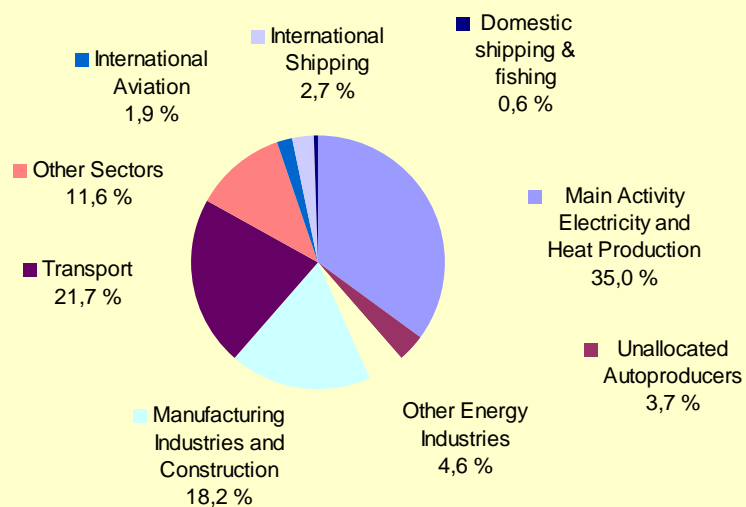
Top-down
(Fuel-sales)
data

2007 CO₂ emissions for international shipping in million tonnes CO₂

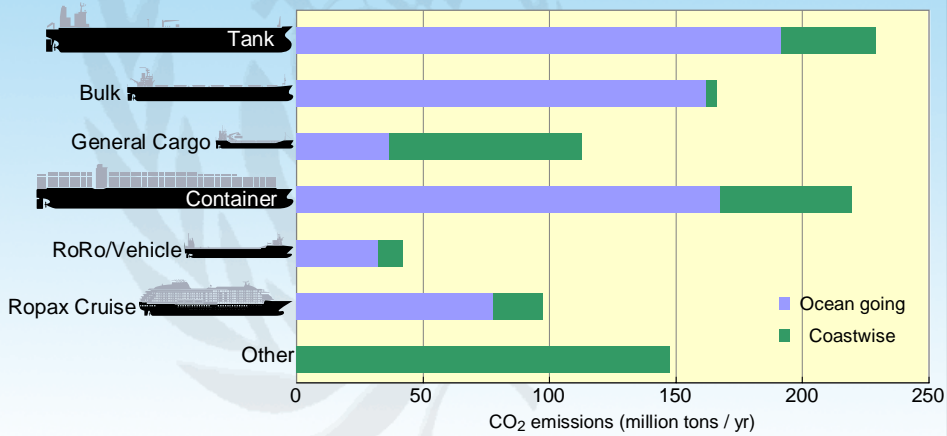
	Low bound	Consensus	High bound
Total shipping emissions (activity based)	854	1019	1224
Total less fishing (activity based)	796	954	1150
IEA domestic shipping (statistical data)	111	111	111
International shipping (hybrid estimate)	685	843	1039

All non-military vessels larger than 100 GT

Share of Global Emissions

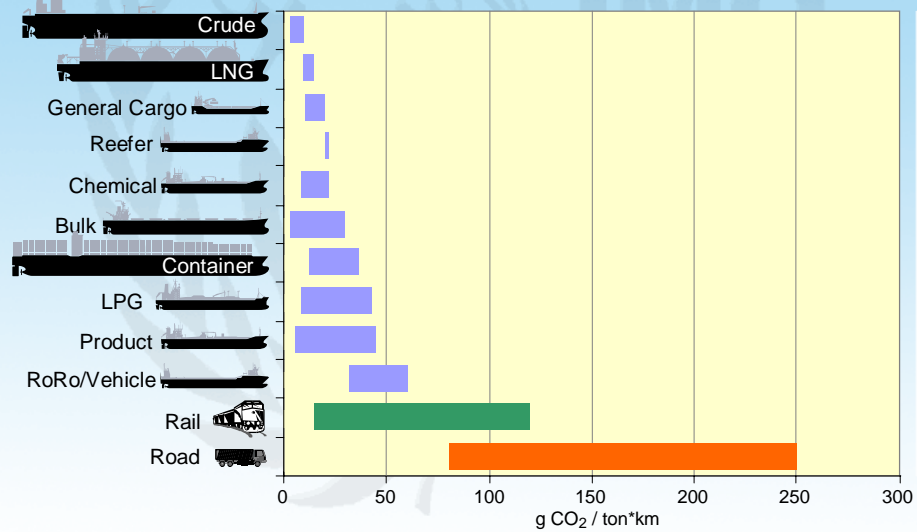


CO₂ emissions divided by main ship categories and assumed typical type of operation



(Coastwise shipping is mainly ships < 15000 dwt, RoPax, Cruise, Service and Fishing)

Range of typical CO₂ efficiencies for various cargo carriers



Data: IMO GHG Study 2008

Future Emissions - Scenario overview

- Based on IPCC SRES storylines
- Phase I *assumes no explicit regulation on GHG emissions affecting ships*
- Changes in economic, technology, and non-GHG regulatory mandates will affect emissions



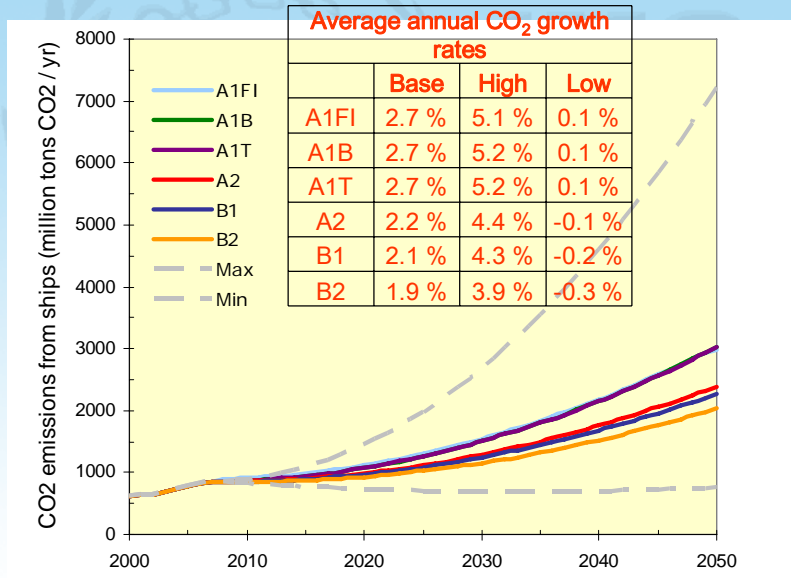
Key Driving Variables


Category	Variable	Related Elements
Economy	Shipping transport demand (tonne-miles/year)	Population, global and regional economic growth, modal shifts, sectoral demand shifts.
Transport efficiency	Transport efficiency (MJ/tonne-mile) – depends on fleet <i>composition</i> , ship <i>technology</i> and <i>operation</i>	Ship design, propulsion advancements, vessel speed, regulation aimed at achieving other objectives but that have a GHG emissions consequence.
Energy	Shipping fuel carbon fraction (gC/MJ fuel energy)	Cost and availability of fuels (e.g., use of residual fuel, distillates, LNG, biofuels, or other fuels).

Different values applied to three categories of ships:


- Coastwise shipping - Ships used in regional (short sea) shipping;
- Ocean-going shipping - Larger ships suitable for intercontinental trade; and,
- Container ships (all sizes).

CO₂ Ship Emission Scenarios







Future Emissions



2020

Predicted growth by a factor of 1.1 – 1.3

= 927 - 1,095 mill tonnes of CO₂

2050

Predicted growth by a factor of 2.4 – 3.0

= 2,023 - 2,529 mill tonnes of CO₂

Shipping Effects on Climate

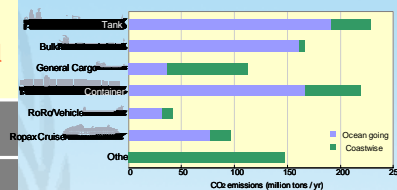
- **Warming effects**
 - CO₂
 - O₃ from NO_x
 - BC (soot)
- **Cooling effects**
 - Sulphur dioxide (SO₂)
 - CH₄ reduction from NO_x
 - Changes of microphysical and optical properties of clouds from aerosols and their precursors



Summary

2007 shipping CO₂ emissions

2007 shipping CO ₂ emissions	Low bound	Consensus estimate	High bound
Total	854	1019	1224
International	685	843	1039



Future CO₂ emissions:

- **Significant increase predicted**
- **Demand is the primary driver**
- **Technical and operational efficiency measures can provide significant improvements**

