



# CLIMATE CHANGE AND INTERNATIONAL SHIPPING

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# GHG Emissions from International Shipping

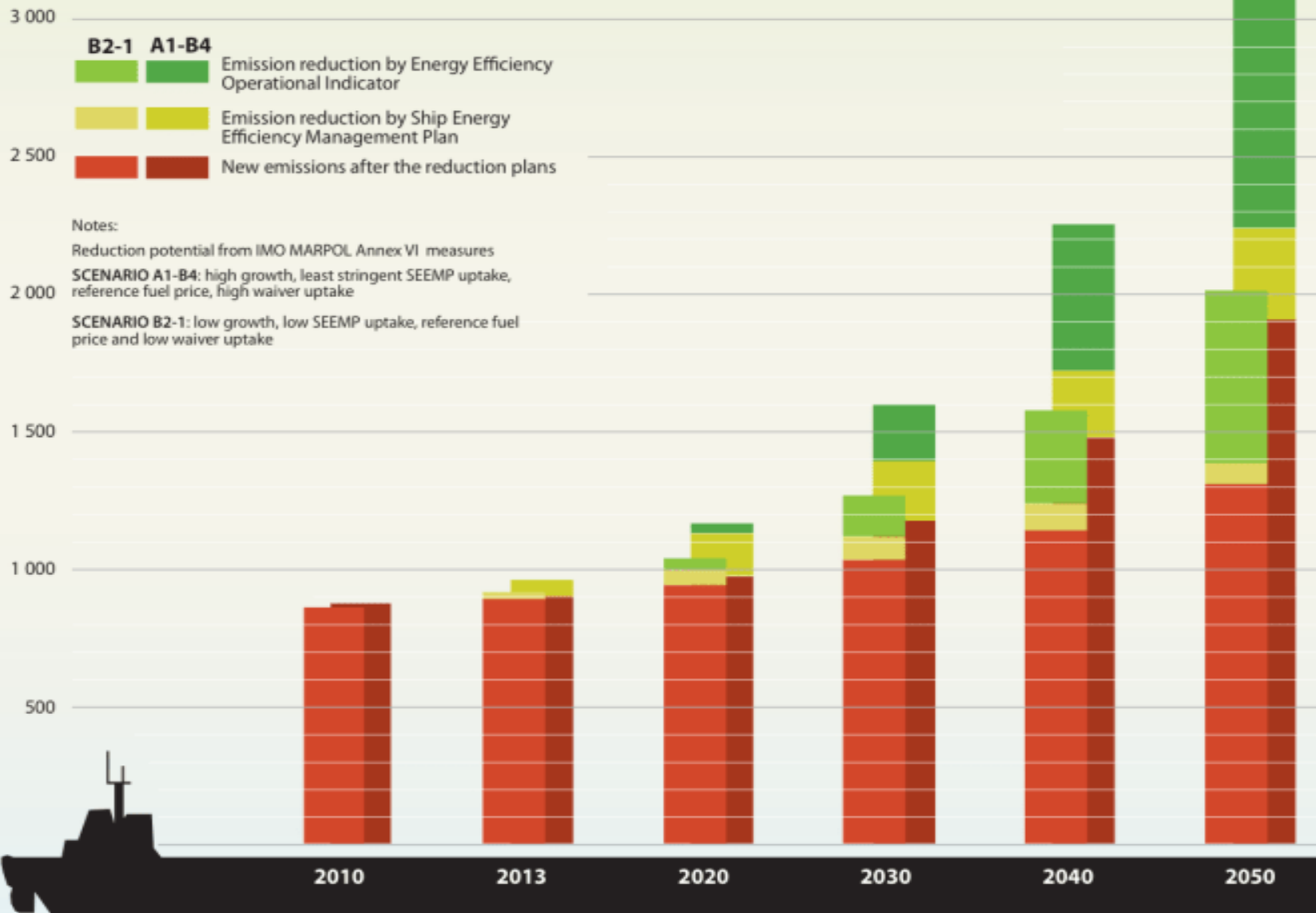
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- Around 90% of the world trade carried by the international shipping industry
- CO<sub>2</sub> emission from international shipping in 2012 was 796 million tons, accounting for 2.2% of global CO<sub>2</sub> emission
  - Korea's national GHG emissions in 2015: 690 MtCO<sub>2</sub>eq.
- Emissions will continue to rise if nothing is done
- Estimates suggest BAU CO<sub>2</sub> emission from international shipping will grow by up to 250% by 2050



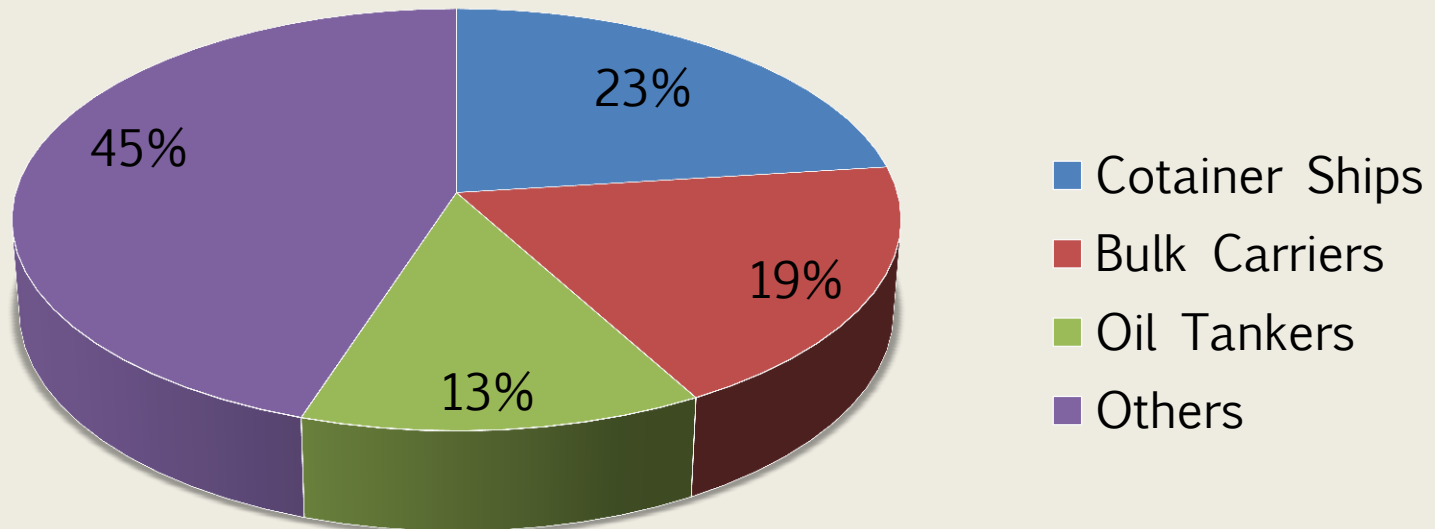
# Projected annual CO<sub>2</sub> emissions from the shipping sector

Million tonnes



# Share of CO<sub>2</sub> Emissions by Ship Class, 2013-2015

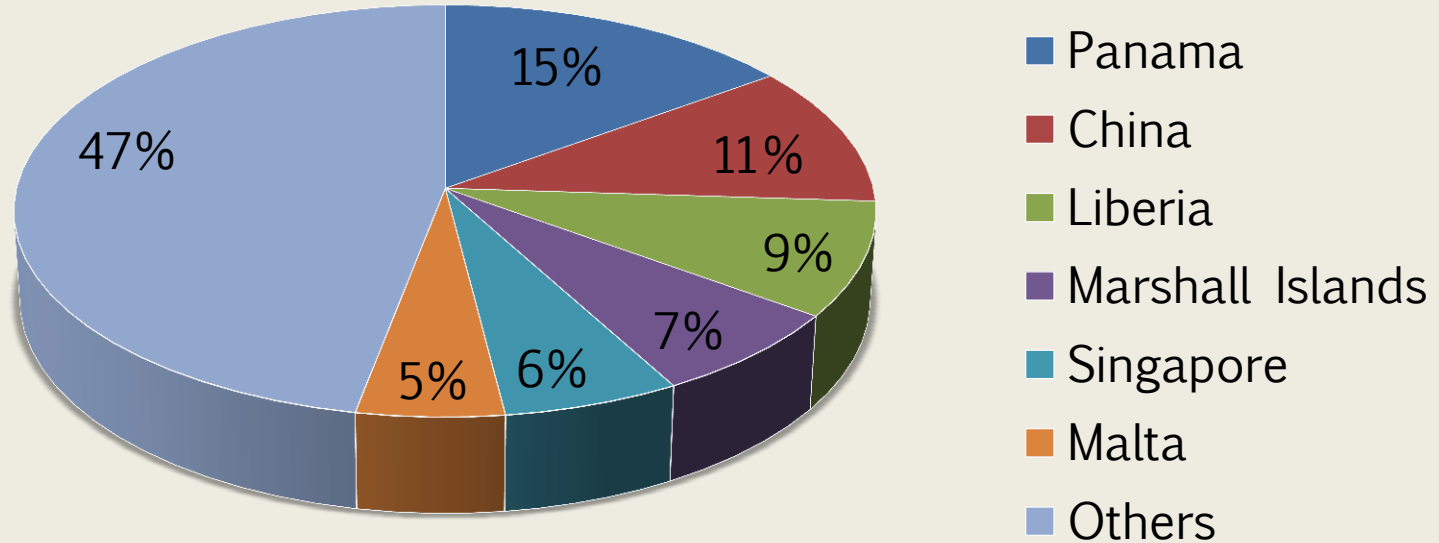
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Source: N. Olmer et al, *Greenhouse Gas Emissions from Global Shipping, 2013-2015*, International Council on Clean Transportation, 2017.

# Share of CO<sub>2</sub> Emissions by Flag State, 2013-2015

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# Divergence of Opinions between Country Groups

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- Developed countries – mostly from EU – in favor of introducing stringent regulations on GHG emissions from international shipping with preferences placed on quantified reduction targets
  - US & Japan exceptions
- Developing nations, especially export-oriented nations and major flag states, oppose introduction of rapid emission reduction obligations in this sector for fear of the impact on their economic development
  - Concern raised about the regulations' discriminating effect on those countries whose major markets are remotely located
- Capacity building & transfer of technology important factors to bridge the differences between the two country groups → focus shifting to burden-sharing

# Options to Reduce GHG Emissions from International Shipping

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- Technical measures: enhancement of the energy efficiency by hardware improvements of the ship
  - Modified hull form (to reduce propulsion resistance)
  - Modified propeller (to enhance propulsion efficiency)
  - Energy-saving appendages on hull
  - Increasing the deadweight capacity by increasing the hull size
  - Use of energy from heat exhaust recovery
  - Use of renewable energy (wind or solar power)

# Options to Reduce GHG Emissions from International Shipping

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- Operational measures: energy efficiency enhancement through improvements or innovations in the operation of the ship
  - Optimization of operational plan of individual ships and fleets
  - Speed reduction
  - Weather routing
  - Just-in-time entry into port
  - Hull & machinery maintenance (to reduce propulsion resistance through clean-ups)
- Economic instruments: incentives to promote the implementation of technical & operational measures
  - Fuel pricing system (Denmark)
  - Emissions trading system (Norway, Germany, France)



# Some Ideas of Technological Innovations in Ship Design & Operation

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- Wind-assisted ship propulsion by the kite system
  - Other types of wind-assisted ship propulsion: Wind turbines, Flettner Rotor
  
- Air Lubrication System
  - Silverstream's original sea trial funded by Shell confirmed consistent net efficiency savings in excess of 4% and up to 8% for larger vessels



# Forums to Tackle Emissions from International Shipping

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- A main forum to discuss climate measures internationally: UNFCCC (Kyoto Protocol, Paris Agreement)
- Problems persist in regulating emissions from international shipping under the umbrella of UNFCCC
  - Difficulty in deciding which country to assign carbon emissions to, when ships are almost always outside national borders
  - Flag states have primary responsibility, but the actual nationality of ships is often different from that of their owners, operators or crew

# Forums to Tackle Emissions from International Shipping

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- Kyoto Protocol, art. 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 aviation and marine bunker fuels, working through the International Civil Aviation Organization and the *International Maritime Organization (IMO)*, respectively.”
- IMO assigned responsibility to limit GHG emissions from international shipping



# The Road to the Initial IMO Strategy

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- 2003: Marine Environment Protection Committee (MEPC) tasked with identifying and developing mechanisms needed to reduce GHG emissions from international shipping
- 2011: Adopted its first mandatory requirements for GHG emissions from oceangoing vessels under the Energy Efficiency Design Index (EEDI)
  - By 2025 new ships built will be 30% more energy efficient than those built in 2014

# The Road to the Initial IMO Strategy

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- 2013: Started to provide technical assistance to member states to enable cooperation in the transfer of energy efficient technologies, esp. to developing countries
- 2016: Introduced mandatory data collection system for fuel oil consumption of ships of 5,000 gross tonnage & above (85% of CO<sub>2</sub> emissions from international shipping); approved a Roadmap for developing a comprehensive IMO strategy on reduction of GHG emissions from ships
- 2018: Adopted the “Initial IMO Strategy on Reduction of GHG Emissions From Ships”

# The Initial IMO Strategy

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- Vision: “IMO remains committed to reducing GHG emissions from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century”
- Principles
  - Non-discrimination
  - No more favorable treatment
  - Common but differentiated responsibilities and respective capabilities (CBDR)

# The Initial IMO Strategy

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- Levels of ambition
  - Carbon intensity of the ship to decline through new phases of EEDI for new ships
  - At least a 40% reduction in carbon intensity by 2030 and pursuing efforts towards a 70% reduction by 2050, compared to 2008 levels
  - Peak GHG emissions as soon as possible and to reduce them by at least 50% by 2050 compared to 2008 levels, while pursuing efforts towards phasing them out consistent with the Paris Agreement temperature goals
    - Paris Agreement temperature goals: well below 2°C above pre-industrial levels; 1.5°C above pre-industrial levels with more efforts (art. 2(1)(a))
- Supportive measures including capacity building, technical cooperation, R&D identified
- A revised strategy to be adopted in 2023, subject to a further review in 2028

# List of Candidate Measures in the Initial IMO Strategy

Term	Years	Measures	Current Status
Short-term	2018-2023	New EEDI phases for new vessels	-10% (2015) -20% (2020) -30% (2025)
		Operational efficiency measures	SEEMP
		Existing fleet improvement program	
		Speed reduction for in-service vessels	
		Measures to address methane & VOC emissions	
Mid-term	2023-2030	Low- & zero-carbon fuel implementation program	
		Further operational efficiency measures	SEEMP
		Market-based measures (MBMs)	
Long-term	>2030	Development & provision of zero-carbon or fossil-free fuels	



# Limits on the Initial IMO Strategy

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- Not legally binding for member states (at least in the current format)
- Targets not aggressive enough
  - EU argued for 70 to 100 % cut in GHG emissions by 2050, compared with 2008 levels
- Distributing responsibilities among member states still remains tough
  - Responsibilities will not be such as those under the Kyoto Protocol
  - Still ,any mandatory measure will inevitably have discriminating effects across nations → prospect of heated arguments about equity & historical responsibilities
- Nonetheless, it marks the first time that international shipping has been given GHG emission reduction targets of any kind, with hopes for more stringent climate action to be taken by member states and stakeholders through the IMO

# What Korea Does to Reduce GHG Emissions from International Shipping

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- Related policy measures focused on short sea shipping
  - Comprehensive Development Strategy for Short Sea Shipping (Oct. 2017): contains measures for phase-outs of old vessels through subsidies & tax breaks
- A couple of measures targeting international shipping in particular
  - RPS for international shipping: 5% of fuel from renewables (Jan. 2014)
  - Fuel shift from oil to LNG for large vessels; incentives for constructing & purchasing LNG-powered vessels (May 2018)
- No systematic response exists yet to tackle GHG emissions from international shipping
- Technical cooperation with neighboring countries (China, Japan) will help designing & implementing effective policy measures geared toward international shipping

Please direct your comments & questions to:  
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Thank you!