Initial IMO GHG strategy – role of alternative fuels in meeting the ambition?

Symposium on IMO 2020 and alternative fuels
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IMO work to address GHG emissions from ships

- In September 1997, Air Pollution Conference adopted resolution 8 on \( CO_2 \) emissions from ships


  - Assembly urged the Marine Environment Protection Committee to identify and develop the mechanism or mechanisms needed to achieve the limitation or reduction of GHG emissions from international shipping and, in doing so, to give priority to:.....

    .....the evaluation of technical, operational and market-based solutions

- Resolution A.1110 (30) Strategic Plan, adopted by Assembly in December 2017

  - Strategic Direction 3 *Respond to climate change*
Initial IMO Strategy on Reduction of GHG emissions from ships - context

➢ In 2012, CO₂ emissions from international shipping were approx. 800 million tonnes accounting for 2.2% of global CO₂ emissions

➢ ~300MT of fuel oil used by shipping in 2012

➢ Negligible energy demand for shipping is met by sustainable low/zero carbon energy

➢ Alternative energy sources and/or alternative fuels are key to reducing GHG emissions

➢ Demand is the key driver for growth in emissions
RESOLUTION MEP/014/2013
(Amended on 15 August 2013)
INITIAL AND SUBSEQUENT REDUCTION OF GHG EMISSIONS FROM DRESE

UNITED NATIONS PROTECTION COMMITTEE

The United Nations, acting through the United Nations Committee on the Prevention of Violations of Human Rights in the Field of Economic, Social and Cultural Rights, was established by the General Assembly in its Resolutions 45/190 of 21 December 1990 and 48/81 of 15 November 1993.

A. Appropriate measures to address economic and social problems arising from the activities of governments and their authorities, including those of international organizations, the United Nations and its specialized agencies,

B. The United Nations Committee on the Prevention of Violations of Human Rights in the Field of Economic, Social and Cultural Rights, in its Resolution of 20 December 1990 (45/190), and in its Resolution of 20 June 1993 (48/81), recommends that States should take appropriate steps to implement the recommendations of the Committee, including those concerning the adoption of legislative and administrative measures to prevent violations of human rights and to ensure that the rights of individuals and peoples are respected and protected.

C. The United Nations Committee on the Prevention of Violations of Human Rights in the Field of Economic, Social and Cultural Rights, in its Resolution of 20 December 1990 (45/190), and in its Resolution of 20 June 1993 (48/81), recommends that States should take appropriate steps to implement the recommendations of the Committee, including those concerning the adoption of legislative and administrative measures to prevent violations of human rights and to ensure that the rights of individuals and peoples are respected and protected.

D. The United Nations Committee on the Prevention of Violations of Human Rights in the Field of Economic, Social and Cultural Rights, in its Resolution of 20 December 1990 (45/190), and in its Resolution of 20 June 1993 (48/81), recommends that States should take appropriate steps to implement the recommendations of the Committee, including those concerning the adoption of legislative and administrative measures to prevent violations of human rights and to ensure that the rights of individuals and peoples are respected and protected.

E. The United Nations Committee on the Prevention of Violations of Human Rights in the Field of Economic, Social and Cultural Rights, in its Resolution of 20 December 1990 (45/190), and in its Resolution of 20 June 1993 (48/81), recommends that States should take appropriate steps to implement the recommendations of the Committee, including those concerning the adoption of legislative and administrative measures to prevent violations of human rights and to ensure that the rights of individuals and peoples are respected and protected.

Adopted
The shipping sector is finally on board in the fight against climate change.

U.N. shipping agency reaches deal to cut CO2 emissions.

Shipping regulators reach deal to cut carbon emissions.

Carbon dioxide from ships at sea to be regulated for first time.

For the first time, maritime shipping has a climate target.

Carbon emissions from global shipping to be halved by 2050, says IMO.

The shipping industry is finally going to cut its climate change emissions. That's a big deal.
#Shipping sector has delivered! The agreement reached this week at @IMOHQ is a significant step forward in the global efforts to tackle climate change. The decision to at least halve shipping emissions by 2050 is a major milestone in addressing #climatechange. I call on all nations to build on this achievement and use the review mechanism to step up the level of ambition in 2023. bit.ly/2lXkWCS #MEPC72 #ParisAgreement

"It is a landmark achievement in the effort to reduce emissions," says Lars Robert Pedersen, BIMCO Deputy Secretary General on adoption of IMO emissions-strategy. #IMO
Initial IMO Strategy on Reduction of GHG emissions from ships

2 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.
.1 carbon intensity of the ship to decline through implementation of further phases of the energy efficiency design index (EEDI) for new ships to review with the aim to strengthen the energy efficiency design requirements for ships with the percentage improvement for each phase to be determined for each ship type, as appropriate;

.2 carbon intensity of international shipping to decline to reduce CO\textsubscript{2} emissions per transport work, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008; and

.3 GHG emissions from international shipping to peak and decline to peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008 whilst pursuing efforts towards phasing them out as called for in the Vision as a point on a pathway of CO\textsubscript{2} emissions reduction consistent with the Paris Agreement temperature goals.
Candidate measures

➢ The Initial Strategy identifies a list of candidate measures with the following timelines:

• Short-term measures could be finalized and agreed between 2018 and 2023

• Mid-term measures could be finalized and agreed between 2023 and 2030

• Long-term measures could be finalized and agreed beyond 2030

➢ The revised IMO strategy is to be adopted in 2023.
Level of ambition 1: carbon intensity of the ship

- EEDI adopted 2011, entered into force 1 January 2013
- Phase 0 (2013 to 2015) required EEDI = reference line
- Phase 1 (1/1/2015 to 31/12/2019) required EEDI = reference line - 10%
- Phase 2 (1/1/2020 to 31/12/2024) required EEDI = reference line - 20%
- Phase 3 (from 1/1/2025 onwards) required EEDI = reference line - 30%

- MEPC 71 established a **Correspondence Group on EEDI Review Beyond Phase 2** to consider a strengthening of the EEDI phase 3 requirements

- MEPC 74 approved, **for adoption at MEPC 75**, amendments to regulation 21.2 of Annex VI:
  - **Phase 3 (30% reduction rate) entry into effect is brought forward to 2022** (from 2025), for the following ship types:
    - Gas carrier of 15,000 DWT and above
    - Containership
    - General cargo ship
    - LNG carrier
    - Cruise passenger ship having non conventional propulsion
Level of ambition 1: carbon intensity of the ship

➢ Amendment, if adopted at MEPC 75, would enhance the phase 3 EEDI reduction rates for containerships as follows:

- 50% for containership of 200,000 DWT and above
- 45% for containerships > 120,000 DWT and < 200,000 DWT
- 40% for containerships > 80,000 DWT and < 120,000 DWT
- 35% for containerships > 40,000 DWT and < 80,000 DWT

➢ MEPC 74 also agreed terms of reference for a Correspondence Group to look into the introduction of a possible “phase 4” of EEDI requirements
Level of ambition 2: carbon intensity of international shipping to decline - technical measures for improving energy efficiency

➢ Improvement of hull form (reduction of propulsion resistance)
➢ Improvement of engine/propeller (improvement in propulsion efficiency)
➢ Hull appendage for energy saving
➢ Waste Heat Recovery
➢ Utilization of renewable energy, etc.
➢ Use of LEDs
Carbon intensity of international shipping to decline - operational measures for improving energy efficiency

- Trim & draft optimization
- Optimization of operating plan for each ship or fleet
- Speed optimization
- Weather Routing
- Just in Time arrival in port
- Hull cleaning
- Propeller polishing
- Maintenance of engine
MEPC 74 adopted **resolution MEPC.323(74) on Invitation to Member States to encourage voluntary cooperation between the port and shipping sectors to contribute to reducing GHG emissions from ships**

This resolution encourages the port sector to engage in the efforts to reduce GHG emissions from ships. It identifies in particular four possible areas of interest:

- development of Onshore Power Supply facilities (preferably from renewable sources);
- provision of safe bunkering of alternative low-carbon and zero-carbon fuels;
- promotion of port incentives schemes; and
- optimization of port calls, including facilitation of Just-in-Time arrival of ships.
Level of ambition 3: at least 50% reduction of absolute GHG emissions by 2050 (requires approximately 85% CO₂ reduction per ship)
........the Initial Strategy identifies levels of ambition for the international shipping sector noting that technological innovation and the global introduction of alternative fuels and/or energy sources for international shipping will be integral to achieve the overall ambition........

.1 carbon intensity of the ship to decline through implementation of further phases of the energy efficiency design index (EEDI) for new ships
to review with the aim to strengthen the energy efficiency design requirements for ships with the percentage improvement for each phase to be determined for each ship type, as appropriate;

.2 carbon intensity of international shipping to decline
to reduce CO₂ emissions per transport work, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008; and

.3 GHG emissions from international shipping to peak and decline
to peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008 whilst pursuing efforts towards phasing them out as called for in the Vision as a point on a pathway of CO₂ emissions reduction consistent with the Paris Agreement temperature goals.
The “4th propulsion revolution”?
How to achieve the ambition of the Initial Strategy

Achieving the goals of the Initial IMO GHG Strategy will require a mix of technical, operational and innovative solutions applicable to ships. Some of them, along with indication on their approximate GHG reduction potential, are highlighted below.

- **5-15%** Power and propulsion systems
- **50-90%** Full electric
- **35%** Bio-LNG/LPG
- **90%** Biofuel 3rd generation
- **80-100%** Hydrogen and other synthetic fuels
- **2-20%** Hull and superstructure
- **2-50%** Concept, speed and capability
- **1-10%** Energy management
- **1-10%** Voyage optimization
- **5-50%** Fleet management, logistics and incentives
- **up to 75%** Extensive speed optimization
Zero-carbon fuels for shipping

Using a mix of electro-fuels and electricity, both made from renewable energy, plus some limited bio-fuels, shipping can achieve the IMO GHG target and reduce its emissions further.

1. **Bio-fuels + limitations**
   - **1st Generation**
     - Produced from food resources, such as wheat and sugar.
     - Resource competition
     - Life-cycle emissions
   - **2nd Generation**
     - Produced from bio-mass resources such as wood and organic waste.
     - Resource competition
     - Land use alteration
   - **3rd Generation**
     - Produced from sustainably cultivated organic materials such as algae.
     - Resource competition
     - Land use alteration
   - **4th Generation**
     - Produced from bio-mass resources in combination with carbon dioxide capture and storage.
     - Resource competition
     - Land use alteration

A number of limitations are associated with bio-fuels. That is why electro-fuels and electricity generated from renewable energy are likely the more sustainable option.

No one solution fits all. Different solutions suit different vessel types based on size, power and range requirements.

Short-sea or domestic shipping suitable for electrification
- Relatively small tonnage and limited range requirements, including small cargo ships and tankers, barges, ferries.

Deep-sea shipping requiring electro-fuels
- Large tonnage and considerable range requirements, including large container ships, bulk cargo and gas carriers, larger tankers, cruise ships, RoRo ferries, etc.

Further work is needed to transition the maritime industry to zero-carbon fuels.

- Scale up production of renewable energy production & zero-carbon fuels
- Improve availability and reduce costs
- Scale up deployment of zero-emission vessels
- Develop supportive policy, standards and rules

Sources:
Programme of follow-up actions of the initial IMO strategy to 2023 (approved at MEPC 73)

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<th>Streams of activity</th>
<th>2018 MEPC 73</th>
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<td>Consideration and decisions on candidate short-term measures that can be considered and addressed under existing IMO instruments e.g. further improvement of the existing energy efficiency framework with a focus on EEDI and SEEMP, ITCP&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Data analysis, in particular from IMO Fuel Oil Consumption DCS</td>
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<td>Candidate mid-/long-term measures and action to address the identified barriers</td>
<td>Invite concrete proposals</td>
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<td>Progress made and timelines agreed on the development of mid- and long-term measures</td>
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**Impact on States**<sup>4</sup>

- **Fourth IMO GHG Study**
  - Scope
  - Initiation of the Study
  - Progress report
  - Final report

**Capacity-building, technical cooperation, research and development**

- Development and implementation of actions including support for assessment of impacts and support for implementation of measures

**Follow-up actions towards the development of the revised Strategy**

- Ship fuel oil consumption data collection pursuant to regulation 22A of MARPOL Annex VI (DCS)
- Initiation of revision of the Initial Strategy taking into account IMO DCS data and other relevant information
- Adoption of revised Strategy

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<sup>2</sup> Includes ongoing work pursuant to regulation 21.6 of MARPOL Annex VI.

<sup>3</sup> “In aiming for early action, the timeline for short-term measures should prioritize potential early measures that the Organization could develop, while recognizing those already adopted, including MARPOL Annex VI requirements relevant for climate change, with a view to achieve further reduction of GHG emissions from international shipping before 2023” (paragraph 4.2 of the Initial Strategy).

<sup>4</sup> Assessment of impacts on States to be undertaken in accordance with the procedure to be developed by the Organization.
Relevant publications

https://glomeep.imo.org/resources/publications/
Future of shipping

- enabling environments need to be developed
- current status of maritime technology and future trends include:
  - smarter, data driven, greener ships
  - fully connected wireless onboard & digitally connected via satellite
  - new cleaner fuels
  - new flexible propulsion technologies
  - new materials
- knowledge gap and readiness of maritime companies to effectively deploy new technologies could be addressed through the use of testing/demonstration facilities
- beyond the “hardware” aspect, the role of the seafarer needs greater consideration without which technology cannot be effectively utilised
Thank you for your attention