

IMO action on reducing GHG emissions from international shipping

*13th ISCC Global Sustainability Conference
15 February 2023*



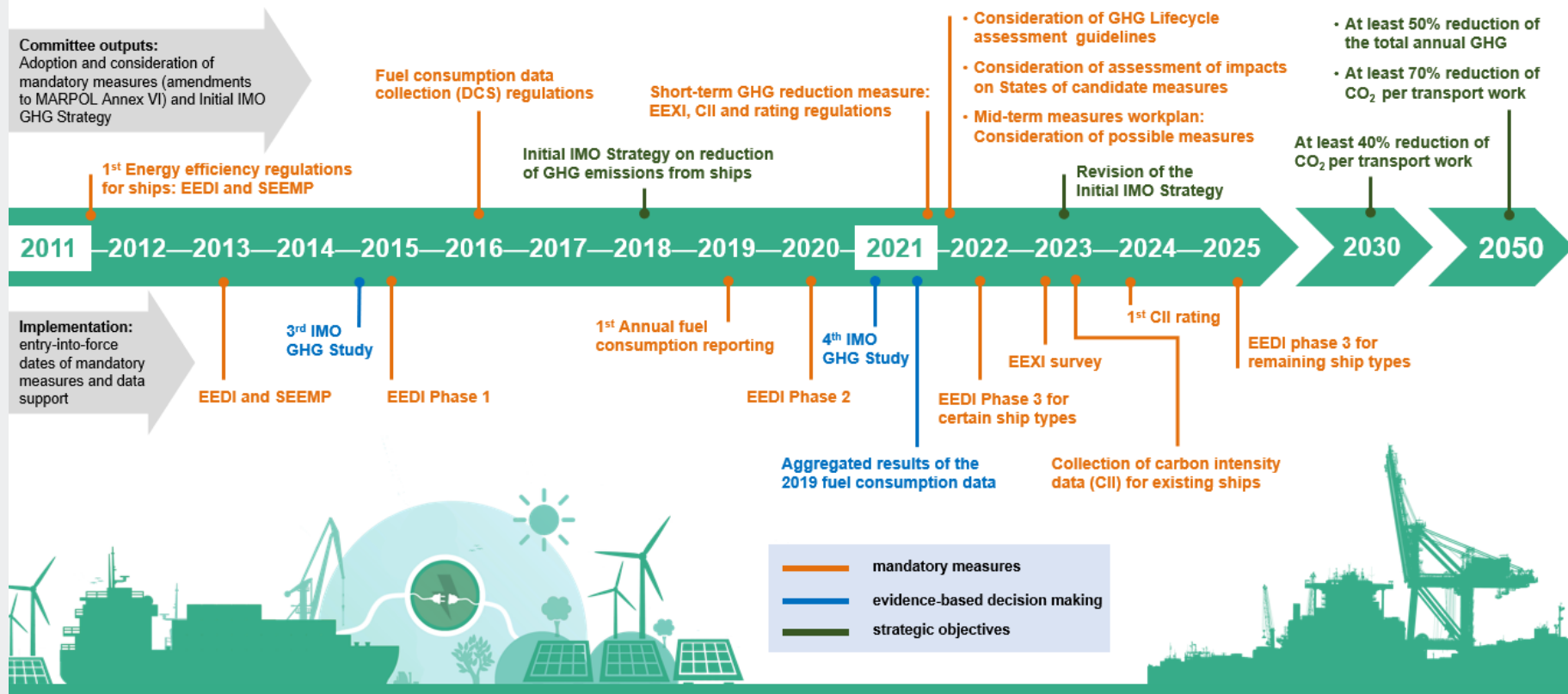
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GHG reduction: Over a decade (2011-2022) of mandatory IMO energy-efficiency requirements in MARPOL Annex VI

Addressing climate change



A decade of **regulatory action** to cut GHG emissions from shipping:
towards phasing out GHG emissions from international shipping as soon as possible in this century



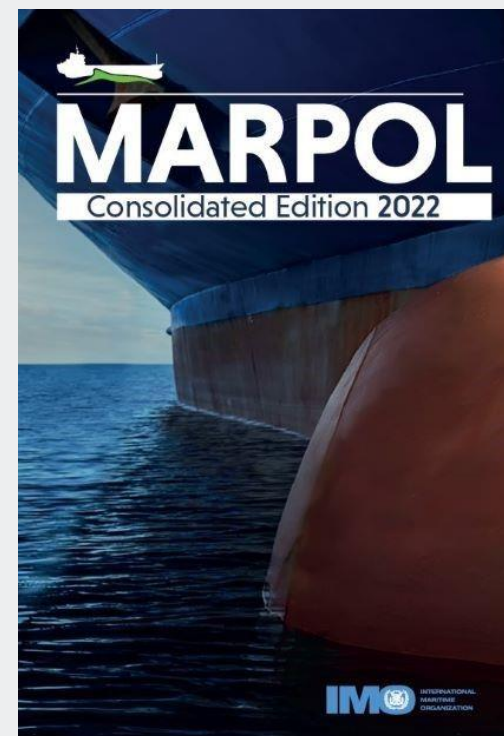
See: <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Cutting-GHG-emissions.aspx>

MARPOL Annex VI: Defining binding regulations aimed at reducing air pollution from ships

MARPOL is the International Convention for the Prevention of Pollution from Ships, adopted in 1973

MARPOL Annex VI on Air Pollution from Ships:

- additional protocol to the Convention adopted in 1997
- ratified by **105 States - 97% of world tonnage**
- contains **binding requirements** which are **enforced globally** by flag States and port States
- **Chapter 3** regulates **air pollution**: sulphur content of bunker fuels (“IMO2020”) – emission control areas (ECAs), NOx emissions from engines, etc.
- **Chapter 4** regulates **carbon intensity of ships** (GHG emissions)



GHG reduction: Over 10-years of mandatory IMO energy-efficiency requirements in MARPOL Annex VI

Ship Energy Efficiency Management Plan (SEEMP)

Since 2013: Each ship shall have a **ship-specific SEEMP** on board

Energy Efficiency Design Index (EEDI)

Since 2015: Gradually **more stringent energy efficiency performance of new build ships** under subsequent EEDI phases

IMO's Fuel Consumption Data Collection System (DCS)

Since 2019: Ships over 5,000 gt to report **annual fuel consumption data** to their Administration; forwarded to IMO

2021: 109 Administrations - 28,171 ships - 212 million tonnes of fuel

Implementing the 2018 *Initial IMO Strategy on Reduction of GHG emissions from ships*



MEPC 72/17/Add.1
Annex 11, page 1

ANNEX 11

RESOLUTION MEPC.304(72)
(adopted on 13 April 2018)

INITIAL IMO STRATEGY ON REDUCTION OF GHG EMISSIONS FROM SHIPS

THE MARINE ENVIRONMENT PROTECTION COMMITTEE

RECALLING Article 38(e) of the Convention on the International Maritime Organization (the Organization) concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

ACKNOWLEDGING that work to address greenhouse gas (GHG) emissions from ships has been undertaken by the Organization continuously since 1997, in particular, through adopting global mandatory technical and operational energy efficiency measures for ships under MARPOL Annex VI,

ACKNOWLEDGING ALSO the decision of the thirtieth session of the Assembly in December 2017 that adopted for the Organization a strategic direction entitled "Respond to Climate Change",

RECALLING the United Nations 2030 Agenda for Sustainable Development,

1. ADOPTS the Initial IMO Strategy on Reduction of GHG Emissions from Ships (hereinafter the Initial Strategy) as set out in the annex to the present resolution;
2. INVITES the Secretary-General of the Organization to make adequate provisions in the Integrated Technical Cooperation Programme (ITCP) to support relevant follow-up actions of the Initial Strategy that may be further decided by the Committee and undertaken by developing countries, particularly least developed countries (LDCs) and small island developing States (SIDS);
3. AGREES to keep the Initial Strategy under review, with a view to adoption of a Revised IMO Strategy on reduction of GHG emissions from ships in 2023.

adopted

1/MEPC.7/MEPC.72-17-ADD.1.docx



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ARTICLE / 14 APR, 2018

World Nations Agree to At Least Halve Shipping Emissions by 2050

Implementing the Initial IMO GHG Strategy: IMO's short-term measure to reduce the carbon intensity of the global fleet

New mandatory carbon intensity requirements

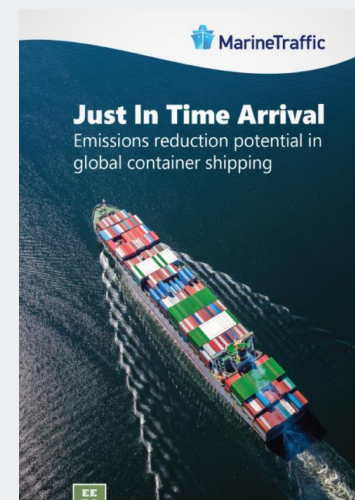
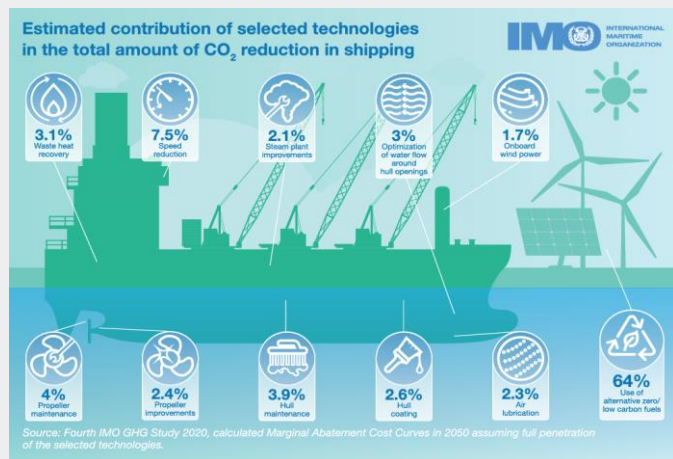
- **MEPC 76** (June 2021): following a '**comprehensive impact assessment**', of possible impacts on States, adopted binding requirements to reduce carbon intensity of the world fleet: **EEXI, CII rating and enhanced SEEMP**
- Implementation guidelines were adopted thereafter
- **Entry-into-force November 2022 – review/strengthening by 2026**

Enhanced involvement of the maritime value chain in the energy efficiency performance of a ship

- IMO's CII is a **valuable tool** for Administrations, ports, and other stakeholders, incl. financial sector, cargo owners, to **enhance their involvement** and **provide incentives** to most energy efficient ships

The short-term IMO GHG reduction measure: enhanced involvement of the maritime value chain in a ship's energy efficiency performance

- Continuous energy efficiency improvements of existing fleet is of key importance to **reduce the world's fleet overall energy needs** and facilitate **take-up of (more expensive) alternative fuels**
- The **short-term measure** provides relevant **building blocks** for future GHG reduction measures



- Review of the measure to be concluded by 2026. Need to **build experience, collect data** in the first years of implementation and provide input to the review process
- Role of **biofuels** in CII compliance?

Outcome of MEPC 79: Revision of the Initial IMO GHG Strategy

- MEPC 79 considered the report of ISWG-GHG 13 (5-9 December 2022)
- A working group on Reduction of GHG emissions from ships was established

The Committee reaffirmed its commitment to:

- adopt a revised IMO GHG Strategy by MEPC 80 (3-7 July 2023)
- revise the IMO GHG Strategy in all its elements
- including a strengthened level of ambition

Revised resolutions adopted on voluntary measures

- MEPC 79 adopted revised resolutions on voluntary cooperation with ports and on national action plans to include references to cooperation through the whole value chain, to create favourable conditions to reduce GHG emissions from ships through **shipping routes** and **maritime hubs**

Outcome of MEPC 79: Development of mid-term IMO GHG reduction measures

Workplan adopted at MEPC 76

- Phase I – Collation and initial consideration of proposed measures
- ➔ ■ Phase II – Assessment and selection of measure(s) to further develop
- Phase III – Development of (a) measure(s) to be finalized within (an) agreed target date(s)

The Committee noted progress on this issue:

- **Increased convergence** on the development of a basket of measures consisting of **both technical (e.g. GHG fuel standard) and economic elements (e.g. levy)**
- Promote the energy transition of shipping and provide the world fleet the needed **incentive** to decarbonize while contributing and **ensuring a level playing field** and a **just and equitable transition**
- MEPC 80 to **identify which mid-term measure(s) to develop further in priority**

Life Cycle GHG assessment guidelines (LCA Guidelines)

- MEPC 79 considered the interim report of the Correspondence Group on LCA guidelines which will allow for a Well-to-Wake calculation of total GHG emissions related to the production and use of marine fuels

Outcome of MEPC 79: Development of guidelines on life cycle GHG intensity of marine fuels (IMO LCA guidelines)

Correspondence Group's tasks

1. identify **main initial fuel production pathways and feedstocks**
2. further consider **sustainability criteria issues** and further develop the Fuel Lifecycle Label (FLL)
3. develop **methodologies** that allow for the calculation of Well-to-Tank, Tank-to-Wake and entire Well-to-Wake GHG emissions **default values**
4. develop procedures that allow for the continuous **review** of emissions **default values**
5. develop guidance for **third-party verification and certification schemes** (*e.g.: scope of third-party verification, criteria for recognizing certification schemes*)

What's next?

ISWG-GHG 15 (26-30 June): finalization of LCA Guidelines
MEPC 80 (3-7 July): adoption of IMO LCA Guidelines

Study on the readiness and availability of low- and zero-carbon technology and marine fuels

Analysis of the **availability and readiness of future fuels and technologies** to assess the feasibility of a series of GHG reduction scenarios

Report to be submitted to MEPC 80

Categories, sub-categories and individual techniques

1. Energy efficiency

Operational / Voyage optimisation

- Speed reduction (slow-steaming)
- Advanced port logistics
- Advanced autopilots
- Weather routing
- Autonomous shipping
- Hull cleaning
- Power demand management (e.g. lighting)
- Propeller cleaning and polishing
- Optimisation of vessel capacity utilisation
- Engine efficiency measurements



2. Reduction in engine energy demand

Alternative propulsion technologies

- Large area propellers (LAP)
- Contra rotating propellers (CRP)
- Podded thrusters
- Ducts
- Pre-swirl
- Post – swirl fins and rudder bulbs



Power assistance

- Flettner rotors
- Towing kites
- Sails
- Solar panels
- Shore power supply



3. Alternative fuels and energy carriers

Future energy carriers

- LNG
- LPG
- Ammonia
- Hydrogen
- Methanol
- DME
- FAME
- HVO
- Batteries
- Fuel Cells



4. Carbon capture

Carbon capture (CC) was also investigated and considered

Vessel design

- Optimum ship size dimensions
- Construction weight
- Hull dimensions (form optimisation)
- Bulbous bow retrofit
- Bow thruster tunnel optimisation
- Hull coatings
- Interceptors
- Ducktail waterline extension
- Air lubrication
- Ballast reduction and trim optimisation



Engine technology and aftertreatment

- Common fuel rail injection
- Water in Fuel Emulsion (WIFE)/Water Injection
- Dual fuel/gas engines
- Waste heat recovery (WHR)

Production pathway stages

Stage	Technologies	Fuels
Resource generation	Not assessed	Assessed
Fuel production	Not assessed	Assessed
Supply/refuelling/manufacturing	Assessed (shipyard capacity from Task 2)	Assessed
On-board storage	Not assessed	Assessed separately for new & existing vessels
Propulsion	Assessed separately for new & existing vessels	Assessed separately for new & existing vessels

Fuel production and use stages (value chains)

Production & use stage	Input	Output
Electrolysis	Water Electricity	Hydrogen (Electrolytic)
Natural gas extraction	Gas energy	Methane (natural gas)
Biogas production	Farm waste	Biogas
Biogas upgrading	Biogas	Methane (bio) CO ₂
Steam methane reforming	Methane water	Syngas
Syngas pressure swing adsorption	Syngas	Hydrogen (blue or bio) CO ₂
Nitrogen separation (PSA or cryo)	Air	Nitrogen Oxygen (& other traces)
Haber Bosch process	Nitrogen Hydrogen Heat energy	Ammonia
Ammonia liquefaction	Ammonia (gas)	Ammonia (liquid)
Carbon capture (industrial)	Flue gas	CO ₂
Carbon capture (air)	Electricity Air	CO ₂
Sabatier process	CO ₂ Hydrogen	Methane (synthetic) Oxygen
Methane liquefaction	Methane (nat gas, bio, eCH ₄) Electricity	LCH ₄
Hydrogen liquefaction	Hydrogen Electricity	LH ₂
Ammonia liquefaction	Ammonia Electricity	LNH ₃
Liquid bio-fuels	Wastes, oils, crops	HVO, FAME, etc.
Methanol synthesis	Hydrogen CO ₂	Methanol (synthetic)
Fischer Tropsch (inc WGSR)	Hydrogen CO ₂	Blue crude -> e-diesel
Hydrogen ICE	Hydrogen	Water (+ NOx)
Hydrogen FC	Hydrogen	Water
Methane ICE	Methane (+ diesel)	CO ₂ +NOx+CH ₄
Methanol ICE	Methanol (+ diesel)	CO ₂ +NOx
Ammonia ICE	Ammonia + diesel	CO ₂ +NOx+NH ₄ +N ₂ O
Diesel ICE	Diesel	CO ₂ +NOx

To be continued...

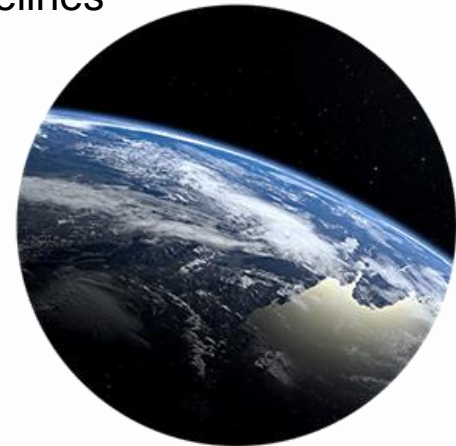
Next steps

- **ISWG-GHG 14 (20-24 March 2023)**
- **ISWG-GHG 15 (26-30 June 2023)**

main focus on:

- (1) revision of the Strategy;
- (2) further consideration of a basket of mid-term GHG reduction measures
- (3) further revision of the IMO DCS
- (4) final report of the Correspondence Group on LCA guidelines

- **MEPC 80 (3-7 July 2023):**
 - (1) adoption of the Revised Strategy;
 - (2) end of Phase II and beginning of Phase III for the development and finalization of mid-term measures
 - (3) adoption of LCA guidelines
- More to come...



Thank you for your attention

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