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The International Maritime Organization's Initial Greenhouse Gas Strategy

(This is an initial report on, and preliminary analysis of, IMO's initial greenhouse gas strategy for international shipping prepared by ICCT's marine program director, Dan Rutherford, and senior marine researcher, Bryan Comer. The ICCT will publish a final policy update on IMO's action in late April or early May.)

At the 72nd meeting of its Marine Environment Protection Committee, the International Maritime Organization (IMO) adopted a resolution codifying an initial greenhouse gas (GHG) strategy for international shipping. This strategy, which represents the first global climate framework for shipping, includes quantitative GHG reduction targets through 2050 and a list of candidate short-, mid-, and long-term policy measures to help achieve these targets. The strategy implies that international shipping would consume between 3.8% and 5.8% of the world's remaining carbon budget under the Paris Agreement, up from 2.3% in 2015. Meeting the strategy's 2050 target will require near-term policies to significantly improve the fuel efficiency of the global fleet and to promote the development and deployment of low- and zero-carbon fuels and propulsion technologies.

INTRODUCTION

The International Maritime Organization (IMO), which regulates international shipping, has struggled with how to control greenhouse gas (GHG) emissions from oceangoing vessels since 1997. Under the United Nations Framework Convention on Climate Change's (UNFCCC) 1997 Kyoto Protocol, the IMO was assigned responsibility to limit GHG emissions from international shipping, which fall outside of national borders. It wasn't until 2011, with the passage of the Energy Efficiency Design Index (EEDI), that IMO adopted its first mandatory requirements for GHG emissions from oceangoing vessels (OGVs). In 2015, reduction targets for international shipping and international aviation were left out of the Paris Agreement. Subsequently, the International Civil Aviation Organization (ICAO), the IMO's sister agency governing aircraft, adopted a global climate agreement aimed at carbon-neutral growth from 2020. This left international shipping as the only major sector not covered under a global GHG agreement.

Recently, IMO has taken action to address this gap. Beginning at the 68th meeting of IMO's

Marine Environment Protection Committee (MEPC 68) in 2015, a group of South Pacific and European member states began pushing IMO to dramatically reduce, and eventually eliminate, GHGs from international shipping. A significant breakthrough happened at MEPC 70 in October 2016, when IMO agreed to develop an initial comprehensive strategy to reduce GHG emissions from international shipping by spring 2018 (MEPC 72), including a broad goal of decarbonization; emission reduction targets (including, potentially, a cap on international shipping emissions), a list of candidate short-, mid-, and long-term measures to reduce emissions; and additional measures to reduce the burden on developing countries. Three intersessional GHG meetings, first in June 2017, then October 2017, and most recently in April 2018, were held to develop the strategy. This strategy was accepted as a resolution at MEPC 72.

OVERVIEW OF THE RESOLUTION

The initial IMO strategy, which will be revised in 2023 and reviewed in 2028, includes an overall vision for decarbonization; GHG reduction targets through 2050; a list of potential short-, mid-, and long-term measures to meet these targets; barriers to achieving the targets and supportive measures to help achieve them; and criteria for future review. Each of these is described in further detail below.

Vision

The resolution's stated vision is a qualitative description of IMO's ambition. It states that "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."

GHG reduction targets

The strategy includes quantitative carbon intensity and GHG reduction targets for the international shipping sector, including:

1. At least a 40% reduction in carbon intensity by 2030 and pursuing efforts towards a 70% reduction by 2050, both compared to 2008 levels.
2. Peak GHG emissions from international shipping as soon as possible and 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.
3. New phases of the EEDI, to be reviewed within MEPC.

CO₂ emissions from international shipping under the strategy are shown in Figure 1 and compared to one possible business as usual (BAU) emissions pathway. Emissions for the years 2007-2012 are from Smith et al. (2015), while emissions from 2013-2015 emissions are from Olmer, et al. (2017). Emissions in 2016 and beyond are projected using the ICCT's fleet turnover model (Wang and Lutsey, 2013). The analysis also incorporates historical demand for international shipping from UNCTAD (2017) and projected future demand for international

shipping from the International Transport Forum (ITF, 2017). A range of emissions pathways are possible under IMO’s initial strategy (Figure 1). The blue line is the minimum ambition implied by the strategy; it reflects a 40% carbon intensity reduction by 2030 and an absolute emissions reduction of 50% by 2050, with full decarbonization by 2100. The green line is the maximum possible ambition implied by the strategy; it’s driven primarily by the goal to pursue phasing out GHG emissions from international shipping at the pace consistent with the Paris temperature goals. The strategy implies cumulative CO₂ emissions of between 28 and 40 gigatonnes (Gt) from international shipping from 2015 through 2075, compared to a BAU of more than 100 Gt over the same period.

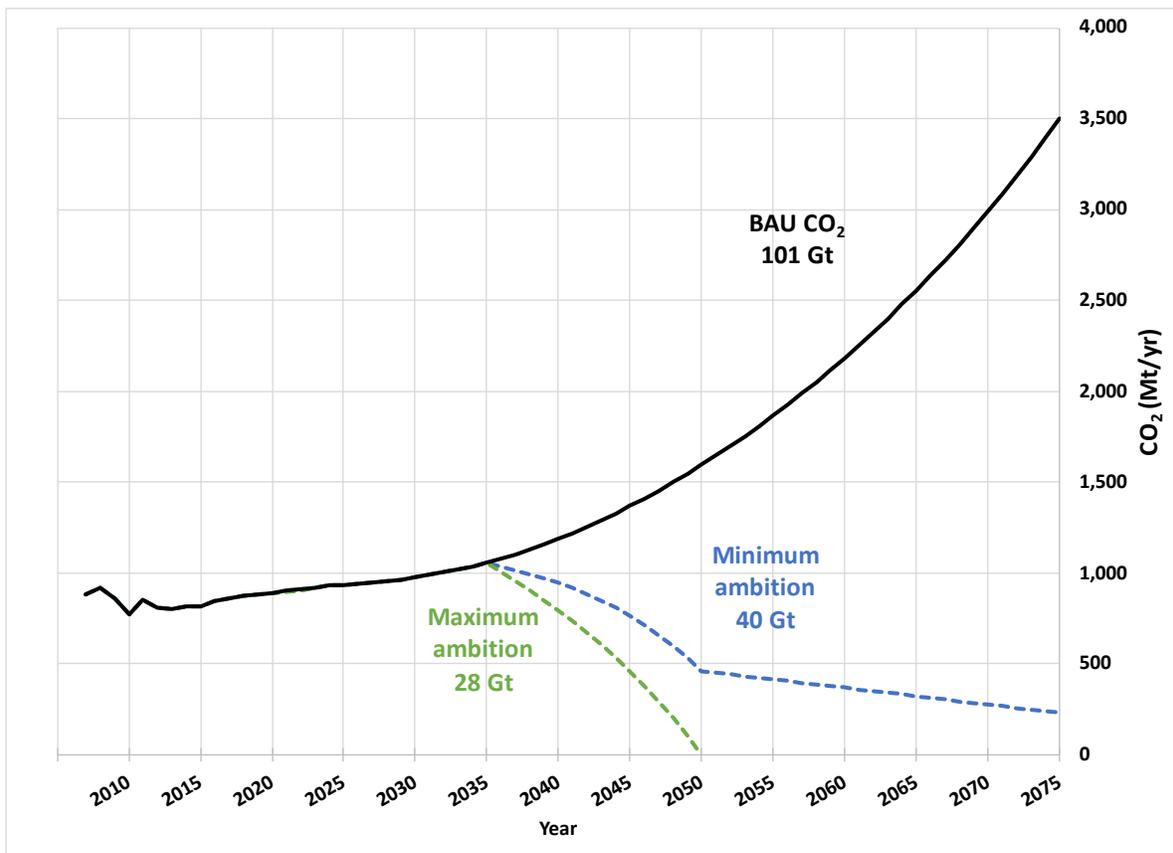


Figure 1: CO₂ emissions from international shipping under IMO’s initial GHG strategy (blue and green) vs. BAU (black), with cumulative emissions 2015 through 2075.

Measures

IMO’s initial GHG strategy includes a list of measures that could be implemented to meet its emission targets. Measures are distinguished as either short-, mid-, or long-term, meaning they would be finalized and implemented from 2018 to 2023, 2023 to 2030, and 2030 or after, respectively (Table 1). These measures need to be made mandatory under an IMO convention like the International Convention for the Prevention of Pollution from Ships (MARPOL) before they become legally binding.

Table 1. Candidate measures included in IMO’s initial GHG strategy.

Type	Years	Measure	Target	Current status
Short-term	2018-2023	New Energy Efficiency Design Index (EEDI) phases	New vessels	-10% in 2015 -20% in 2020 -30% in 2025
		Operational efficiency measures (e.g. SEEMP, operational efficiency standard)	In-service vessels	SEEMP planning required
		Existing fleet improvement program	In-service vessels	-----
		Speed reduction	In-service vessels	-----
		Measures to address methane and VOC emissions	Engines and fugitive emissions	-----
Mid-term	2023-2030	Alternative low-carbon and zero-carbon fuels implementation program	Fuels/new and in-service vessels	-----
		Further operational efficiency measures (e.g. SEEMP, operational efficiency standard)	In-service vessels	SEEMP planning required
		Market-based Measures (MBMs)	In-service vessels/fuels	-----
Long-term	2030+	Development and provision of zero-carbon or fossil-free fuels	Fuels/new and in-service vessels	-----

The strategy also identified measures that could indirectly support these GHG reduction efforts, notably:

1. Encouraging the development and update of national action plans;
2. Encouraging ports to facilitate GHG reductions from shipping;
3. Initiating and coordinating R&D activities by establishing an International Maritime Research Board (IMRB);
4. Pursuing zero-carbon or fossil-free fuels for the shipping sector and developing robust lifecycle GHG/carbon intensity guidelines for alternative fuels;
5. Undertaking additional GHG emission studies to inform policy decisions and to estimate Marginal Abatement Cost Curves for each measure (if appropriate); and
6. Encouraging technical cooperation and capacity-building activities, as appropriate.

Other considerations

The strategy enumerates guiding principles, barriers to effective implementation, and approaches for future decision-making. These include: reconciling the IMO principle of nondiscrimination of legally binding measures by flag state (“no more favorable treatment”, or NMFT) to the UNFCCC principle of Common but Differentiated Responsibilities and Respective

Capabilities (CBDR-RC). Additionally, IMO agreed that the impact of measures on States, including developing countries and, in particular, Least Developed Countries (LDCs) and Small Island Developing States (SIDS), should be considered and that future decisions should combine evidence-based decision-making, balanced with a precautionary approach.

Review

The resolution agrees to keep IMO's initial GHG strategy under review, with a view to adopt a revised strategy in 2023. The revised strategy will be subject to review five years later.

ANALYSIS

As the first global climate framework for international shipping, IMO's initial GHG strategy holds important implications for the maritime transport industry's fuel use and GHG emissions. This section considers three of these implications: the likely overall emissions trajectory, measures to improve fuel efficiency, and measures to control other climate pollutants.

Emissions trajectory

According to the International Energy Association (IEA, 2017), in order for international shipping to contribute equally to the Paris Agreement goal of limiting anthropogenic warming to well below 2°C, shipping must emit no more than 17 Gt CO₂ from 2015 onward. The strategy implies between 28 and 43 Gt of CO₂ emitted by international shipping through 2100. Thus, IMO's initial GHG strategy suggests an emissions trajectory that overshoots a 1.75° C pathway by between 65% and 150%. In this case, international shipping would consume between 3.8% and 5.8% of the world's remaining Paris-compatible carbon budget, compared to 2.3% of anthropogenic CO₂ emissions today (Olmer et al., 2017).

The agreed emissions targets can be compared to the short-, mid-, and long-term measures summarized in Table 1. Figure 2 presents two policy pathways bridging the range of possible approaches that IMO could take to limit cumulative post-2015 emissions to less than 40 Gt through 2075. On the left panel, IMO adopts a mix of short-, mid-, and long-term measures starting in 2022, the final year of the initial strategy. On the right panel, IMO adopts only long-term measures, which take effect starting in 2030. Emission reductions associated with short, mid-, and long-term measures are shown as the brown, hatched gray, and cubed yellow wedges, respectively. Remaining emissions are shown in dark blue.

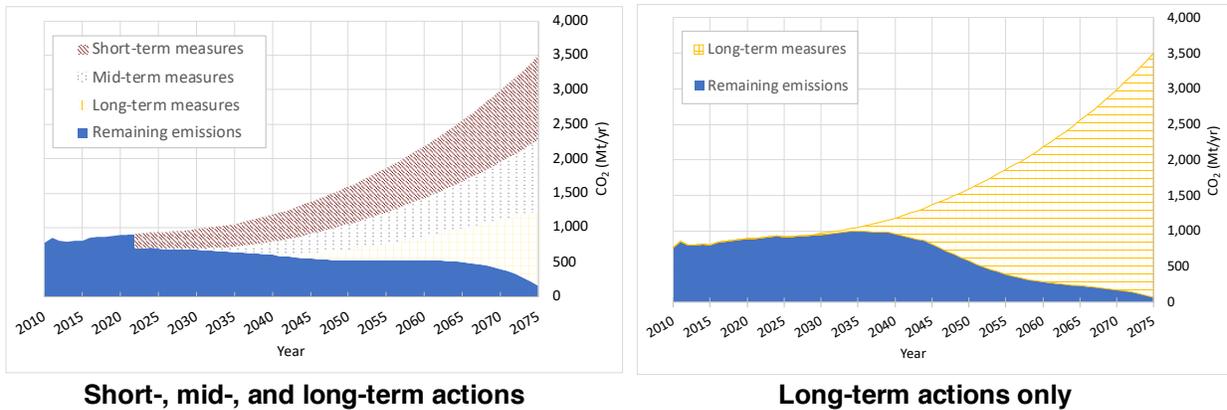


Figure 2: Potential policy pathways consistent with IMO's initial GHG strategy.

Under the first scenario, short-term measures, notably establishing new, more stringent EEDI targets and reducing fleet-wide speeds by an average of 20%, enables a more gradual decarbonization pathway and results in 36 Gt of cumulative CO₂ emissions from 2015-2075. Under this scenario, emissions peak in 2021, short-term measures account for about half cumulative reductions from BAU, and mid- and long-term measures are responsible for 30% and 20% of net reductions, respectively. Under the latter approach, which results in 39 Gt of cumulative CO₂ emissions from 2015-2075, peak emissions are delayed until 2034 with very aggressive policies required to reduce the carbon intensity of the fleet by more than 6% per year beginning in 2050 (see below).

Efficiency

Under the strategy's operational efficiency target, the carbon intensity of international shipping would fall 40% by 2030 from 2008 levels and up to 70% in 2050. As of 2015, the carbon intensity of international shipping has already dropped by more than 30% from 2008 levels (Olmer et al., 2017; Smith et al., 2015), primarily due to the 2008 global economic downturn that led ships to adopt widespread slow steaming to reduce fuel consumption and, therefore, fuel costs. Based on trends in international shipping emissions and demand, combined with fleet renewal under the EEDI, shipping's carbon intensity is likely to fall by at least another 10 percentage points by 2030 without further policy interventions. Similarly, the goal of halving 2050 emissions compared to 2008 levels implies reductions in carbon intensity greater than 70% target.

The minimum ambition targets above imply significant improvements to the design efficiency of new-build ships. Under the scenario where IMO works to implement short-, mid-, and long-term measures (Figure 2, left), EEDI targets are tightened gradually from -30% in 2022, to -40% in 2025, up to -70% in 2040. Under the scenario where IMO only focuses on long-term measures (Figure 2, right), EEDI targets are increased much more steeply, from -50% in 2035 up to -90% in 2045. This is in addition to widespread adoption of low-carbon fuels for zero emission vessels which, in this scenario, would account for two-thirds of all shipping energy use in 2070.

Other climate pollutants

IMO's agreement explicitly covers CO₂ and calls for considering measures to address emissions of methane and volatile organic compounds but not other climate pollutants, such as nitrous oxide or black carbon. Black carbon, in particular, is estimated to account for 7% to 21% of the overall climate impact of international shipping (Comer et al., 2017). Separate action on black carbon is being considered in IMO's Pollution Prevention and Response (PPR) Subcommittee.

NEXT STEPS

Now that the initial strategy has been finalized, IMO will consider which, if any, of the short-term measures should be made mandatory. An additional intersessional working group (ISWG-GHG 4) is planned for later this year, focused on developing an implementation plan for short-term measures. Separately, MEPC will deliberate whether to tighten the existing EEDI standards for new-build ships at its next two meetings. The phase 3 targets (30% efficiency improvement by 2025) are currently under review, and could be implemented soon, subject to a decision expected at MEPC 73 (October 2018). A separate decision on whether to institute new EEDI phases will be considered at MEPC 74 in 2019.

REFERENCES

Comer, B., Olmer, N., Mao, X., Roy B., & Rutherford, D. (2017). *Black carbon emissions and fuel use in global shipping, 2015*. International Council on Clean Transportation. Retrieved from <https://www.theicct.org/publications/black-carbon-emissions-global-shipping-2015>.

International Council on Clean Transportation (ICCT). (2011). *The Energy Efficiency Design Index (EEDI) for new ships*. Retrieved from <https://www.theicct.org/publications/energy-efficiency-design-index-eedi-new-ships>.

International Energy Agency (IEA). (2017). *Energy Technology Perspectives 2017*. Retrieved from <https://www.iea.org/etp2017/>.

International Transport Forum (ITF). (2017). *ITF Transport Outlook 2017*. Retrieved from <http://www.oecd.org/about/publishing/itf-transport-outlook-2017-9789282108000-en.htm>.

Olmer, N., Comer, B., Roy, B., Mao, X., & Rutherford, D. (2017). *Greenhouse gas emissions from global shipping, 2013–2015*. International Council on Clean Transportation. Retrieved from <https://www.theicct.org/publications/GHG-emissions-global-shipping-2013-2015>.

Smith, T. W. P., Jalkanen, J. P., Anderson, B. A., Corbett, J. J., Faber, J., Hanayama, S., ...& Pandey, A. (2015). Third IMO Greenhouse Gas Study 2014. Retrieved from

<http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>.

United Nations Conference on Trade and Development (UNCTAD). (2017). *Review of Maritime Transport 2017*. Retrieved from <http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=1890>.

Wang, H. & Lutsey, N. (2013). *Long term potential for increased shipping efficiency*. *International Council on Clean Transportation*. Retrieved from <https://www.theicct.org/publications/long-term-potential-increased-shipping-efficiency>.