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FURTHER DEVELOPMENT OF THE STRUCTURE AND IDENTIFICATION OF CORE ELEMENTS OF THE DRAFT INITIAL IMO STRATEGY ON REDUCTION OF GHG EMISSIONS FROM SHIPS

Identification and evaluation of measures to address GHG emissions from ships

Submitted by IMarEST

SUMMARY

Executive summary:	This document proposes a way to systematically identify measures to address GHG emissions from ships. It also discusses ways in which measures can be evaluated ex-ante
Strategic direction:	7.3
High-level action:	7.3.2
Output:	7.3.2.1
Action to be taken:	Paragraph 21
Related documents:	MEPC 57/21; MEPC 59/INF.10, MEPC 59/4/7; MEPC 67/6; MEPC 70/18/Add.1; MEPC 71/WP.5; ISWG-GHG 1/2/4; ISWG-GHG 1/2/7; MEPC 71/7/2 and ISWG-GHG 2/2

Introduction

1 MEPC 70 has agreed on a Roadmap for developing a comprehensive IMO Strategy on the reduction of GHG emissions from ships. The Roadmap specifies that the initial Strategy shall include "a list of candidate short-, mid- and long term further measures" (MEPC 70/18/Add.1).

2 The ISWG-GHG has noted lists of possible short-, mid- and long-term candidate measures that could be included in the initial Strategy. It also indicated in its report that these lists are not exhaustive (MEPC 71/WP.5).

3 This submission has a dual aim: it presents a framework for the identification of policy measures to address GHG emissions of ships; and it provides a framework for the ex-ante evaluation of these policy measures.

4 This submission focusses on policy measures that aim to reduce CO_2 emissions of ships because CO_2 constitutes almost 98% of the greenhouse gas emissions of ships, expressed in CO_2-equivalent emissions (MEPC 67/6). Other emissions include for example refrigerants, insulation fluids and methane.

5 This submission deals exclusively with measures that reduce CO_2 emissions in the shipping sector. It does not deal with supporting measures (e.g. R&D which can improve the available technology but does not in itself reduce emissions), nor with measures aimed at reducing barriers to the implementation of technical or operational measures (e.g. capacity building and technical cooperation), or with measures that offset emissions from the shipping sector by financing emission reductions in other sectors.

6 This submission first presents a comprehensive framework of factors that contribute to maritime greenhouse gas emissions. Next, policies are identified using this framework. Finally, drawing on IPCC publications, methods for evaluating these policies ex-ante (i.e. before the policies are implemented) are presented.

Factors contributing to maritime CO_2 emissions

7 Maritime CO_2 emissions emerge as a result of the combustion of fossil fuels by ships. The Second IMO Greenhouse Gas Study provides this overview of factors that contribute to maritime CO_2 emissions (slightly amended):

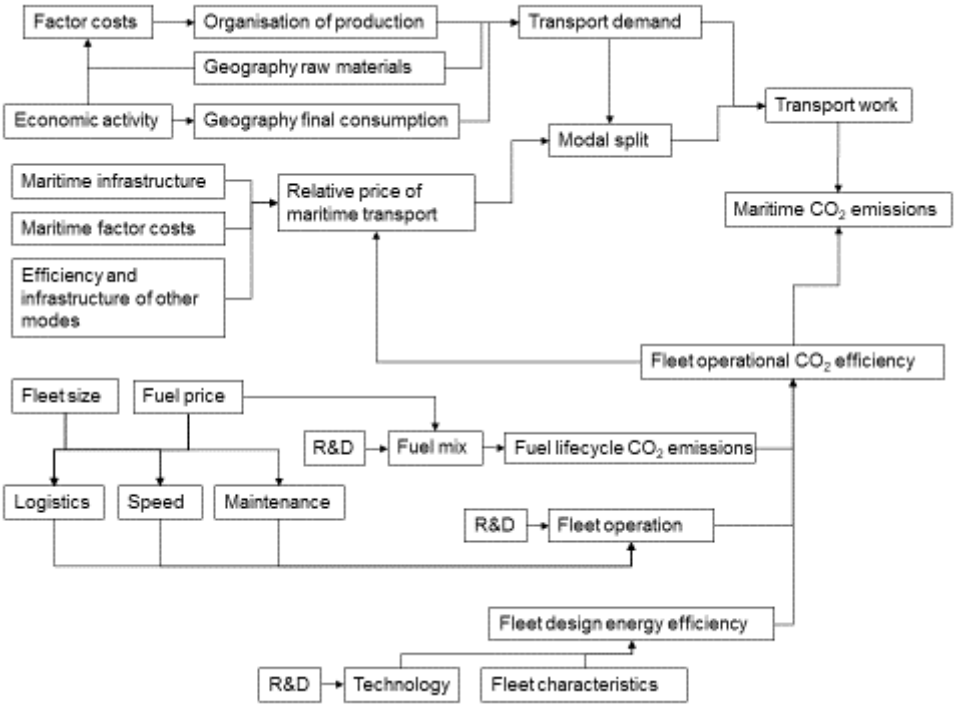

Figure 1: Stylized representation of factors determining maritime CO_2 emissions

8 As shown in figure 1, maritime CO_2 emissions can be considered to be the product of the amount of transport work provided (or the number of miles sailed for non-cargo ships) and the fleet operational CO_2 efficiency (i.e. the amount of CO_2 emissions per tonne-mile or per mile).

9 Figure 1 shows how these factors can be disaggregated further. For example, the fleet operational CO_2 efficiency is determined by the fleet design energy efficiency, the way the fleet is operated, and the average lifecycle CO_2 emissions of the fuel mix.

10 Figure 1 can be used to analyse how changes in certain factors affect maritime CO_2 emissions. For example, a reduction in transport demand will reduce maritime CO_2 emissions as long as the fleet operational CO_2 efficiency remains constant or improves. The figure 1 shows that many factors are interlinked and it is important to take those interlinkages into account in the design and evaluation of policies as they may strengthen or reduce the effect of any changes in a factor on the maritime CO_2 emissions. For example, a change in the fleet design energy efficiency will generally affect maritime CO_2 emissions, but the effect can be negated if the change in design energy efficiency results in changes in fleet operation, e.g. when ships go faster because they are designed more efficient.

Identification of policies to address maritime GHG emissions

11 In principle, most of the factors shown in figure 1 can be targeted by policies. The IMO is well equipped to addressing some of these factors (e.g. fleet design energy efficiency, fleet operation, fuel lifecycle CO_2 emissions), whereas others, especially the factors in the top left corner, are farther away from IMO's realm.

12 According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, policy measures fall into five broad categories (IPCC 2014)[1]:

.1 regulatory approaches (e.g. set a limit or standard or maximum/minimum value);

.2 economic instruments (Market based measures (MBMs) like subsidies, levies, credits or allowances);

.3 information policies, e.g. exchange of best practices, technical cooperation;

.4 government provision of public goods and services and procurement; and

.5 voluntary action, e.g. rewarding good performers with public recognition, provision of incentives by private parties.

13 In principle, each category of policy can be employed to address each of the factors identified in figure 1. Often, this can be done in several ways. Table 1 presents examples of policies aimed to lower the lifecycle CO_2 emissions of maritime fuels. Examples of policies addressing a few other factors from figure 1 are included in the annex to this document.

[1] *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Table 1. Examples of policies addressing the lifecycle CO_2 emissions of maritime fuels

Policy category	Examples of policy measures
Regulatory approaches	Maximum lifecycle carbon content of marine fuels used in international shipping
	Maximum carbon content of marine fuels used in international shipping
	Ban on the use of fossil fuels
Economic instruments	Carbon taxes
	Carbon credit trading
	Subsidies for renewable fuels
Information policies	Published research and studies on low-carbon fuels for example commissioned by IMO
	Promotion of information exchange and sharing of best practice
	Fostering of technical cooperation on renewable fuels
Government provisions and procurement	Government procurement of low-carbon fuels for government-operated vessels
	Including the lifecycle carbon content of fuel in the award criteria of government tenders for maritime services
Voluntary action	Corporate standards to use a certain share of low-carbon fuels in marine fuel mix
	Port incentives for ships using low-carbon fuels
	Introduction of corporate internal/shadow carbon pricing on fuel purchases

14 Note that policies addressing certain factors often also encourage changes in underlying factors. For example, a carbon tax would aim to address maritime CO_2 emissions and would incentivise ships to improve their operational efficiency, their technical efficiency and/or the carbon content of the fuel because all these measures can be used to lower the tax burden. Similarly, a regulation to comply with an operational efficiency standard would incentivise ships to improve their maintenance, logistics and/or adjust their speed because all these factors will result in changes in operational efficiency.

Evaluation of policies

15 The criteria used in the evaluation of policies are guided by what is deemed important by the evaluator. Various submissions have been made to ISWG-GHG 1 and to other MEPC meetings proposing criteria for the evaluation of GHG policies (documents MEPC 57/21, paragraph 4.73; ISWG-GHG 1/2/4, ISWG-GHG 1/2/7 and MEPC 71/7/2). This document does not intend to discuss these criteria but aims to provide a way in which some of the most commonly mentioned criteria can be evaluated ex-ante. It presents a relatively simple framework that can be used for a quick evaluation of policy measures, but can also be employed for a more detailed assessment.

16 Common elements are the criteria used in general in evaluating climate policies (IPCC 2014), viz.:

.1 environmental effectiveness;

.2 economic performance (economic efficiency and cost-effectiveness);

.3 distributional and social impacts; and

.4 institutional feasibility.

17 When evaluating measures to address GHG emissions of ships, these criteria can be interpreted as follows:

.1 environmental effectiveness: ability of the policy measure to meet the levels of ambition of the comprehensive IMO Strategy. This depends on:

.1 The factor that is addressed by the policy measure. In general, because of negative and positive feedback loops, policies closer to the desired goal are preferable because their effectiveness can be assessed with greater accuracy. For example, the impact of policies aiming to improve the design efficiency of ships on maritime CO_2 emissions may be influenced by changes in fleet operations (e.g. more efficient ships sailing faster) or fuel carbon emissions.

.2 The amount of emissions under the scope of the policy. For example, policy measures that target one ship type have a lower overall effectiveness than policy measures that target all ships (although they may be very effective for that specific ship type).

.3 The stringency of the policy measure. Ambitious standards and strong economic incentives will provide a stronger argument to change behaviour.

.4 Positive and negative interaction with other policies. If behavioural change is hampered by other policies, the environmental effectiveness of a policy measure may be reduced.

.2 economic performance (economic efficiency and cost-effectiveness):

The costs of a policy comprise the costs of the operational and technical measures that ships will need to take to comply with the policy requirements and the administrative costs. In general, the more technical and operational measures are available, the lower the costs because the chance that low-cost options are available increases. This implies that measures aimed at e.g. reducing maritime GHG emissions will achieve a certain emission reduction goal at lower costs than measures aimed to improve the design energy efficiency of the fleet, because the latter do not allow to use improvements of operational efficiency or use of lower carbon fuels for compliance.

.3 distributional and social impacts:

In the context of the comprehensive IMO Strategy, impacts on States have been included in the elements to be discussed because different States may face different impacts and different States gave different abilities to deal with these impacts. It is beyond the scope of this submission to outline how the impacts on States can be evaluated.

.4 institutional feasibility:

The institutional feasibility relates to the governance of policy measures and enforcement. Environmental policies that are well adapted to existing institutional constraints have a high degree of institutional feasibility. An evaluation of the institutional feasibility would include an analysis of whether an organisation has the competence to regulate the policy subject, how fast a policy can be agreed upon and implemented, whether an organisation has the manpower to implement a policy, etc.

A relevant element of the institutional feasibility is the feasibility of enforcement. If a policy cannot be effectively enforced, its environmental effectiveness is eroded.

Conclusion

18 This submission presents an overview of the factors that contribute to maritime CO_2 emissions. It can be used for systematically identifying the factors that can be addressed to achieve a certain level of ambition of the IMO GHG Strategy.

19 Furthermore, this submission also shows how policy measures can be identified and presents examples of a range of different measures that address different factors that contribute to maritime GHG emissions.

20 Finally, this submission presents a framework for the ex-ante evaluation of policy measures that can be used to select policies for inclusion in the IMO GHG Strategy.

Action requested of the Working Group

21 The Working Group is invited to note the information in this submission and take action as appropriate.

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ANNEX

EXAMPLES OF POLICIES AIMING TO ADDRESS SEVERAL FACTORS CONTRIBUTING TO MARITIME CO_2 EMISSIONS

Examples of policies to improve the efficiency of fleet operation

Policy category	Examples of policy measures
Regulatory approaches	Operational-efficiency standard
Economic instruments	Baseline-and-credit trading on the basis of operational efficiency
Information policies	Update SEEMP guidelines
	IMO GloMEEP Energy Efficiency Portal
Government provisions and procurement	Including operational efficiency targets in the award criteria of government tenders for maritime services
Voluntary action	Reflection of the operational efficiency of ships in charter rates

Examples of policies to reduce speed

Policy category	Examples of policy measures
Regulatory approaches	Mandatory speed limit
Economic instruments	Speed taxes
Information policies	Virtual arrival: Improving information exchange between ports and ships so that ships can sail at optimal speed
Voluntary action	Changes in charter parties so that ships are encouraged to use optimise speed in line with virtual arrival

Table 4 Examples of policies to improve the design efficiency of ships

Policy category	Examples of policy measures
Regulatory approaches	EEDI: Requirement to meet or exceed an operational efficiency standard (new ships only)
Economic instruments	Baseline-and-credit trading on the basis of the design efficiency of ships
Information policies	Providing information on the design efficiency of ships
Government provisions and procurement	Procurement of government vessels above a certain design efficiency
	Including technical efficiency targets in the award criteria of government tenders for maritime services
Voluntary action	Reflection of the design efficiency of ships in charter rates
	Preferential treatment by ports of ships with a good design efficiency