

**Note by the International Maritime Organization to the UNFCCC Talanoa Dialogue**

**ADOPTION OF THE INITIAL IMO STRATEGY ON REDUCTION OF GHG EMISSIONS FROM SHIPS AND EXISTING IMO ACTIVITY RELATED TO REDUCING GHG EMISSIONS IN THE SHIPPING SECTOR**

**SUMMARY**

The International Maritime Organization's (IMO) Marine Environment Protection Committee (MEPC) has for some time now been considering actions to address greenhouse gas (GHG) emissions from ships engaged in international trade. It met for its seventy-second session (MEPC 72) from 9 to 13 April 2018, at IMO Headquarters in London, with the participation of more than 100 Member States, three associate members, two United Nations bodies including UNFCCC, eight intergovernmental organizations and 47 non-governmental organizations.

During this meeting, the Committee adopted resolution MEPC.304(72) on *Initial IMO Strategy on reduction of GHG emissions from ships*. The vision set out in the text of this important Initial Strategy confirms IMO's commitment to reducing GHG emissions from international shipping and, as a matter of urgency, to phasing them out as soon as possible in this century.

The Initial Strategy, and its adopting resolution, is set out in annex 1 to this submission. This Initial Strategy is the latest action taken by the IMO to address GHG emissions from ships and existing activity related to reducing GHG emissions from international shipping is set out in annex 2 to this submission.

**Context**

1 International shipping plays an essential role in the facilitation of world trade as the most cost-effective and energy-efficient mode of mass cargo transport, making a vital contribution to international trade and being a key pillar of the development of a sustainable global economy.

2 The International Maritime Organization (IMO) was established by Governments as a specialized agency under the United Nations to provide the machinery for intergovernmental cooperation in the field of regulation of ships engaged in international trade. IMO is responsible for the global regulation of all aspects of international shipping and has a key role in ensuring that lives at sea are not put at risk, including security of shipping, and that the environment is not polluted by ships' operations – as summed up in IMO's mission statement: **Safe, secure and efficient shipping on clean oceans.**

3 Following the suggestion during MEPC 72, supported by many delegations, for IMO to participate in the Talanoa Dialogue, the Secretariat was invited to consider submission of relevant information, including the Initial Strategy, to the Talanoa Dialogue portal.

## ANNEX 1

### 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.

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## **Annex**

### **INITIAL IMO STRATEGY ON REDUCTION OF GHG EMISSIONS FROM SHIPS**

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## 1 INTRODUCTION

1.1 The International Maritime Organization (IMO) is the United Nations specialized agency responsible for safe, secure and efficient shipping and the prevention of pollution from ships.

1.2 The Strategy represents the continuation of work of IMO as the appropriate international body to address greenhouse gas (GHG) emissions from international shipping. This work includes Assembly resolution A.963(23) on *IMO policies and practices related to the reduction of greenhouse gas emissions from ships*, adopted on 5 December 2003, urging the Marine Environment Protection Committee (MEPC) to identify and develop the mechanisms needed to achieve the limitation or reduction of GHG emissions from international shipping.

1.3 In response to the Assembly's request, work to address GHG emissions from ships has been undertaken, including inter alia:

- .1 MEPC 62 (July 2011) adopted resolution MEPC.203(62) on *Inclusion of regulations on energy efficiency for ships in MARPOL Annex VI* introducing mandatory technical (EEDI) and operational (SEEMP) measures for the energy efficiency of ships. To date more than 2,700 new ships have been certified to the energy efficiency design requirement;
- .2 MEPC 65 (May 2013) adopted resolution MEPC.229(65) on *Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships*, which, among other things, requests the IMO, through its various programmes (ITCP<sup>1</sup>, GloMEEP project<sup>2</sup>, MTCC network<sup>3</sup>, etc.), to provide technical assistance to Member States to enable cooperation in the transfer of energy efficient technologies, in particular to developing countries; and
- .3 MEPC 70 (October 2016) adopted, by resolution MEPC.278(70), amendments to MARPOL Annex VI to introduce the *data collection system for fuel oil consumption of ships*, containing mandatory requirements for ships to record and report their fuel oil consumption. Ships of 5,000 gross tonnage and above (representing approximately 85% of the total CO<sub>2</sub> emissions from international shipping) are required to collect consumption data for each type of fuel oil they use, as well as other, additional, specified data including proxies for "transport work".

1.4 This Initial Strategy is the first milestone set out in the *Roadmap for developing a comprehensive IMO Strategy on reduction of GHG emissions from ships* (the Roadmap) approved at MEPC 70. The Roadmap identifies that a revised Strategy is to be adopted in 2023.

### Context

1.5 The Initial Strategy falls within a broader context including:

- .1 other existing instruments related to the law of the sea, including UNCLOS, and to climate change, including the UNFCCC and its related legal instruments, including the Paris Agreement;

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<sup>1</sup> Integrated Technical Cooperation Programme <http://www.imo.org>

<sup>2</sup> Global Maritime Energy Efficiency Partnerships <http://glomeep.imo.org/>

<sup>3</sup> Global Maritime Technology Cooperation Centres Network <http://gmn.imo.org/>

- .2 the leading role of the Organization for the development, adoption and assistance in implementation of environmental regulations applicable to international shipping;
- .3 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”; and
- .4 the United Nations 2030 Agenda for Sustainable Development.

### **Emissions and emission scenarios**

1.6 The *Third IMO GHG Study 2014* has estimated that GHG emissions from international shipping in 2012 accounted for some 2.2% of anthropogenic CO<sub>2</sub> emissions and that such emissions could grow by between 50% and 250% by 2050. Future IMO GHG studies would help reduce the uncertainties associated with these emission estimates and scenarios.

### **Objectives of the Initial Strategy**

1.7 The Initial Strategy is aimed at:

- .1 enhancing IMO’s contribution to global efforts by addressing GHG emissions from international shipping. International efforts in addressing GHG emissions include the Paris Agreement and its goals and the United Nations 2030 Agenda for Sustainable Development and its SDG 13: *“Take urgent action to combat climate change and its impacts”*;
- .2 identifying actions to be implemented by the international shipping sector, as appropriate, while addressing impacts on States and recognizing the critical role of international shipping in supporting the continued development of global trade and maritime transport services; and
- .3 identifying actions and measures, as appropriate, to help achieve the above objectives, including incentives for research and development and monitoring of GHG emissions from international shipping.

## **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.

## **3 LEVELS OF AMBITION AND GUIDING PRINCIPLES**

### **Levels of ambition**

3.1 Subject to amendment depending on reviews to be conducted by the Organization, 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. The reviews should take into account updated emission estimates, emissions reduction options for international shipping, and the reports of the Intergovernmental Panel on Climate Change (IPCC), as relevant. Levels of ambition directing the Initial Strategy are as follows:

**.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<sub>2</sub> 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<sub>2</sub> emissions reduction consistent with the Paris Agreement temperature goals.

### **Guiding principles**

3.2 The principles guiding the Initial Strategy include:

- .1 the need to be cognizant of the principles enshrined in instruments already developed, such as:
  - .1 the principle of non-discrimination and the principle of no more favourable treatment, enshrined in MARPOL and other IMO conventions; and
  - .2 the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances, enshrined in the UNFCCC, its Kyoto Protocol and the Paris Agreement;
- .2 the requirement for all ships to give full and complete effect, regardless of flag, to implementing mandatory measures to ensure the effective implementation of this strategy;
- .3 the need to consider the impacts of measures on States, including developing countries, in particular, on LDCs and SIDS as noted by MEPC 68 (MEPC 68/21, paragraphs 4.18 to 4.19) and their specific emerging needs, as recognized in the Organization's Strategic Plan (resolution A.1110(30)); and
- .4 the need for evidence-based decision-making balanced with the precautionary approach as set out in resolution MEPC.67(37).

## **4 LIST OF CANDIDATE SHORT-, MID- AND LONG-TERM FURTHER MEASURES WITH POSSIBLE TIMELINES AND THEIR IMPACTS ON STATES**

### **Timelines**

4.1 Candidate measures set out in this Initial Strategy should be consistent with the following timelines:

- .1 possible short-term measures could be measures finalized and agreed by the Committee between 2018 and 2023. Dates of entry into force and when the measure can effectively start to reduce GHG emissions would be defined for each measure individually;
- .2 possible mid-term measures could be measures finalized and agreed by the Committee between 2023 and 2030. Dates of entry into force and when the measure can effectively start to reduce GHG emissions would be defined for each measure individually; and
- .3 possible long-term measures could be measures finalized and agreed by the Committee beyond 2030. Dates of entry into force and when the measure can effectively start to reduce GHG emissions would be defined for each measure individually.

4.2 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.

4.3 Certain mid- and long-term measures will require work to commence prior to 2023.

4.4 These timelines should be revised as appropriate as additional information becomes available.

4.5 Short-, mid- and long-term further measures to be included in the Revised IMO GHG Strategy should be accompanied by implementation schedules.

4.6 The list of candidate measures is non-exhaustive and is without prejudice to measures the Organization may further consider and adopt.

### **Candidate short-term measures**

4.7 Measures can be categorized as those the effect of which is to directly reduce GHG emissions from ships and those which support action to reduce GHG emissions from ships. All the following candidate measures<sup>4</sup> represent possible short-term further action of the Organization on matters related to the reduction of GHG emissions from ships:

- .1 further improvement of the existing energy efficiency framework with a focus on EEDI and SEEMP, taking into account the outcome of the review of EEDI regulations;

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<sup>4</sup> The Initial Strategy is subject to revision based on fuel oil consumption data collected during 2019-2021 and does not prejudice any specific further measures that may be implemented in Phase 3 of the three-step approach.

- .2 develop technical and operational energy efficiency measures for both new and existing ships, including consideration of indicators in line with the three-step approach that can be utilized to indicate and enhance the energy efficiency performance of shipping, e.g. Annual Efficiency Ratio (AER), Energy Efficiency per Service Hour (EESH), Individual Ship Performance Indicator (ISPI), Fuel Oil Reduction Strategy (FORS);
- .3 establishment of an Existing Fleet Improvement Programme;
- .4 consider and analyse the use of speed optimization and speed reduction as a measure, taking into account safety issues, distance travelled, distortion of the market or to trade and that such measure does not impact on shipping's capability to serve remote geographic areas;
- .5 consider and analyse measures to address emissions of methane and further enhance measures to address emissions of Volatile Organic Compounds;
- .6 encourage the development and update of national action plans to develop policies and strategies to address GHG emissions from international shipping in accordance with guidelines to be developed by the Organization, taking into account the need to avoid regional or unilateral measures;
- .7 continue and enhance technical cooperation and capacity-building activities under the ITCP;
- .8 consider and analyse measures to encourage port developments and activities globally to facilitate reduction of GHG emissions from shipping, including provision of ship and shore-side/on-shore power supply from renewable sources, infrastructure to support supply of alternative low-carbon and zero-carbon fuels, and to further optimize the logistic chain and its planning, including ports;
- .9 initiate research and development activities addressing marine propulsion, alternative low-carbon and zero-carbon fuels, and innovative technologies to further enhance the energy efficiency of ships and establish an International Maritime Research Board to coordinate and oversee these R&D efforts;
- .10 incentives for first movers to develop and take up new technologies;
- .11 develop robust lifecycle GHG/carbon intensity guidelines for all types of fuels, in order to prepare for an implementation programme for effective uptake of alternative low-carbon and zero-carbon fuels;
- .12 actively promote the work of the Organization to the international community, in particular, to highlight that the Organization, since the 1990's, has developed and adopted technical and operational measures that have consistently provided a reduction of air emissions from ships, and that measures could support the Sustainable Development Goals, including SDG 13 on Climate Change; and
- .13 undertake additional GHG emission studies and consider other studies to inform policy decisions, including the updating of Marginal Abatement Cost Curves and alternative low-carbon and zero-carbon fuels.

### **Candidate mid-term measures**

4.8 Measures can be categorized as those the effect of which is to directly reduce GHG emissions from ships and those which support action to reduce GHG emissions from ships. All the following candidate measures represent possible mid-term further action of the Organization on matters related to the reduction of GHG emissions from ships:

- .1 implementation programme for the effective uptake of alternative low-carbon and zero-carbon fuels, including update of national actions plans to specifically consider such fuels;
- .2 operational energy efficiency measures for both new and existing ships including indicators in line with three-step approach that can be utilized to indicate and enhance the energy efficiency performance of ships;
- .3 new/innovative emission reduction mechanism(s), possibly including Market-based Measures (MBMs), to incentivize GHG emission reduction;
- .4 further continue and enhance technical cooperation and capacity-building activities such as under the ITCP; and
- .5 development of a feedback mechanism to enable lessons learned on implementation of measures to be collated and shared through a possible information exchange on best practice.

### **Candidate long-term measures**

4.9 All the following candidate measures represent possible long-term further action of the Organization on matters related to the reduction of GHG emissions from ships:

- .1 pursue the development and provision of zero-carbon or fossil-free fuels to enable the shipping sector to assess and consider decarbonization in the second half of the century; and
- .2 encourage and facilitate the general adoption of other possible new/innovative emission reduction mechanism(s).

### **Impacts on States**

4.10 The impacts on States of a measure should be assessed and taken into account as appropriate before adoption of the measure. Particular attention should be paid to the needs of developing countries, especially small island developing States (SIDS) and least developed countries (LDCs).

4.11 When assessing impacts on States the impact of a measure should be considered, as appropriate, inter alia, in the following terms:

- .1 geographic remoteness of and connectivity to main markets;
- .2 cargo value and type;
- .3 transport dependency;
- .4 transport costs;

- .5 food security;
- .6 disaster response;
- .7 cost-effectiveness; and
- .8 socio-economic progress and development.

4.12 The specification for and agreement on the procedure for assessing and taking into account the impacts of measures related to international shipping on States should be undertaken as a matter of urgency as part of the follow-up actions.

4.13 Disproportionately negative impacts should be assessed and addressed, as appropriate.

## **5 BARRIERS AND SUPPORTIVE MEASURES; CAPACITY-BUILDING AND TECHNICAL COOPERATION; R&D**

5.1 The Committee recognizes that developing countries, in particular the LDCs and SIDS, have special needs with regard to capacity building and technical cooperation.

5.2 The Committee acknowledges that development and making globally available new energy sources that are safe for ships could be a specific barrier to the implementation of possible measures.

5.3 The Committee could assist the efforts to promote low-carbon technologies by facilitating public-private partnerships and information exchange.

5.4 The Committee should continue to provide mechanisms for facilitating information sharing, technology transfer, capacity-building and technical cooperation, taking into account resolution MEPC.229(65) on *Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships*.

5.5 The Organization is requested to assess periodically the provision of financial and technological resources and capacity-building to implement the Strategy through the ITCP and other initiatives including the GloMEEP project and the MTCC network.

## **6 FOLLOW-UP ACTIONS TOWARDS THE DEVELOPMENT OF THE REVISED STRATEGY**

6.1 A programme of follow-up actions of the Initial Strategy should be developed.

6.2 The key stages for the adoption of a Revised IMO GHG Strategy in 2023 as set out in the Roadmap, are as follows:

Spring 2018 (MEPC 72)	Adoption of the Initial Strategy <sup>5</sup> , including, inter alia, a list of candidate short-, mid- and long-term further measures with possible timelines, to be revised as appropriate as additional information becomes available
January 2019	Start of Phase 1: Data collection (Ships to collect data)
Spring 2019 (MEPC 74)	Initiation of Fourth IMO GHG Study using data from 2012-2018
Summer 2020	Data from 2019 to be reported to IMO
Autumn 2020 (MEPC 76)	Start of Phase 2: data analysis (no later than autumn 2020) Publication of Fourth IMO GHG Study for consideration by MEPC 76
Spring 2021 (MEPC 77)	Secretariat report summarizing the 2019 data pursuant to regulation 22A.10  Initiation of work on adjustments on Initial IMO Strategy, based on Data Collection System (DCS) data
Summer 2021	Data for 2020 to be reported to IMO
Spring 2022 (MEPC 78)	Phase 3: Decision step Secretariat report summarizing the 2020 data pursuant to regulation 22A.10
Summer 2022	Data for 2021 to be reported to IMO
Spring 2023 (MEPC 80)	Secretariat report summarizing the 2021 data pursuant to regulation 22A.10 Adoption of Revised IMO Strategy, including short-, mid- and long-term further measure(s), as required, with implementation schedules

6.3 The Marginal Abatement Cost Curve (MACC) for each measure, as appropriate, should be ascertained and updated, and then evaluated on a regular basis.

## 7 PERIODIC REVIEW OF THE STRATEGY

7.1 The Revised Strategy is to be adopted in Spring 2023.

7.2 The Revised Strategy should be subject to a review five years after its final adoption.

7.3 The Committee should undertake the review including defining the scope of the review and its terms of reference.

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<sup>5</sup> Initial IMO Strategy is subject to revision based on DCS data during 2019-2021 and does not prejudice any specific further measures that may be implemented in Phase 3 of the three-step approach.

## ANNEX 2

### EXISTING IMO ACTIVITY RELATED TO REDUCING GHG EMISSIONS IN THE SHIPPING SECTOR

#### INTRODUCTION

1 The International Maritime Organization (IMO) was established by Governments as a specialized agency under the United Nations to provide the machinery for intergovernmental cooperation in the field of regulation of ships engaged in international trade. IMO is responsible for the global regulation of all aspects of international shipping and has a key role in ensuring that lives at sea are not put at risk, including security of shipping, and that the environment is not polluted by ships' operations – as summed up in the IMO's mission statement: to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation.

2 IMO is the global standard-setting authority for the safety, security and environmental performance of international shipping. Its regulatory framework covers all aspects of technical matters pertaining to the safety of ships and of life at sea, efficiency of navigation, and the prevention and control of marine and air pollution from ships. Following several high profile oil spills, the original focus of IMO's environmental work was on the prevention of marine pollution by oil, resulting in the adoption of the first-ever comprehensive anti-pollution convention, the International Convention for the Prevention of Pollution from Ships (MARPOL) in 1973. This has changed over the last few decades to include a much wider range of measures to prevent marine pollution, and the original MARPOL Convention has been amended to include requirements addressing pollution from chemicals, other harmful substances, garbage, sewage and, under an Annex VI adopted in 1997 by a Protocol to MARPOL, air pollution and control of emissions from ships.

#### CONTROL OF EMISSIONS FROM SHIPS – MARPOL ANNEX VI: REGULATIONS FOR THE PREVENTION OF AIR POLLUTION FROM SHIPS

3 In November 1991, the IMO Assembly adopted resolution A.719(17) on *Prevention of Air Pollution from Ships*, stating the desire to reduce air pollution from ships by cooperative efforts of Member Governments which may be best achieved by establishing a new annex to MARPOL which would provide rules for restriction and control of emission of harmful substances from ships into the atmosphere.

4 In September 1997, a Conference of Parties to MARPOL adopted the Protocol of 1997 to amend the Convention. The Protocol, which entered into force on 19 May 2005, incorporated in MARPOL a new Annex VI, entitled "Regulations for the prevention of air pollution from ships", with the aim of controlling airborne emissions from ships of sulphur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), ozone-depleting substances (ODS), volatile organic compounds (VOCs) and their contribution to global air pollution and environmental impacts.

5 Eight years after its adoption, but only two months after its entry into force, the Marine Environment Protection Committee (MEPC), at its fifty-third session (MEPC 53 in July 2005), decided that Annex VI should undergo a general revision. The decision was based on new knowledge of the harmful impact that ships' exhaust gases may have on ecosystems and human health and recognized that technological developments would enable significant improvements of the current standards.

6 After three years of intensive work, MEPC 58 (October 2008) unanimously adopted a revised MARPOL Annex VI and the associated Technical Code on control of emissions of nitrogen oxides from marine diesel engines (NO<sub>x</sub> Technical Code 2008) for surveying and certifying marine diesel engines, both of which entered into force on 1 July 2010. The revised Annex VI introduced even more stringent limits for the emission of air pollutants from ships, together with phased-in reductions, to be achieved through fuel oil quality and marine diesel engine design or equivalent technologies, in particular for SO<sub>x</sub> and particulate matter (PM) and NO<sub>x</sub> emissions.

## **IMO AND THE UNFCCC POLICY FRAMEWORK**

7 Prior to the signing in December 1997 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), the aforementioned IMO International Air Pollution Conference in September 1997 adopted conference resolution 8 which recognized that CO<sub>2</sub> emissions, being greenhouse gases (GHGs), have an adverse impact on the environment, and noted that UNFCCC had recognized that GHGs also originate from international shipping and contribute to the global inventory of emissions. The resolution invited the MEPC to consider what CO<sub>2</sub> reduction strategies may be feasible in light of the relationship between CO<sub>2</sub> and atmospheric pollutants, especially NO<sub>x</sub>, since NO<sub>x</sub> emissions may exhibit an inverse relationship to CO<sub>2</sub> reductions.

8 In December 2003, the IMO Assembly adopted resolution A.963(23) on *IMO policies and practices related to the reduction of greenhouse gas emissions from ships* that urged the MEPC to identify and evaluate mechanisms to achieve the limitation or reduction of greenhouse gas emissions from international shipping and keep the matter under review and that, in doing so, it should cooperate with the Conference of the Parties (COP) to the UNFCCC.

9 Article 2.2 of the Kyoto Protocol states that the Parties included in Annex I shall pursue limitation or reduction of emissions of GHGs not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization (ICAO) and IMO, respectively.

10 No reference to IMO (nor ICAO) is made in either the articles of the 2015 Paris Agreement on Climate Change (the Paris Agreement) or the decisions to implement the agreement, including on the pre-2020 ambition (the period between the Kyoto Protocol commitment period ending on 31 December 2020 and the Paris Agreement entering into effect on 1 January 2020).

11 The forty-third session of the Subsidiary Body for Scientific and Technological Advice (SBSTA), held during COP 21 in Paris in December 2015, took note of the information received from and progress reported by the Secretariats of ICAO and IMO on their ongoing work on addressing emissions from fuel used for international aviation and maritime transport respectively, and invited the Secretariats to continue to report at future sessions of SBSTA on relevant work on this issue.

12 IMO reported to SBSTA 45 at COP 22 in Morocco in November 2016 on progress made subsequent to the Paris Agreement, including the adoption of the data collection system for fuel oil consumption of ships and the approval of the *Roadmap for developing a comprehensive IMO strategy on reduction of GHG emissions from ships*.

13 As requested by Assembly resolution A.963(23), and reaffirmed by MEPC 69 (April 2016), the Secretariat shall continue reporting to UNFCCC SBSTA under the agenda item on "Emissions from fuel used for international aviation and maritime transport" and participate in related United Nations system activities.

## IMO GREENHOUSE GAS STUDIES

14 The 1997 Air Pollution Conference resolution 8 on *CO<sub>2</sub> emissions from ships* that initiated IMO's work to address GHG emissions from ships invited IMO to undertake a study of CO<sub>2</sub> emissions from ships for the purpose of establishing the amount and relative percentage of such emissions as part of the global inventory of CO<sub>2</sub> emissions. MEPC 63 (March 2012) noted that uncertainty existed in the estimates and projections of emissions from international shipping and agreed that further work should take place to provide the MEPC with reliable and up-to-date information to base its decisions on. MEPC 64 (October 2012) endorsed, in principle, an outline for an update of the GHG emissions estimate, and an expert workshop in Spring 2013 further considered the methodology and assumptions to be used to update the study. To date, three IMO Greenhouse Gas Studies have been published:

- .1 the First IMO GHG Study, published in 2000, estimated that international shipping in 1996 contributed about 1.8% of the global total anthropogenic CO<sub>2</sub> emissions;
- .2 the Second IMO GHG Study, published in 2009, estimated international shipping emissions in 2007 to be 880 million tonnes, or about 2.7% of the global total anthropogenic CO<sub>2</sub> emissions; and
- .3 the Third IMO GHG Study, published in 2014<sup>6</sup>, estimated international shipping emissions in 2012 to be 796 million tonnes, or about 2.2% of the global total anthropogenic CO<sub>2</sub> emissions. The Study also updated the CO<sub>2</sub> estimates for 2007 to 885 million tonnes, or 2.8%.

15 The Third IMO GHG Study 2014 (MEPC 67/INF.3 and Corr.1) employed both top-down and bottom-up (individual ship activity) methods to provide two different and independent analysis tools for estimating emissions from ships. The top-down estimate mainly used data on marine fuel oil (bunker) sales (divided into international, domestic and fishing) from the International Energy Agency (IEA), and is the approach used by the Intergovernmental Panel on Climate Change (IPCC) to calculate CO<sub>2</sub> emissions from international bunkers. However, the top-down method is considered less accurate than the bottom-up method as IEA and the Organization for Economic Co-operation and Development (OECD) identified specific types of error in energy data that involve marine bunkers. The first is allocation or classification error involving imports, exports and marine bunker statistics. The second is country-to-country differences in data quality, specifically related to poor accuracy for international bunkers or stock changes.

16 The bottom-up estimate combined the global fleet technical data from the maritime information provider, IHS Fairplay, with fleet activity data derived from Automatic Identification System (AIS) observations to provide statistics on activity, energy use and emissions for all ships from 2007 to 2012. This approach removed uncertainties attributed to the use of average values and represented a substantial improvement in the resolution of shipping activity, energy demand and emissions data, showing that high-quality inventories of shipping emissions can be produced through the use of quality analysis, such as rigorous testing of bottom-up results against noon reports and Long-range Identification and Tracking (LRIT) and AIS data from a variety of providers, both shore-based and satellite-received data.

17 Although international shipping is already the most energy-efficient mode of mass cargo transportation and carries over 80% of all goods by volume (over 55% in terms of

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<sup>6</sup> The Study can be downloaded online:  
<http://www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx>

freight activity by tonne-mile<sup>7</sup>), a global approach to further enhance its energy efficiency and effective emission control is needed as, depending on future economic and energy developments, the Third IMO GHG Study forecasted a growth in CO<sub>2</sub> emissions for international maritime transport of 50 to 250% in the period up to 2050.

18 Up-to-date emission estimates are considered necessary, in general, to provide a better foundation for future work by IMO to address GHG emissions from international shipping. Ocean transport is fuel-efficient and without these updated figures it would be difficult to provide a meaningful baseline to illustrate the steadily ongoing improvement in fuel efficiency due to improved hull design, more effective diesel engines and propulsion systems and more effective utilization of individual ships resulting from the introduction of mandatory technical and operational measures. Importantly, the 2012 estimate provides a baseline estimate for international shipping emissions prior to the entry into force of regulations on energy efficiency for ships in 2013.

## **ENERGY EFFICIENCY OF INTERNATIONAL SHIPPING**

19 In July 2011, IMO adopted mandatory measures to improve the energy efficiency of international shipping through resolution MEPC.203(62), representing the first-ever mandatory global energy efficiency standard for an international industry sector, the first legally binding instrument to be adopted since the Kyoto Protocol that addresses GHG emissions and the first global mandatory GHG-reduction regime for an international industry sector.

20 The amendments adopted by resolution MEPC.203(62) added a new chapter 4 entitled "Regulations on energy efficiency for ships" to MARPOL Annex VI. This package of technical and operational requirements which apply to ships of 400 GT and above, are known as the Energy Efficiency Design Index (EEDI), applicable to new ships, which sets a minimum energy efficiency level for the work undertaken (e.g. CO<sub>2</sub> emissions per tonne-mile) for different ship types and sizes, and the Ship Energy Efficiency Management Plan (SEEMP), applicable to all ships. These mandatory requirements entered into force on 1 January 2013. The Energy Efficiency Operational Indicator (EEOI) for monitoring operational energy efficiency of ships also remains available for voluntary application.

21 The EEDI requirement aims to increase the energy efficiency of new ships over time. It is a non-prescriptive, performance-based mechanism that leaves the choice of technologies to use in a specific ship design to the industry. As long as the required energy efficiency level is attained, ship designers and builders are free to use the most cost-efficient solutions in complying with the regulations. It is therefore intended to stimulate innovation in, and continued development of, the technical elements influencing the energy efficiency of a ship. By February 2017 more than 2200 new ships have been certified to the energy efficiency design requirements.

22 The EEDI has been developed for the largest and most energy-intensive segments of the world merchant fleet and, following the inclusion of additional ship types, will embrace approximately 85% of emissions from international shipping. EEDI reduction factors are set until 2025 to the extent that ships constructed in 2025 will be required to be at least 30% more energy efficient than those constructed in 2014. The SEEMP establishes a mechanism for operators to improve the energy efficiency of existing ships against business-as-usual operations, in a cost-effective manner and also provides an approach for monitoring ship and fleet efficiency performance over time.

23 All ships of 400 GT and above engaged in international trade are required to implement and maintain a SEEMP that establishes a mechanism for operators to improve

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<sup>7</sup> International Council on Clean Transportation (ICCT), Long-term potential for increased shipping efficiency through the adoption of industry-leading practices, Wang & Lutsey, 2013.

the energy efficiency of ships. This should be achieved by monitoring the energy efficiency performance of a ship's transportation work, using, for example, the EEOI as a monitoring and/or benchmarking tool and at regular intervals considering new technologies and practices to improve energy efficiency.

24 A study<sup>8</sup> undertaken following the adoption of the mandatory energy efficiency measures indicates that the uptake of SEEMP measures will have a significant effect in the short to medium term, while EEDI measures should have a greater impact in the longer term, as fleet renewal takes place and new technologies are adopted. Estimates suggest that a successful implementation of this energy efficiency framework by 2050 could reduce shipping CO<sub>2</sub> emissions by up to 1.3 gigatonnes per year against the business-as-usual scenario. To put this in context, the Third IMO GHG Study 2014 estimated global CO<sub>2</sub> emissions to be 35.64 gigatonnes in 2012.

25 Four important guidelines have been adopted<sup>9</sup>, intended to assist in the implementation of the mandatory regulations on energy efficiency for ships, as follows:

- .1 *2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships, as amended* (resolution MEPC.245(66));
- .2 *2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP)* (resolution MEPC.282(70));
- .3 *2014 Guidelines on survey and certification of the Energy Efficiency Design Index (EEDI), as amended* (resolution MEPC.254(67)); and
- .4 *2013 Guidelines for calculation of reference lines for use with the Energy Efficiency Design Index (EEDI)* (resolution MEPC.231(65)).

26 MEPC 65 (May 2013) agreed to include several additional ship types in the EEDI framework and further guidance was agreed, or existing guidance amended, to support the uniform implementation of the energy efficiency regulations. Furthermore, a work plan was endorsed to continue work on the development of the EEDI framework for ship types and sizes and propulsion systems not covered by the current EEDI requirements and to consider guidelines on propulsion power needed to maintain the manoeuvrability of a ship under adverse conditions.

27 MEPC 69 (April 2016) considered an interim report of its correspondence group conducting a review of the status of technological developments relevant to implementing Phase 2 of the EEDI regulations. This review is required by regulation 21.6 of MARPOL Annex VI, with a further review to take place before Phase 3. Following consideration, MEPC 69 instructed the group to continue considering the status of technological developments for ro-ro cargo and ro-ro passenger ships and to make recommendations to MEPC 70 on whether the time periods, the EEDI reference line parameters for relevant ship types and the reduction rates in regulation 21 of MARPOL Annex VI should be retained or, if proven necessary, amended.

28 MEPC 70 (October 2016) agreed to retain the EEDI requirements for Phase 2 (except for ro-ro cargo ships and passenger ships which will be considered further at MEPC 71) and on the need for a thorough review of EEDI Phase 3 (1 January 2025 and onwards) requirements, including discussion on its earlier implementation and the possibility of

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<sup>8</sup> Estimated CO<sub>2</sub> emissions reduction from introduction of mandatory technical and operational energy efficiency measures for ships, Lloyd's Register and DNV, October 2011 (MEPC 63/INF.2).

<sup>9</sup> Originally adopted by MEPC 63 (March 2012) and subsequently revised and/or amended.

establishing a Phase 4. Phase 3 requirements provide that new ships be built to be 30% more energy efficient compared to the baseline.

29 MEPC 71 (July 2017) approved draft amendments to regulation 21 of MARPOL Annex VI regarding EEDI requirements for ro-ro cargo and ro-ro passenger ships, which were subsequently adopted at MEPC 72 (April 2018).

30 In addition, MEPC 71 also established a Correspondence Group on EEDI review beyond phase 2, under the coordination of Japan, and instructed it to recommend to MEPC 73 the time period and the reduction rates for EEDI phase 3 requirements, and consider a possible introduction of EEDI phase 4 requirements with associated time period and reduction rates.

### **Development of further measures to enhance the energy efficiency of ships**

31 At MEPC 65 (May 2013) several delegations recognized the importance of enhancing energy efficiency and reducing fuel consumption with subsequent reductions of CO<sub>2</sub> emissions and other pollutants emitted to air. The Committee noted considerable support for the development of further measures to enhance the energy efficiency of shipping and to use a three-step approach, i.e. data collection and data analysis, followed by decision-making on what further measures, if any, are required (the three-step approach).

32 MEPC 68 (May 2015) noted that one purpose of a data collection system was to analyse energy efficiency and that for this analysis to be effective, some transport work data needed to be included. In this regard, the Committee agreed that data collected by IMO, particularly that related to transport work, should be confidential and not publicly available, and that resulting administrative burdens, the impact on industry and variables that influence energy efficiency needed to be addressed.

33 IMO therefore focussed on the development of a data collection system for ships and MEPC 69 (April 2016) reaffirmed that it would follow the three-step approach and agreed that confidentiality of data is crucial and that no third-party access to the data should be permitted.

34 MEPC 70 (October 2016) adopted mandatory MARPOL Annex VI requirements for ships to record and report their fuel oil consumption. Under the amendments, ships of 5,000 GT and above (representing approximately 85% of the total CO<sub>2</sub> emissions from international shipping) will be required to collect consumption data for each type of fuel oil they use, as well as, additionally, other specified data, including proxies for "transport work". The aggregated data will be reported to the flag State after the end of each calendar year and the flag State, having determined that the data have been reported in accordance with the requirements, will issue a Statement of Compliance to the ship. Flag States will be required to subsequently transfer this data to an IMO Ship Fuel Oil Consumption Database. The Secretariat is required to produce an annual report to the MEPC, summarizing the data collected.

### **REDUCTION OF GREENHOUSE GAS EMISSIONS FROM SHIPS**

35 The MEPC has a standing item on "Reduction of GHG emissions from ships" on its agenda. MEPC 69 (April 2016) considered several submissions addressing the issue and, following an extensive debate:

- .1 welcomed the Paris Agreement and acknowledged the major achievement of the international community in concluding the agreement;

- .2 recognized and commended the current efforts and those already implemented by IMO to enhance the energy efficiency of ships;
- .3 widely recognized and agreed that further appropriate improvements related to shipping emissions can and should be pursued;
- .4 recognized the role of IMO in mitigating the impact of GHG emissions from international shipping;
- .5 agreed to the common understanding that the approval at MEPC 69 and subsequent adoption of the data collection system was the priority;
- .6 reiterated its endorsement of the three-step approach; and
- .7 agreed to establish a working group at MEPC 70, with a view to an in-depth discussion on how to progress the matter.

### **Comprehensive IMO strategy on reduction of GHG emissions from ships**

36 MEPC 70 (October 2016) approved a *Roadmap for developing a comprehensive IMO strategy on reduction of GHG emissions from ships*, which identified that an initial GHG reduction strategy should be adopted in 2018. The Roadmap contains a list of activities, including further IMO GHG studies and significant intersessional work with relevant timelines and provides for alignment of those new activities with the ongoing work on the aforementioned three-step approach to ship energy efficiency improvements. This provides a way forward to the adoption of a revised strategy in 2023 to include short-, mid-, and long-term further measures, as required, with implementation schedules.

37 To progress the work intersessionally, MEPC 70 agreed to the establishment of an intersessional Working Group on Reduction of GHG emissions from ships.

### ***Initial strategy on reduction of GHG emissions from ships***

38 Following two sessional and three intersessional meetings of the Working Group on Reduction of GHG emissions from ships, the *Initial IMO Strategy on Reduction of GHG emissions from ships* was adopted by MEPC 72 (April 2018) in line with the timeline stipulated in the Roadmap (see annex 1 of this submission).

### ***Identification of a list of candidate further measures***

39 As identified by resolution A.963(23), the list of further measures could include technical, operational and market-based measures. As the preceding paragraphs indicate, IMO has made significant progress to date on the development and delivery of technical and operational energy efficiency measures for ships, including the adoption of the data collection system for fuel oil consumption.

### ***Technical and operational energy efficiency measures***

40 For existing ships, MEPC 67 considered the development of mandatory fleet-wide operational energy efficiency standards but since no clear way forward on the need for such standards for ships could be concluded at that session, the Committee agreed that document MEPC 67/5/4, addressing energy efficiency metric options, should be held in abeyance until a future session, and invited Member Governments and international organizations to submit comments and proposals addressing the questions set out in paragraph 15 of document MEPC 67/5 and in document MEPC 67/5/6 to MEPC 68 (MEPC 67/20, paragraph 5.9). Following further consideration, MEPC 68 agreed that the development of a data collection

system for ships should progress and follow the three-step approach (MEPC 68/21, paragraph 4.8). MEPC 70 identified further possible development of the EEDI framework for new ships (see paragraph 28).

*Market-based measures to address GHG emissions from international shipping*

41 Resolution A.963(23) urged MEPC 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, inter alia, an evaluation of the use of technical, operational and market-based solutions. MEPC 55 adopted a work plan to identify and develop the mechanisms needed to achieve the limitation or reduction of CO<sub>2</sub> emissions from international shipping (MEPC 55/23, annex 9).

42 MEPC recognized that, in view of projected increases in the world's population and trade, market-based measures (MBMs) may be necessary to supplement the adopted technical and operational measures to ensure even further reductions in GHG emissions from international shipping (MEPC 59/24, paragraph 4.92). Several MBM proposals from governments and organizations were received and MEPC 60 established an expert group to undertake a feasibility study and impact assessment of the proposals (MEPC 60/22, paragraph 4.89). The outcome of the study and assessment was subsequently examined by an intersessional working group (GHG-WG 3) in March 2011, which was tasked with providing advice on, among other subjects, the compelling need and purpose of MBMs as possible mechanisms to reduce GHG emissions from international shipping; and with evaluating the outcome of work conducted by the expert group, which had also endeavoured to assess the impact of the proposed MBMs on, among others, international trade, the maritime sector of developing countries, least developed countries (LDCs) and Small Island Developing States (SIDS), as well as the corresponding environmental benefits.

43 Following completion of the expert group's study, some of the proposed MBMs were combined or further developed by their respective proponents and, in examining the proposals, the intersessional working group had an extensive exchange of views on issues related to, inter alia, the desirability of MBMs providing: certainty in emission reductions or carbon price; revenues for mitigation, adaptation and capacity-building activities in developing countries; incentives for technological and operational improvements in shipping; and offsetting opportunities. Based on such policy considerations, the group reported to the MEPC, in accordance with its terms of reference, related to: the grouping of the MBMs; the strengths and weaknesses of the MBM groups; their relation to relevant international conventions; and the aforementioned possible impacts. The report of GHG-WG 3 (MEPC 62/5/1) was held in abeyance by MEPC 62 and considered at MEPC 63 (MEPC 63/21, paragraph 5.7).

44 If an MBM for international shipping was considered further, then part of any consideration could be the possibility of raising funds from the implementation of such a measure. MEPC 63 noted (MEPC 63/23, paragraph 5.34.7) that there were several possible uses for revenues generated by an MBM for international shipping, as identified in the MBM proposals, including:

- .1 incentivizing shipping to achieve improved energy efficiency;
- .2 offsetting – purchase of approved emission reduction credits;
- .3 providing a rebate to developing countries;
- .4 financing adaptation and mitigation activities in developing countries;
- .5 financing improvement of maritime transport infrastructure in developing countries (e.g. Africa);

- .6 supporting R&D to improve energy efficiency of international shipping; and
- .7 supporting IMO's Integrated Technical Co-operation Programme (ITCP).

45 Should an MBM be introduced for international shipping, MEPC 63 recognized the need for a continued impact assessment and that its focus should be on possible impacts on consumers and industries in developing countries (MEPC 63/23, paragraph 5.14).

46 Following further consideration at MEPC 64 (October 2012), the Committee agreed to keep the documents presented in abeyance and postpone further debate on MBMs to MEPC 65 (MEPC 64/23, paragraph 5.15). MEPC 65 (May 2013) agreed to suspend discussions on market-based measures and related issues to a future session (MEPC 65/21, paragraph 5.1).

### ***Reduction target for international shipping***

47 MEPC 60 noted that there would be a need to consider whether the international maritime sector should be subject to an explicit emission ceiling (cap) or a reduction target comprising the entire world fleet of merchant vessels (MEPC 60/22, paragraph 4.89). The paramount questions would be how and by which international organization such a cap or reduction target should be established. Other questions related to whether a cap or a target line would include the methodology by which the cap/target is set and maintained as well as the possible connection with other transport modes and how they are regulated internationally.

48 MEPC 60 agreed that the debate on reduction targets was a vital part of IMO's GHG work (MEPC 60/22, paragraph 4.93) and the issue of a reduction target for international shipping was included in its agenda item on "Reduction of GHG emissions from ships". However, due to time constraints, the Committee held the matter in abeyance until consideration of MBMs was suspended at MEPC 65.

49 The Paris Agreement identifies a target of global temperature increase above pre-industrial level of "well below 2°C" with an aim of limiting the increase to 1.5°C. Reference is made to the temperature goals of the Paris Agreement in the "Levels of ambition" included in the *Initial IMO Strategy on Reduction of GHG emissions from ships* (see annex 1 of this submission).

## **CONTROL OF OTHER EMISSIONS FROM SHIPS**

50 The adoption of MARPOL Annex VI in 1997, its entry into force in 2005 and its subsequent revision in 2008 represent significant steps towards establishing a robust global regime responsive to the air quality issues experienced in coastal areas. By reducing harmful emissions to air from ships, the measures are expected to have a significant beneficial impact on the atmospheric environment and on human health, particularly for those people living in port cities and coastal communities. As of 18 April 2018, 89 IMO Member States, the combined merchant fleets of which constitute approximately 96.18% of the gross tonnage of the world's merchant fleet, have ratified MARPOL Annex VI.

### **Sulphur Oxides (SO<sub>x</sub>) and Particulate Matter (PM)**

51 SO<sub>x</sub> and PM emission controls apply to all fuel oils, as defined in regulation 2.9 of MARPOL Annex VI, combustion equipment and devices onboard and therefore include both main and all auxiliary engines together with items such as boilers and inert gas generators. These controls are divided into those applicable inside Emission Control Areas (ECAs) established to limit the emission of SO<sub>x</sub> and PM and those applicable outside such areas, and are primarily achieved by limiting the maximum sulphur content of the fuel oils as loaded, bunkered and subsequently used onboard. These fuel oil sulphur limits (expressed in terms of % m/m, that is, by mass) have been subject to a series of step changes over the

years (regulations 14.1 and 14.4 of MARPOL Annex VI). Currently, the sulphur limit outside an ECA established to limit SO<sub>x</sub> and PM emissions is 3.50% m/m and will fall to 0.50% m/m on 1 January 2020, following a review of the availability of the required compliant fuel oil completed at MEPC 70 (October 2016) – further information is provided below.

52 Most ships operating both outside and inside ECAs will therefore use different fuel oils in order to comply with the respective limits. In such cases, prior to entry into an ECA, the ship is required to have fully changed over to using ECA-compliant fuel oil and to have onboard written procedures showing how the changeover is to be undertaken (regulation 14.6 of MARPOL Annex VI). Similarly, a changeover from using ECA-compliant fuel oil is not to commence until after exiting the ECA. At each changeover it is required that the quantities of ECA-compliant fuel oils onboard are recorded, together with the date, time and position of the ship when either completing the changeover prior to entry or commencing changeover after exit from such areas. This is to be recorded in a logbook as prescribed by the ship's flag State, and in the absence of any specific requirement in this regard the record could be made, for example, in the ship's Annex I Oil Record Book.

53 The first level of control in this respect is therefore the actual sulphur content of the fuel oils as bunkered. This value is to be stated by the fuel oil supplier on the bunker delivery note and hence is, together with other related aspects, directly linked to the fuel oil quality requirements as covered under regulation 18 of MARPOL Annex VI. Thereafter it is for the ship's crew to ensure, in respect of ECA-compliant fuel oils, that through avoiding loading into otherwise part-filled storage, settling or service tanks, or in the course of transfer operations, such fuel oils do not become mixed with other, higher sulphur content fuel oils, so that the fuel oil as actually used within an ECA exceeds the applicable limit.

54 Consequently, regulation 14 of MARPOL Annex VI provides both the limit values and the means to comply. However, there are other means by which equivalent levels of SO<sub>x</sub> and PM emission control, both outside and inside ECAs, could be achieved. These may be divided into methods termed primary (in which the formation of the pollutant is avoided) or secondary (in which the pollutant is formed but subsequently removed to some degree prior to discharge of the exhaust gas stream to the atmosphere). Regulation 4.1 of MARPOL Annex VI allows for the application of such methods, subject to approval by the administration. In approving such "equivalents" an Administration should take into account any relevant guidelines. There are no guidelines in respect of any primary methods. In terms of secondary control methods, guidelines have been adopted and subsequently amended for exhaust gas cleaning systems that operate by water washing the exhaust gas stream prior to discharge to the atmosphere (resolution MEPC.259(68)). In using such arrangements there would be no constraint on the sulphur content of the fuel oils as bunkered other than that given by the system's certification.

55 There are no provisions for PM in regulation 14, but it is recognized that the sulphur content of fuel oil relates to the PM of the exhaust. PM consists of particles of soot or smoke resulting from the burning of, primarily, heavier oils. It is considered to be a major health hazard as particulates may penetrate deep into the lungs and blood and cause cancer (see also Black Carbon discussion below).

56 As indicated, MEPC 70 agreed to "1 January 2020" as the effective date of implementation for ships to comply with global 0.50% m/m sulphur content of fuel oil requirement and, in this connection, adopted resolution MEPC.280(70) on the effective date of implementation of the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI.

57 MEPC 70, in recognizing the concerns expressed regarding implementation, instructed the 4th session of the Sub-Committee on Pollution Prevention and Response (PPR 4) to develop a draft justification and scope for new output on consistent

implementation of the 0.50% m/m sulphur limit. PPR 4 in January 2017 agreed a draft justification and scope for new output on consistent implementation of the 0.50% m/m sulphur limit.

***Consistent implementation of regulation 14.1.3 of MARPOL Annex VI***

58 MEPC 71 in July 2017 approved the new output on "Consistent implementation of regulation 14.1.3 of MARPOL Annex VI", for inclusion in the PPR Sub-Committee's biennial agenda for 2018-2019 and the provisional agenda for PPR 5, with a target completion year of 2019.

59 MEPC 71 also approved the following scope of work:

- .1 **preparatory and transitional issues** that may arise with a shift from the 3.50% m/m sulphur limit to the new 0.50% m/m limit;
- .2 **impact on fuel and machinery systems** that may result from the use of fuel oils with a 0.50% m/m sulphur limit;
- .3 **verification issues and control mechanisms and actions** that are necessary to ensure compliance and consistent implementation;
- .4 **development of a draft standard format (a standardized system) for reporting fuel oil non-availability** as provided in regulation 18.2.4 of MARPOL Annex VI that may be used to provide evidence if a ship is unable to obtain fuel oil compliant with the provisions stipulated in regulations 14.1.3 and 14.4.3;
- .5 **development of guidance, as appropriate, that may assist Member States and stakeholders** in assessing the sulphur content of fuel oil delivered for use on board ship, based on the consideration of mechanisms to encourage verification that fuel oils supplied to ships meet the specified sulphur limit as stated on the bunker delivery note;
- .6<sup>10</sup> **request to ISO to consider the framework of ISO 8217** with a view to keeping consistency between the relevant ISO standards on marine fuel oils and the implementation of regulation 14.1.3 of MARPOL Annex VI;
- .7 **any consequential regulatory amendments and/or guidelines necessary** to address issues raised in items .1 to .6 above or otherwise considered necessary to ensure consistent of regulation 14.1.3 of MARPOL Annex VI; and
- .8<sup>11</sup> **consideration of the safety implications relating to the option of blending fuels in order to meet the 0.50% m/m sulphur limit.**

60 Having been forwarded by PPR 5 as an urgent matter, MEPC 72 (April 2018) approved draft amendments to MARPOL Annex VI for a prohibition on the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship, with a view to adoption at MEPC 73 (October 2018).

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<sup>10</sup> Completed at MEPC 71 (MEPC 71/17, paragraph 14.27.5). A letter has also been sent to ISO by the Secretariat on 4 September 2017.

<sup>11</sup> Agreed by MEPC 71 (MEPC 71/17, paragraph 14.27.2)

## **Nitrogen Oxides (NO<sub>x</sub>)**

61 NO<sub>x</sub> can act as indirect greenhouse gases by producing the tropospheric GHG ozone via photochemical reactions in the atmosphere. The control of diesel engine NO<sub>x</sub> emissions is achieved through the survey and certification requirements leading to the issue of an Engine International Air Pollution Prevention (EIAPP) Certificate and the subsequent demonstration of in service compliance in accordance with the requirements of regulations 13.8 of MARPOL Annex VI and 5.3.2 of the NO<sub>x</sub> Technical Code 2008.

62 The NO<sub>x</sub> control requirements of MARPOL Annex VI apply to installed marine diesel engines of over 130 kW output power other than those used solely for emergency purposes, irrespective of the tonnage of the ship on which such engines are installed. Definitions of "installed" and "marine diesel engine" are given in regulations 2.12 and 2.14 of MARPOL Annex VI, respectively. Different levels (Tiers) of control apply based on the ship construction date, a term defined in regulations 2.19 and hence 2.2, and within any particular Tier the actual limit value is determined from the engine's rated speed. The most stringent limit, Tier III, applies only to specified ships while operating in ECAs established to limit NO<sub>x</sub> emissions. Outside such areas Tier II controls apply. A marine diesel engine installed on a ship constructed on or after 1 January 2016 and operating in the North American ECA and the United States Caribbean Sea ECA shall comply with the Tier III NO<sub>x</sub> standards.

63 The emission value for a marine diesel engine is to be determined in accordance with the NO<sub>x</sub> Technical Code 2008 in the case of Tier II and Tier III limits. Most Tier I engines have been certified to the earlier 1997 version of the NO<sub>x</sub> Technical Code which, in accordance with the *Guidelines for the application of the NO<sub>x</sub> Technical Code relative to certification and amendments of Tier I engines* (MEPC.1/Circ.679), may continue to be used in certain cases until 1 January 2011. Certification issued in accordance with the 1997 NO<sub>x</sub> Technical Code remains valid over the service life of such engines.

### **Emission control areas designated under MARPOL Annex VI**

64 MARPOL Annex VI includes provisions to establish ECAs for the control of emissions of NO<sub>x</sub>, SO<sub>x</sub> and PM. The North American ECA (August 2011) and the United States Caribbean Sea ECA (January 2013) have been designated as ECAs for the control of emissions of SO<sub>x</sub>, NO<sub>x</sub> and PM. The North American ECA comprises the sea areas 200 nautical miles off the Pacific coasts of the United States and Canada; off the Gulf of Mexico and Atlantic coasts of the United States, Canada and the French territories; and off the coasts of the populated Hawaiian Islands. The United States Caribbean Sea ECA comprises waters adjacent to the coasts of Puerto Rico and the United States Virgin Islands.

65 The Baltic Sea (May 2005) and the North Sea including the English Channel (November 2006) had been designated for the control of SO<sub>x</sub> emissions only. MEPC 71 (July 2017) adopted amendments to MARPOL Annex VI to designate the North Sea and the Baltic Sea as emission control areas (ECAs) for nitrogen oxides (NO<sub>x</sub>) under regulation 13 of MARPOL Annex VI. Both ECAs will take effect on 1 January 2021, thereby considerably lowering emissions of NO<sub>x</sub> from international shipping in those areas.

66 Provisions were approved at MEPC 70 to allow ships fitted with non-Tier III compliant marine diesel engines to be built, converted, repaired and/or maintained at shipyards located in the designated NO<sub>x</sub> Tier III ECAs.

### **Use of gas as fuel for international shipping**

67 There is significant interest in the use of gas as fuel for international shipping as its combustion results in less harmful pollutants being emitted than by fuel oil. Depending on the gas used, the emissions can be virtually sulphur-free and there can be reduced emissions of

NO<sub>x</sub> (some engines solely fuelled by gas can meet Tier III limits), CO<sub>2</sub> and PM. This development lead to requests for the risks of using gas, and other low flashpoint fuels, to be appropriately regulated. Following several years of work, the International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code) was adopted in 2015, along with new SOLAS regulations making the Code mandatory which require ships constructed after 1 January 2017 to comply with the requirements of the IGF Code.

68 Furthermore, to allow the use of gas as a fuel under MARPOL Annex VI, the definitions of "fuel oil" and "marine diesel engine" have been amended and further amendments were made to permit the testing of gas-fuelled and dual fuelled engines to enable them to be appropriately certified under the NO<sub>x</sub> Technical Code 2008. One of the current limitations for the use of gas as a fuel is the lack of a global gas bunkering network supporting an international trading fleet of gas-fuelled ships. Other alternative fuels for ships under consideration include methanol (see paragraph 68.5) and hydrogen in fuel cells.

### **Black Carbon**

69 MEPC 62 (July 2011) agreed to the following work plan for the BLG Sub-Committee to consider the impact on the Arctic of emissions of Black Carbon from international shipping (MEPC 62/24, paragraph 4.20):

- .1 develop a definition for Black Carbon emissions from international shipping;
- .2 consider measurement methods for Black Carbon and identify the most appropriate method for measuring Black Carbon emissions from international shipping; and
- .3 investigate appropriate control measures to reduce the impact of Black Carbon emissions from international shipping.

70 The matter is now being considered by the Sub-Committee on Pollution Prevention and Response (PPR) under its agenda item on "Consideration of the impact on the Arctic of emissions of Black Carbon from international shipping". MEPC 68 (May 2015) approved a definition of Black Carbon for international shipping agreed by PPR 2 (January 2015). MEPC 68 also noted that at that stage it was not possible to consider possible control measures to reduce the impact on the Arctic of emissions of Black Carbon from international shipping.

71 PPR 3 (January 2016) developed a measurement reporting protocol for voluntary data collection of Black Carbon and invited interested Member Governments and international organizations to use the protocol and submit data to PPR 4. Voluntary measurement studies using the agreed definition of Black Carbon were reported to PPR 4 (January 2017) and are continuing, in order to identify the most appropriate measurement method(s).

72 PPR 4 noted that some delegations encouraged information on potential control measures to be submitted to PPR 5. PPR 5 (January 2018) agreed the *Reporting protocol for voluntary measurement studies to collect Black Carbon data* as well as most appropriate Black Carbon measurement methods for data collection. PPR 5 encouraged Member States and international organizations to continue to collect Black Carbon data, using the agreed reporting protocol and the agreed measurement methods, and submit relevant data to the next session of the Sub-Committee.

## **IMO-published technical studies**

73 In support of the work of the MEPC and to provide timely information to Member Governments, specifically to support developing countries with the implementation of the provisions of MARPOL Annex VI, and using funds donated by Canada and Norway, the Secretariat has undertaken and published<sup>12</sup> a series of technical studies as follows:

- .1 investigation of appropriate control measures (abatement technologies) to reduce Black Carbon emissions from international shipping;
- .2 emission control and energy efficiency measures for ships in the port area;
- .3 studies on the feasibility and use of liquid natural gas (LNG) as a fuel for shipping;
- .4 optimization of energy consumption as part of implementation of a Ship Energy Efficiency Management Plan (SEEMP); and
- .5 methanol as marine fuel: environmental benefits, technology readiness and economic feasibility.

## **PROMOTION OF TECHNICAL COOPERATION AND TRANSFER OF TECHNOLOGY RELATING TO THE IMPROVEMENT OF ENERGY EFFICIENCY OF SHIPS**

74 In order to support countries that lack the requisite resources, experience or skills to implement IMO treaties, IMO has developed an Integrated Technical Co-operation Programme (ITCP) which is designed to assist Governments by helping them build the necessary capacity. Through technical cooperation and capacity-building activities, IMO helps to transfer know-how to those countries that need it, thereby promoting wider and more effective implementation of IMO measures.

75 Linked to the implementation of energy efficiency measures, and specifically to regulation 23 of MARPOL Annex VI, MEPC 65 (May 2013) adopted resolution MEPC.229(65) on *Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships*, requiring Administrations, in cooperation with IMO and other international bodies, to promote and provide, as appropriate, support directly or through the IMO to Member States, especially developing countries that request technical assistance. It also requires the Administration of a Party to MARPOL Annex VI to cooperate actively with other Parties, subject to its national laws, regulations and policies, to promote the development and transfer of technology and exchange of information to States that request technical assistance, particularly developing States.

76 Pursuant to resolution MEPC.229(65), MEPC 66 (April 2014) established an Ad Hoc Expert Working Group on Facilitation of Transfer of Technology for Ships. MEPC 69 considered the final report of the group and noted the outcome of its work, as follows:

- .1 A scoping document on the establishment of an inventory of energy efficiency technologies for ships was forwarded to the GEF-UNDP-IMO project "Transforming the global maritime transport industry towards a low carbon future through improved energy efficiency" (GloMEEP). Using this scoping document, GloMEEP has developed an information portal for energy efficiency technologies for ships<sup>13</sup>.

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<sup>12</sup> <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/IMO-Publications.aspx>

<sup>13</sup> <http://glomeep.imo.org/resources/energy-efficiency-techologies-information-portal/>

- .2 Development of a *Model agreement between Governments on technological cooperation for the implementation of the regulations in chapter 4 of MARPOL Annex VI* (MEPC.1/Circ.861).
- .3 Recommendations provided to guide and assist Member States, industry and other entities within States in implementing the regulations of chapter 4 of MARPOL Annex VI.
- .4 Assessments made to identify barriers to transfer of technology and potential implications and impacts on the implementation of the regulations in chapter 4 of MARPOL Annex VI, in particular on developing States, as a means to identify their technology transfer and financial needs.

77 MEPC 69 also noted that a comprehensive update of the "Train the Trainer" package on "Energy Efficient Ship Operation" had been undertaken to include a new module on the regulatory framework related to the energy efficiency of ships, an EEDI calculator for training purposes, and other related updated information, such as the findings from the Third IMO GHG Study 2014. Member Governments and other interested delegations were encouraged to make use of it. MEPC 69 further noted that IMO's technical cooperation activities would seek to address the specific needs of LDCs and SIDS with regard to the implementation of ship energy efficiency requirements.

78 Building on the success of the cooperation agreement between the Korean International Co-operation Agency (KOICA) and IMO on "Building Capacities in East Asia countries to address Greenhouse Gas Emissions from Ships" undertaken between 2011 and 2013, IMO has engaged in two partnership projects to further technical cooperation and technology transfer: the aforementioned GloMEEP project and the establishment of a global network of regional Maritime Technology Cooperation Centres (MTCCs) (Global MTCC Network (GMN) project).

79 The two-year GloMEEP project, an initiative of the Global Environment Facility (GEF), the United Nations Development Programme (UNDP) and IMO, focusses in particular on building capacity to implement technical and operational measures in developing countries, where shipping is increasingly concentrated and controlled. Ten IMO Member States have signed up as lead pilot countries: Argentina, China, Georgia, India, Jamaica, Malaysia, Morocco, Panama, Philippines and South Africa. They are being supported through a series of national and regional workshops and the development of guides in taking a fast-track approach to pursuing relevant legal, policy and institutional reforms, and driving national and regional Government action and industry innovation to support the effective implementation of IMO's energy efficiency requirements.

80 The GMN project aims to form a global network of regional centres of excellence (MTCCs) to promote the uptake of low-carbon technologies and operations in maritime transport. The five target regions, Africa, Asia, the Caribbean, Latin America and the Pacific, have been selected for their significant number of LDCs and SIDS. Three of the five centres, i.e. MTCC-Africa (Kenya), MTCC-Asia (China) and MTCC-Caribbean (Trinidad&Tobago), have now been selected as part of the GMN project, with the remaining (Latin-America and Pacific) expected to be selected during 2017. The four-year project, administered by IMO with €10 million in funding from the European Union, is designed to enable beneficiary countries to limit and reduce GHG emissions from their shipping sectors through technical assistance and capacity building, while encouraging the uptake of innovative energy-efficient technologies among a large number of users through the widespread dissemination of technical information and know-how. This is expected to heighten the impact of technology transfer.

