

MARINE ENVIRONMENT PROTECTION  
COMMITTEE  
65th session  
Agenda item 5

MEPC 65/5/4  
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## REDUCTION OF GHG EMISSIONS FROM SHIPS

### Shipping emissions in the context of a 2°C emission pathway

#### Submitted by the Clean Shipping Coalition (CSC)

#### SUMMARY

*Executive summary:* IMO is preparing to update the inventory of ship GHG emissions to inform work towards agreeing additional measures to reduce GHG emissions from ships. UNEP has developed emission reduction pathways for CO<sub>2</sub> in order to keep global warming limited to the 2°C increase target. This document draws attention to recent subsequent work undertaken by Professor David Lee and colleagues at Manchester Metropolitan University which sets unmitigated shipping (and aviation) emissions within this context. CSC believes that this work represents further strong evidence highlighting the urgent need for the IMO to take immediate action. The 65th session of MEPC should agree in particular on the early adoption of immediate measures to address GHG emissions from existing ships so as to preserve the chances of limiting global warming to 2°C.

*Strategic direction:* 7.3

*High-level action:* 7.3.2

*Planned output:* 7.3.2.1

*Action to be taken:* Paragraph 10

*Related document:* MEPC 65/5/2

#### Introduction

1 This document is submitted in accordance with paragraph 6.12.5 of the *Guidelines on the organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.4/Rev.2) and comments on document MEPC 65/5/2 (Secretariat).

2 The Report of the Expert Workshop on the update of GHG emissions estimate for international shipping (MEPC 65/5/2) recognizes the need for reliable and up-to-date information to support the Committee's work regarding future possible measures to address

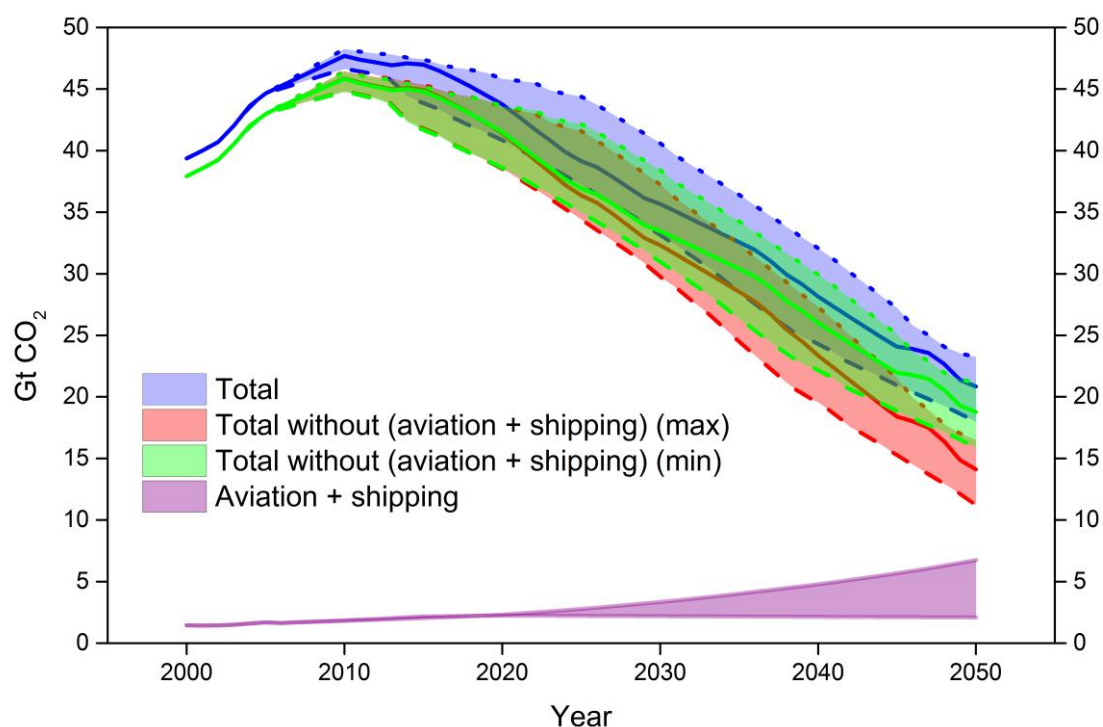
GHG emissions from international shipping. At IMO, progress in limiting and reducing emissions has resulted in the introduction of the EEDI which may begin to have an impact on emissions in the next decade depending in part on compliance questions. Since adoption of the Kyoto Protocol in 1997, emissions from international shipping have continued to grow steadily notwithstanding recent effects of the economic crisis and the advent of widespread slow steaming. By a wide consensus, emissions are expected to resume their upward trend after the economic recovery tracking the growth in world trade. Such a growth in emissions is completely unsustainable. IMO's Member States need to recognize this and move to adopt urgent measures to halt this trend. The principal task now, given the adoption of the EEDI, is to address emissions from existing ships which represent 100 per cent of the problem today and will continue to do so to a declining extent for another two decades.

3 UNEP has developed emission reduction pathways for CO<sub>2</sub> in order to keep global warming limited to the no more than 2°C increase target in 2100. This document draws attention to recent subsequent work undertaken by Professor David Lee and colleagues at Manchester Metropolitan University setting shipping (and aviation) emissions out to 2050 within this context. CSC believes this work represents further strong evidence highlighting the urgent need for the IMO to take immediate action to reduce emissions of the world fleet with this critical timeline in mind. The 65th session of MEPC should agree in particular on the early adoption of immediate measures to address GHG emissions from existing ships so as to help preserve the chances of limiting global warming to no more than 2°C.

4 The full details of the report are: Shipping and aviation emissions in the context of a 2°C emission pathway, David S. Lee, Ling Lim, Bethan Owen. Manchester Metropolitan University, Dalton Research Institute, Faculty of Science and Engineering, Chester Street, Manchester M1 5GD, UK. March 2013. It can be consulted at: <http://www.cate.mmu.ac.uk/projects/shipping-and-aviation-emissions-in-the-context-of-a-2c-emission-pathway/> and at <http://www.transportenvironment.org/publications/shipping-and-aviation-emissions>

### **Report highlights**

5 Shipping and aviation represented around 3.2 and 2.1 per cent respectively of global CO<sub>2</sub> emissions in the mid-2000s. A wide range of projections and scenarios shows that both sectors are likely to grow over the coming decades with a resultant increase in CO<sub>2</sub> emissions by 2050, despite various mitigation efforts. Here, a typical emission pathway that will limit global mean surface temperatures to no more than a 2°C increase by 2100 over pre-industrial temperatures is taken from prior work. This 2°C emission pathway makes no assumptions over the contributions of either the shipping or aviation sectors or of any particular nations' efforts. It merely shows what the overall global emission reduction trend must be to reach the 2°C target. If current projections of emissions from shipping and aviation to 2050 are placed in the context of such an overall global 2°C emissions reduction pathway, then shipping might contribute between approximately 6 and 18 per cent of median permissible total CO<sub>2</sub>-e emissions in 2050 to meet the pathway, and aviation might contribute between approximately 4 and 15 per cent of median total CO<sub>2</sub>-e emissions, and the two sectors together might contribute between approximately 10 and 32 per cent of total median CO<sub>2</sub>-e emissions in 2050.



**Figure 1: Projected 2°C Emission Pathways**

6 In figure 1 above the 2°C emission pathway (blue band) and aviation plus shipping emissions (minimum, maximum from figure, purple band) and total emissions less minimum aviation plus shipping emissions (green band) and maximum aviation plus shipping emissions (red band) are shown. For "total", "total without aviation + shipping (max)", "total without aviation + shipping (min)", the solid line of the coloured band is the median, the dotted line the 80 percentile value, the dashed line the 20 percentile value.

7 It is important to understand what is shown in figure 1; the emissions underlying the 2°C emission pathway (blue band) make no assumptions about mitigation from particular sectors. The emissions are simply those in CO<sub>2</sub>-e that result in a particular emission pathway.

8 It should be noted that the total emissions considered are Kyoto CO<sub>2</sub>-e gas emissions. Thus, the comparison with aviation and shipping emissions is accurate in using CO<sub>2</sub> only under this particular definition. However, it is understood that aviation has a total radiative forcing response that exceeds that from its CO<sub>2</sub> emissions alone (Lee et al., 2009; 2010) and shipping has one that produces an overall negative radiative forcing response (Eyring et al. 2010). The overall negative radiative forcing effect of shipping is driven by sulphur emissions, which under IMO regulations are expected to be reduced on air quality/public health grounds. MEPC 58 revised MARPOL Annex VI regulations in October 2008 requiring the reduction of the global sulphur limit of marine fuels from 4.5 to 3.5 per cent in 2012, and to 0.5 per cent in 2020 or 2025, pending a review of fuel availability. The CO<sub>2</sub> radiative forcing response from shipping, however, remains and Fuglestvedt et al. (2009, 2010) have shown that at some point the accumulating CO<sub>2</sub> global and long-term positive response will overwhelm the regional and short-term (reducing) negative response from sulphur emissions, such that the overall response will change sign. Accounting for these complex responses could be done by usage of a variety of potential climate metrics such as the Global Warming Potential (GWP) or Global Temperature Change Potential (GTP) (Shine et al. 2005), but the underlying non-CO<sub>2</sub> radiative forcings are uncertain and would also require value judgements over user

choices in these candidate metrics such as time horizon, on which the GWP and GTP values are strongly dependent (Fuglestvedt et al. 2010).

### **Report conclusions**

- 9 The main conclusions from the report are as follows:
- .1 2°C emission pathway (see UNEP (2011) analysis) shows that total "allowable" emissions in 2050 (on this pathway) would be between 18.0 and 23.2 Gtonnes of CO<sub>2</sub>-equivalent (CO<sub>2</sub>-e).
  - .2 This estimate makes no assumptions over contributions of sectors or countries, it is simply an estimate of global CO<sub>2</sub>-e emissions that would result in a typical 2°C emission pathway (by 2100), at 2050.
  - .3 Taking available estimates of CO<sub>2</sub> emissions projections from the literature to 2050 for aviation and shipping, aviation might represent between approximately 4 and 15 per cent of median total CO<sub>2</sub>-e emissions in 2050; shipping might represent between approximately 6 and 18 per cent of total CO<sub>2</sub>-e emissions.
  - .4 Taken together, shipping plus aviation emissions might represent between approximately 10 and 32 per cent of total median CO<sub>2</sub>-e emissions in 2050 under a typical 2°C emission pathway.
  - .5 Emissions of aviation and shipping in these scenarios from the literature represent a variety of growth and technological scenarios, but no specific climate mitigation responses.

### **Action requested of the Committee**

10 The Committee is invited to note the above comments and to take action as appropriate.

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