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PREVENTION OF AIR POLLUTION FROM SHIPS

Reduction of emissions of Black Carbon from shipping in the high northern latitudes

Submitted by the Clean Shipping Coalition (CSC), Friends of the Earth International (FOEI), Pacific Environment and World Wide Fund for Nature (WWF)

SUMMARY

Executive summary:	This document contains a proposal to address the impacts of Black Carbon (BC) emissions from shipping in high northern latitudes on human health and climate in the Arctic[1]
Strategic direction:	7.3
High-level action:	7.3.1
Planned output:	7.3.1.1
Action to be taken:	Paragraph 25
Related documents:	MEPC 62/4/3, MEPC 62/INF.32, MEPC 62/INF.33, MEPC 58/INF.21, MEPC 59/INF.15, MEPC 60/INF.20, MEPC 60/4/24; BLG 15/INF.5, BLG 15/INF.8, BLG 15/WP.8; DE 55/12/3, DE 55/12/5 and DE 55/12/18

Introduction

1 During the past year or so, a number of submissions have been made to MEPC and to several Sub-Committees concerning the problem of emissions of Black Carbon (BC) by international shipping in areas that impact human health and climate in the Arctic (see, e.g., "Related documents", above). Nevertheless, IMO has yet to seriously examine this important issue. The Committee, at its sixty-first session, invited interested delegations and observers to make submissions on the subject to BLG at its fifteenth session. BLG 15, however, decided that it needed clearer instruction from the Committee on how to proceed, and in turn invited submission of documents containing concrete proposals on the matter to MEPC 62 (BLG 15/19, paragraphs 11.44 to 11.52).

2 In the context of the current discussion on development of a mandatory Polar Code, the DE Sub-Committee decided, at its fifty-fifth session, to seek input from the Committee regarding Black Carbon emissions (DE 55/22, paragraph 12.13).

[1] This document was prepared by the Clean Air Task Force, with assistance from Transport & Environment.

3 In order to progress further discussion of the matter with the aim of determining the best approach to reducing shipping emissions of Black Carbon that impact the Arctic, the co-sponsors submit this proposal for consideration by the Committee.

Background

4 Much information has been previously submitted to IMO on this issue, including:

.1 the state of technical and scientific knowledge concerning Black Carbon emissions and their impacts in documents MEPC 60/4/24 (Norway, Sweden and the United States) and BLG 15/INF.8 (CSS (CLRTAP BC Expert Group Report));

.2 recent inventories of shipping emissions of black carbon in the Arctic region in document BLG 15/INF.5 (CSC);

.3 a new scientific study of the climate impacts of emissions of Black Carbon from shipping in areas that impact the Arctic in document BLG 15/INF.5 (CSC); and

.4 description of certain measures that can be used to reduce shipping emissions of black carbon in documents MEPC 60/4/24 (Norway, Sweden and the United States) and DE 55/12/18 (FOEI, CSC, IFAW, WWF and Pacific Environment).

5 In addition, CSC is submitting two additional informational documents to this session, MEPC 62/INF.32 providing an estimate of premature mortality in areas north of 40 degrees north latitude from shipping emissions of black carbon and organic carbon, and MEPC 62/INF.33 providing an assessment of potential BC control measures.

6 The information provided in the mentioned documents is detailed and substantial, and will not be repeated here. However, some of the basic highlights are set forth below to accommodate efficient analysis of this issue.

Analysis

7 Black Carbon (BC) is a component of fine particulate matter (PM) produced by incomplete combustion of various fossil fuels. It is commonly known as "soot", sometimes called "elemental carbon", and may be defined as "the carbonaceous component of primary particulate matter that absorbs all wavelengths of solar radiation".

8 Because BC is emitted in varying amounts with other components of directly emitted particulate matter (organic carbon, metals and ash), most control measures for directly emitted PM will also control BC to a similar degree (however, some devices such as oxidation catalysts control organic carbon but not Black Carbon). The Committee will need to agree on the appropriate method of measuring PM (various approaches are described in the annex to document BLG 15/WP.8).

Climate Impacts

9 The climate impacts of BC, including the particularly potent impacts in the Arctic region, have been summarized in the Energy and Environmental Research Associates documents in annex to document MEPC 62/INF.32, as follows:

> "Black Carbon has a potent climate-forcing effect estimated at 680-2200 times the warming potential of carbon dioxide (CO_2) per mass unit on global average. The total warming impact of BC emissions globally is estimated to be ~40% of total CO_2 climate forcing. Black Carbon emissions are of particular concern in the Arctic and Arctic Front (defined as the region south of the Arctic Circle to 40°N latitude) due to the heat absorbing effect of the dark particles, which accelerates melting of snow and ice. The warming potential of BC in the Arctic is higher than the global average, estimated to be 2900-7200 times that of CO_2 per mass unit. [Citations omitted]."

10 Not only is BC an extremely potent climate forcing agent, it also has a short residence time in the atmosphere, and therefore BC emission reductions will bring immediate benefits. The co-sponsors stress that efforts to reduce BC emissions are no substitute for reducing emissions of carbon dioxide, which is the most important cause of global climate change and stays in the atmosphere for hundreds of years. Rather, a complete climate strategy will require reductions of both BC and CO_2, in addition to other climate warming pollution. Reduction of BC emissions can reduce the pace of warming in the near term while CO_2 reductions are critical to stabilize climate over the long term.

11 The Arctic is warming twice as rapidly as the Earth as a whole. This has alarming negative effects, including sea-level rise, impacts on Arctic communities and economies, and possibly release of greenhouse gases from thawing soils, freshwater and marine systems. Because of the strong and near-term warming effects of BC in the Arctic and the rapid warming of that region, it is particularly important to reduce emissions of BC, most particularly emissions of BC from far-north locations where the pollution is most likely to reach the Arctic.

12 It should be stressed that Arctic melting and warming will have repercussions that extend globally. One of these effects is the melting of the Greenland ice sheet and other land ice masses and the resulting sea level rise. Global sea levels are rising, and the rise is accelerating.[2] According to the Arctic Monitoring and Assessment Programme,[3] sea level is projected to rise by 0.9 to 1.6 metres above 1990 levels by 2100, with substantial ongoing increases thereafter. Rising global temperatures and sea levels will have a dramatic impact on coastal areas around the world, and especially on small island states, including a number of IMO Member States with substantial shipping interests. Impacts are likely to include increased flooding and damage to ports, roads and other coastal infrastructure, degradation of fresh water supplies, damage to agriculture, increased erosion, damage to fisheries and coral reefs, and increased destruction from tropical storms.

Harm to Human Health

13 Black Carbon, as a component of PM emissions, also causes significant damage to human health. Impacts include increased mortality from cardiovascular and respiratory conditions and lung cancer, as well as increased morbidity from non-fatal heart attacks and lung cancer, respiratory problems, asthma and neurophysiological problems.[4] A newly completed study (MEPC 62/INF.32) estimates that premature mortality in the Arctic front area (above 40 degrees N latitude) from co-emitted BC and particulate organic matter (POM) from ships is 6,200 persons per year (the Arctic Premature Mortality Study).

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2 See, e.g., Rignot, E., Velicogna, I, van den Broeke, M.R., Monaghan, A., and Lenaerts, J., "Acceleration of the contribution of the Greenland and Antarctic ice sheets to sea level rise," *Geophysical Research Letters,* Vol. 38, L05503 (March 2011), doi:10.1029/2011GL046583.

3 See http://www.amap.no/swipa/.

4 See, e.g., US EPA (2010), "Control of Emissions From New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder; Final Rule," 75 Fed. Reg. 22896, at 22903-06 and 2295-63 (April 30, 2010).

14 The Arctic Premature Mortality Study clearly establishes that ocean-going ship emissions of BC and POM, major components of primary fine particulate matter emitted by ships, produce substantial harm to human health. In fact, the study underestimates the human health impacts, since it only estimates premature death, and does not include estimates of the other significant health impacts of diesel particulate emissions.

15 The societal costs of these northern shipping emissions are quite large enough to support the efforts necessary to reduce them. Many benefits of reduced emissions cannot be quantified in monetary terms. However, a variety of efforts have been made in recent years to quantify some of the benefits of air pollution reduction. For example, in order to evaluate the benefits of its regulatory programmes, the United States EPA has quantified a number of benefits from reduced particulate emissions in the United States. Using EPA's figure for the value of a statistical life, the estimated monetized value of lives lost annually found by the Arctic Premature Mortality Study to be caused by shipping emissions of BC and POM is over $39 billion per year (2000$)[5]. Furthermore, in the absence of IMO action these costs are likely to grow substantially in the future as shipping activity in the Arctic increases, as discussed below.

16 In summary, the Arctic Premature Mortality Study clearly provides an important and independent reason for taking regulatory steps to reducing emissions of directly emitted PM, including BC, in the world's northern latitudes.

Shipping Emissions of Black Carbon and Mitigation Potential

17 Globally, shipping contributes almost as much primary PM emissions as road traffic. Up to 17% of global PM emissions have been estimated to be BC (see document MEPC 59/INF.15). Work carried out for the Arctic Council recently showed that BC shipping emissions in the Arctic proper warm the Arctic many times more, on a per-tonne basis, than average global BC emissions. In-Arctic shipping emissions are presently relatively small, estimated at about 900 tonnes annually. However, due to the ongoing warming and melting occurring in the Arctic, and the resultant opening up of Arctic sea lanes, shipping emissions in the Arctic are projected to increase dramatically over the next several decades, by up to five times by 2030 and almost 20 times by 2050. The huge increase in deposition of BC on local Arctic snow and ice resulting from such a large expansion in shipping activity could spell disaster for the Arctic, and ultimately for the planet as a whole.

18 As demonstrated by the recent study by James Corbett and colleagues described in document MEPC 62/INF.33, there are a number of control measures available today to reduce primary PM emissions, including BC. These measures include:

.1 slide valves;

.2 water-in-fuel emulsion;

.3 diesel particulate filters;

.4 emulsified fuel; and

.5 seawater scrubbers.

Potential BC control measures are also discussed in document MEPC 60/4/24.

[5] See, e.g., 75 Fed. Reg. 22896, at 22956. There, EPA applied a value of statistical life of $6.3 million (2000$), representing the mean value from estimates derived from 26 labour market and contingent valuation studies published between 1974 and 1991.

19 The Corbett study found that certain BC control measures, when used in combination, can produce significant emission reductions cost-effectively. Thus, the study found that a 60% reduction in Black Carbon could be realized at less than US$10 per $mtCO_2eq$ (20 year), with a 70% reduction costing about US$20 to 35 per $mtCO_2eq$ (20 year), under conditions where the vessel spends 25-100% of the time in a sensitive region such as the Arctic. In fact, the study estimates that BC emissions from Arctic shipping could be reduced by over 60% in 2020 by approximately $20 million/yr, a figure which is orders of magnitude less than the human health cost resulting from these emissions (see paragraph 15 above).

20 Reduction of the sulphur content in marine fuel is not likely directly to reduce BC emissions, although it will, of course, reduce secondary sulphate PM emissions.

21 Because BC is a product of incomplete fuel combustion, measures (both design and operational) that will increase the efficiency of combustion or otherwise reduce fuel use will reduce emissions of BC as well as most other pollutants, while at the same time cutting fuel costs.

Proposed Approach to BC Reductions

22 In light of the urgent need to reduce BC emissions in northern latitudes where those emissions can impact both Arctic climate and human health, and the availability of cost-effective emission reduction measures to accomplish this, the co-sponsors urge the Committee to take prompt action to reduce BC emissions in sea areas north of 40°N latitude.

23 Shipping in northern latitudes has a greater impact on the Arctic climate than the emissions farther south, and given the large projected increase of maritime traffic in the Arctic region, it is very important to adopt measures promptly to be applied for vessels operating north of 60°N latitude, *before* the anticipated increase in Arctic shipping traffic occurs.

24 The co-sponsors therefore propose that the Committee:

.1 adopt requirements for ships operating in sea areas north of 60°N latitude to implement measures to reduce BC emissions by at least 50% by 2016 and at least 70% by 2020;

.2 develop interim guidelines for BC reduction measures and consider measures, including economic instruments, for ships operating between 60°N and 40°N latitude and report on the effectiveness of such guidelines, pending the outcome of an expert group study referred to below; and

.3 establish an Expert Group on Arctic Black Carbon Emissions to assess shipping emissions of BC in sea areas between 60°N and 40°N latitude, their impacts and the transport of these emissions to the Arctic, and recommend appropriate action to the Committee.

Action requested of the Committee

25 The Committee is invited to consider the information and proposal presented in this document and take action as appropriate.