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REDUCTION OF THE IMPACT ON THE ARCTIC OF BLACK CARBON EMISSIONS FROM INTERNATIONAL SHIPPING

Developing concrete measures to reduce the impact of Black Carbon emissions from international shipping on the Arctic

Submitted by FOEI, WWF, Pacific Environment and CSC

SUMMARY

Executive summary:	This document aims to remind the Sub-Committee of the urgent need to reduce Black Carbon emissions from ships impacting the Arctic, details approaches and provides recommendations for potential Black Carbon control measures.
Strategic direction, if applicable:	3
Output:	3.3
Action to be taken:	See paragraph 18
Related documents:	PPR 10/6, PPR 10/18 ; MEPC 79/5/6 ; MEPC 80/9/2 and PPR 11/6/1

Background

1 At PPR 10, six potential Black Carbon (BC) control measures set out in paragraph 15.5 of document PPR 10/6 (Denmark) were discussed and interested Member States and international organizations were invited to work intersessionally to further develop proposals on potential BC control measures and submit them to the next session of the Sub-Committee (PPR 10/18, paragraph 6.3). This document details approaches and recommendations for potential BC control measures.

2 After 13 years of discussion at MEPC and PPR, the need for the shipping industry to act and reduce its emissions of BC impacting the Arctic remains urgent. As a quick reminder, BC is a short-lived climate pollutant (SLCP), produced by the incomplete combustion of fossil fuels, with a climate impact over 3,000 times higher than that of CO_2 on a 20-year global warming potential (GWP20) basis. When released near the Arctic, BC has a disproportionately high impact. It contributes to warming in the atmosphere and accelerates melting when deposited onto snow and ice. The melting snow and ice exposes darker areas of land and water, which absorb further heat from the sun. As a result, the reflective capacity of the planet's

polar ice cover – the albedo effect – is severely reduced. More heat in the polar systems results in increased melting – a feedback that contributes to "Arctic amplification" of climate warming. BC is also an air pollutant that has a high negative impact on human health including respiratory and cardiovascular diseases.

3 The Arctic is a major climate regulator and scientists now report that it is warming as much as four times faster than the planet as a whole.[1] It is also an important ice habitat for wildlife – unique ecosystems supporting a huge productivity of plant and animal life in the oceans. The Arctic also provides cultural identity for Inuit and other Indigenous Peoples. But we are losing Arctic Sea ice – at a rate of around 12% per decade since 1979[2] and the multi-year ice is disappearing[3] – with unprecedented consequences for the global biodiversity crisis and the loss of the Inuit homeland.

4 Following the release in 2018 of the IPCC (Intergovernmental Panel on Climate Change) Special Report on Global Warming (of 1.5°C), the United Nations Environment Programme reiterated that "fast and immediate action on SLCPs (including BC) can avoid a half a degree of warming by 2050 and such action will also avoid over 50% of the predicted warming in the Arctic by 2050, thereby significantly decreasing the chances of triggering dangerous climate tipping points" such as the loss of Arctic sea ice. Both the UN Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution and the UN Framework Convention on Climate Change have emphasized the threat to the Arctic and global processes from short-lived climate pollutants including BC.

5 In 2017, the Arctic Council adopted a pan-Arctic collective, aspirational goal to reduce emissions of BC by 25% to 33% below 2013 levels by 2025. This followed the adoption of a 2015 framework that set out a common vision for Arctic States to accelerate the reduction of both BC and methane emissions. Within the framework, Arctic States committed to strengthening national actions, developing, and improving emissions inventories and emissions projections for BC and methane, and to submitting national reports to the Arctic Council Secretariat. The third progress report published in 2021, announced that the Arctic States were on track to reach the collective goal of a 25% to 33% reduction in BC levels by 2025, despite emissions from ships operating in the Arctic doubling between 2015 and 2021 (see paragraph 9). During the Arctic Council's Icelandic Ministerial in 2021, Ministers committed to possibly updating the goal at the next Arctic Council Ministerial meeting.

Context for reducing emissions of BC from ships

6 BC makes up around one-fifth of international shipping's CO_2 equivalent (CO_2e) emissions globally. In 2010, Norway, Sweden and the United States called on the Organization to address BC by first examining measures which would significantly reduce emissions from shipping having an impact on the Arctic (document MEPC 60/4/24), the premise being that reductions of BC from shipping in the most climate sensitive area – the Arctic – could contribute to short-term climate responses that were considered to be "absolutely necessary to forestall a climate tipping point" and could provide "breathing time" for the needed reductions in CO_2 to take hold over the longer term.

1 https://assets.researchsquare.com/files/rs-654081/v1_covered.pdf?c=1631873458, https://agu.confex.com/agu/fm21/meetingapp.cgi/Paper/898204

2 https://climate.nasa.gov/vital-signs/arctic-sea-ice/

3 https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2023JC020157, https://iopscience.iop.org/article/10.1088/1748-9326/ac8be7

7 Supporting the proposals in document MEPC 60/4/24, the United Nations Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution urged the Organization to take active steps to reduce emissions from shipping of BC on the Arctic region – to improve public health, particularly for Indigenous Arctic populations, and to slow the rate of warming (document MEPC 62/4/3). This document recognized that action could be performance-based requiring a specific emission reduction, or technology-based, such as requiring the use of low-sulphur fuel and diesel particulate filters when operating in the Arctic. Ultimately, the document acknowledged that a technological approach was probably easier to verify.

8 Ten years ago in 2013, work was presented to IMO from the Arctic Council's Arctic Monitoring and Assessment Programme (AMAP) showing the significance of close-to-Arctic and within Arctic sources of BC, with the Arctic defined as all regions above 60° North. The work concluded that emissions of BC above 60° North were more significant than emissions at lower latitudes and that this should be taken into account when establishing potential mitigation action for BC (document MEPC 65/4/22 (Norway)).

9 Disappointingly, the progress made in achieving reductions in BC emissions from a variety of sectors to meet the Arctic Councils 25% to 33% target by 2025 is not reflected in emissions from the shipping sector. Recent work from the International Council on Clean Transportation (ICCT) shows that emissions of BC from ships operating in the Arctic have doubled from 193 tonnes to 413 tonnes between 2015 and 2021 (document MEPC 80/9/2 (FOEI et al.)).

10 It has been argued that regulation 43A of MARPOL Annex I, which starts to take effect in July 2024 and comes into full effect on 1 July 2029, will address BC emissions from ships. Document MEPC 79/5/6 (FOEI et al.) sets out the limitations of this MARPOL Annex I regulation to address emissions to air of BC. In summary, MARPOL Annex I regulation 43A was designed as a fuel oil spill regulation and will only fully prohibit the use of heavy fuel oils (as defined) from 1 July 2029 – much too late to deliver the "rapid, deep and sustained mitigation and accelerated implementation of adaptation actions this decade" called for by the IPCC Sixth Assessment Report. In addition, the requirements of regulation 43A are only applicable to ships operating in Arctic waters as defined by MARPOL Annex I for the purposes of IMO's Polar Code. This area has a much smaller scope than all waters above 60° North which is commonly used to define the geographic Arctic. Furthermore, this agenda item is aimed at reducing the impacts on the Arctic of BC emissions from international shipping. Work published by ICCT has shown that in 2021 only 22% of ships operating above 58.95° North sailed within the waters included in the Polar Code Arctic waters area and they emitted only 27% of the total BC emissions in the Arctic (document MEPC 80/9/2). To address BC emissions from international shipping impacting the Arctic and to support Arctic Indigenous communities' rights and survival, a much broader approach to controlling emissions of BC from international shipping is required.

Next steps for addressing BC emission reductions from ships

11 Last year, PPR 9's Correspondence Group on Prevention of Air Pollution from Ships reduced the list of potential BC reduction regulatory control measures, proposing that further work should focus on measures that can be agreed and implemented now. A switch to cleaner fuels such as distillates was identified as an easy-to-apply short term measure as well as designation of emission control areas (ECAs). Measures requiring further work included the development of a fuel standard, engine certification and mandatory installation of BC reduction technology such as diesel particulate filters (document PPR 10/6 (Denmark)).

12 The Organization has spent over 13 years debating how to address the impact of shipping's BC emissions on the Arctic but has yet to deliver on the purpose of all this work – actual reduction of the impact on the Arctic of emissions of BC from international shipping. Consequently, the shipping sector continues to emit an extremely powerful but very short-lived climate forcer in an unregulated manner, and emissions are increasing in the region where the most damage occurs. This is directly contrary to the rapid, deep and sustained mitigation and accelerated implementation of adaptation actions this decade as called for by the IPCC Sixth Assessment Report, which concluded that "[t]he likelihood and impact of abrupt and/or irreversible changes in the climate system, including changes triggered when tipping points are reached, increase with further global warming. And as warming levels increase, so do the risks of species extinction or irreversible loss of biodiversity in ecosystems including forests, coral reefs and in Arctic regions."

Options to urgently reduce BC emissions

13 Limiting the aromatic content of fossil fuels reduces BC emissions. Importantly, it is the hydrogen to carbon (H/C) ratio of these fuels that is the best indicator of a fuel's aromatic or paraffinic nature. Limits on the aromatic content of fuels for road use, off-road, diesel-powered locomotives and even for inland shipping fuels have been applied in both Europe and North America for over a decade. In the case of aviation fossil kerosene fuels, reducing the aromatic content leads to less soot at altitude – and thus an immediate reduction in contrails which account for approximately 60% of the aviation sectors' climate impact. The EU's Fit for 55 package of climate regulations has now mandated that from 2025 all aviation fuels must be tested for aromatic content, with a view to the European Commission potentially capping and requiring reductions.

14 The International Organization for Standardization (ISO) has committed to proposing an indicator for a marine fuels' paraffinic nature. So far only the test results of heavy fuel oils, very low sulphur fuel oils and ultra-low sulphur fuel oils have been assessed for paraffinic levels. Test results for distillate fuels are also available and it would be valuable for an assessment of distillate fuels to be undertaken and published as soon as possible in order to obtain a complete picture of the performance of all fossil-based marine fuels. In addition, document PPR 11/6/1 (Canada et al.) noted that the H/C ratio is a better, more direct and cost-effective measure of a fuel's sooting propensity than the Viscosity Gravity Constant (VGC) being proposed by ISO as an indicator to characterize whether a marine fuel tends to be more paraffinic or aromatic in nature. The H/C ratio is a basic elemental analysis (ASTM 5291), feasible for all types of marine fuels, is not expensive and can already be performed by many fuel oil laboratories. Incorporating the H/C ratio in ISO 8217 as a simple, affordable fuel parameter to identify fuels with high BC emission potential would enable the aromatic or paraffinic nature of fuels being bunkered to be readily identified and also facilitate any work to develop a marine polar fuel standard.

15 Work in the aviation sector over the last few years has focused on assessing the impact of the aromatic content in fossil kerosene, in part because developing combustor technology to reduce non-volatile particulate matter (soot/BC) emissions has proven difficult, costly, time-consuming and generally performed well below expectations. Tests showed that soot/BC emissions can vary by an order of magnitude between combustor manufacturers, so a fuel-based solution, to complement engine technology, is being pursued. An H/C ratio requirement in test fuels for aircraft engine certification has already been set out in the Standards and Recommended Practices to Annex 16 of the ICAO Convention and an affordable direct fuel test for compliance is readily available. Similar work on fuels in the maritime sector involving regulators and standards bodies should be prioritized including the need to develop a straightforward and cost-effective test of marine fuels' H/C ratio as proposed in document PPR 11/6/1.

16 A call has been issued for concrete BC abatement proposals to be brought forward to PPR 11 for consideration. The co-sponsors have focused on the shortlist of control measures identified through the work of the PPR 9 Correspondence Group (see paragraph 11), which were briefly discussed at the PPR 10 working group. The co-sponsors believe that three of the measures identified by the Correspondence Group could be applied in a stepped approach and should be pursued by the Organization as a high priority:

.1 Mandatory switch to distillate in the Arctic:

The first measure is a switch to distillate. This is a simple change in fuel choice, which has been on the table for over 13 years. This measure is already encouraged on a voluntary basis through resolution MEPC.342(77) and is undoubtedly the simplest and quickest way in which BC emissions in and near to the Arctic can be reduced. It would deliver between 42% to 79% reductions in BC emissions depending on the engine type, age, maintenance, and load. Ships already switch between heavier fuels and distillate as they operate in and out of emission control areas (ECAs), and the use of lighter distillate fuels would facilitate the installation of diesel particulate filters which could reduce emissions of BC by over 90%. It would be important that such a measure be applied over a suitable geographic area which is indicated by AMAP. ICCT and others' work should be all Arctic seas above 60° North or alternatively the waters within the Arctic Human Development Report or Arctic Monitoring and Assessment Programme boundary. Such a measure could be included in MARPOL Annex VI through the introduction of a new BC regulation. Implementation could be quick and straightforward and constitute the first move in a stepped approach.

.2 Arctic aromatic fuel standard:

A polar aromatic fuel standard could also be introduced via the addition of a new BC regulation to MARPOL Annex VI. Such an approach would be goal-based. It would be necessary to know the aromatic/paraffinic nature of the marine fuels by testing for the H/C ratio, and to establish a suitable compliance threshold, e.g. all marine fuels used in or near the Arctic (see .1 above, all Arctic seas above 60° North) would have to comply with a specific H/C ratio standard. Initially the threshold could be set based on an average performance of distillate fuels and tightened over time since ultimately the threshold needs to be set at zero BC emissions. The geographic scope of the regulation would need to be determined.

.3 BC emission control area (based on aromatic content or H/C ratio)

A further measure is the development of a BC ECA designation. This measure would also require an H/C ratio compliance threshold to be introduced via a new BC regulation in MARPOL Annex VI. A BC ECA regulation could support other types of ECAs, for example, a compliant fuel would need to meet both the required 0.10% m/m or 1,000 ppm sulphur limits and the H/C threshold. There would be no need to define the geographic scope of the measure and designation could also be used by States to support reductions in BC emissions arising from further South.

Conclusions

17 The planet's climate is changing rapidly and there is a clear and present climate crisis in the Arctic. The UN now recognizes that we are currently on course for nearly 3°C of warming by the end of the century.[4] There is an urgent need for measures that will reduce short-lived climate pollutants today – particularly those that impact the Arctic. Here the co-sponsors lay out three possible options based on the work of this Organization to date. In order to achieve the necessary rapid, deep and sustained mitigation called for in the latest IPCC report, there is a need to regulate emissions of short-lived climate forcers from all sectors, including international shipping. It is a climate travesty that a very potent short-lived climate pollutant remains unregulated, especially when solutions already exist.

Action requested of the Sub-Committee

18 The Sub-Committee is invited to consider the information provided in this document and, in particular, to:

.1 invite ISO to analyse and publish data/information on the paraffinic nature of distillate fuels; and

.2 proceed with the development of control measures starting with an immediate and mandatory switch to distillates or other cleaner fuels and the development of a polar fuel standard and BC ECA.

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[4] https://www.unep.org/resources/emissions-gap-report-2023