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**EVALUATION AND HARMONIZATION OF RULES AND GUIDANCE ON THE
DISCHARGE OF DISCHARGE WATER FROM EGCS INTO THE AQUATIC
ENVIRONMENT, INCLUDING CONDITIONS AND AREAS**

On the need to ban scrubbers

Submitted by FOEI, WWF, Pacific Environment, CSC and Inuit Circumpolar Council

SUMMARY

Executive summary: This document identifies impacts of scrubber wastewater on aquatic life, reports on rates of non-compliance, documents existing regional restrictions, provides proposals for prohibiting scrubber discharges in sensitive waters until banned globally, and recommends local and regional measures.

*Strategic direction,
if applicable:* 1

Output: 1.23

Action to be taken: Paragraph 21

Related documents: MEPC 76/9/1, MEPC 76/INF.5 and MEPC 79/5/3

Introduction

1 Ships routinely introduce large volumes of harmful substances into the ocean and freshwater basins by means of operational discharges and other incidental wastes. These wastes collectively degrade the environment and pose a risk to the health and wellbeing of wildlife and people. A substantial proportion of ships' discharges originate from exhaust gas cleaning systems (EGCS) (also known as scrubbers), which have seen a meteoric rise in popularity in the past decade.

2 This document issues a call to action for States, recalling their duties and obligations (e.g. UNCLOS Article 195, etc.), to ban scrubber discharges in their jurisdictional waters and to stop approving scrubbers for use on ships registered under their flags. This document also recommends that further work be undertaken at IMO to rapidly phase out scrubbers and in the meantime to prioritize bans in environmentally, ecologically, and culturally significant areas, such as the Arctic and in designated protected areas. The co-sponsors also raise the issue of non-compliance and question whether scrubbers are fit for purpose, particularly in sulphur emission control areas (SO_x-ECA).

Background

3 In 2008, MEPC 57 agreed to reduce the maximum allowable sulphur content of marine fuels from 4.5% to 3.5% after 1 January 2012, and then to 0.50% from 1 January 2020, except in Sulphur Emission Control Areas (SECAs), where the maximum sulphur content was limited to 1.0% after 1 July 2010 and 0.10% in January 2015.

4 As an alternative compliance mechanism, MARPOL Annex VI allows ships to continue using high-sulphur fuels if they are fitted with an exhaust gas cleaning system (EGCS), also known as a "scrubber". MARPOL Annex VI identifies national maritime administrations as the Parties responsible for approving scrubbers and issuing SO_x Emission Compliance Certificates for flagged ships. Notably, MARPOL Annex VI also states that national maritime administrations "shall endeavour not to impair or damage its environment, human health, property, or resources or those of other States".

Impacts of scrubber discharges

5 Previous work submitted to IMO, including document MEPC 76/9/1 (ICES), identified the many ways in which both open-loop and closed-loop scrubbers degrade water, air, and sediment quality. This includes through the discharge of large amounts of wastewater which is acidic and contains harmful and persistent substances including polycyclic aromatic hydrocarbons (PAHS), nitrates, nitrites, and heavy metals including nickel, lead, copper, and mercury, all of which are discharged to the aquatic environment in dissolved and readily bioavailable form. Research has also shown that using heavy fuel oil (HFO) with scrubbers results in higher amounts of carbon dioxide, particulate matter, and black carbon compared to marine gas oil (MGO).¹ Still further research has been conducted demonstrating the enormous quantities of scrubber wastewater produced and discharged annually worldwide (>10 Gt).²

6 The co-sponsors are of the view that sufficient sound and compelling evidence already exists to support bans on scrubber discharges as well as put into serious question their use as a regulatory compliance tool. Nonetheless, the co-sponsors highlight below additional research to support further action to ban scrubbers both regionally and internationally.

Severe toxic effects to marine animals

7 Discharges from both open-loop and closed-loop scrubbers are toxic to the tiny animals that support the marine food web.³ These conclusions are detailed in Thor et al., 2021, which demonstrates severe toxic effects on copepods exposed to scrubber washwater, including elevated mortality and impaired molting even at the lowest tested concentrations of scrubber washwater. Copepods are an essential species in the marine food web and form 80% of zooplankton biomass. This study notes that scrubber effluent appears more toxic to marine copepods than crude oil.

¹ [Air emissions and water pollution discharges from ships with scrubbers](#). International Council on Clean Transportation. 2020.

² Ship scrubber washwater: [How much, what's in it, and where it's dumped](#). International Council on Clean Transportation. 2021.

³ Severe Toxic Effects on Pelagic Copepods from Maritime Exhaust Gas Scrubber Effluents Peter Thor, Maria E. Granberg, Hulda Winnes, and Kerstin Magnusson. Environmental Science & Technology 2021 55 (9), 5826-5835. <https://doi.org/10.1021/acs.est.0c07805>

Risks to port environments

8 A more recent study by Hermansson et al. shows that substances found in scrubber wastewater such as polycyclic aromatic hydrocarbons (PAHs) and heavy metals lead to unacceptable risks for marine life.⁴ In 2023, Chalmers University calculated loads and predicted environmental concentrations (PECs) of metals and PAHs in four ports. They then compared these with predicted no effect concentrations (PNEC) to assess environmental risk from ship sources. The results show that three out of four ports were subject to unacceptable risk.

9 The above-mentioned study illustrates the importance of accounting for multiple contaminant sources when assessing the marine environmental risks of shipping and challenges the suitability of the proposed new international guidelines on how to assess risk of scrubber wastewater discharge. The study also found that ten of the most toxic contaminants found in scrubber wastewater contribute to >95 percent of the cumulative risk associated with open-loop scrubber wastewater discharge.

Toxic at low concentrations

10 EMERGE is an innovative 4-year project funded by the European Commission under the Horizon 2020 programme. In the project, eight universities, five research institutes, two companies and the intergovernmental organisation HELCOM all cooperate, aiming to assess the combined impacts of shipping emission control options on the aquatic and atmospheric environments, including their suitability, efficacy, cost-effectiveness, and the bioaccumulation of pollutants. Partners in the project have been systematically analysing the complex interactions between technological options, pollutant emissions and dispersion, and the environment. Measurements focus on abatement techniques and include emissions to, and concentrations in, water, air and marine biota.

11 A recent EMERGE report shows that toxic effects of scrubber wastewater were detected at considerably lower concentrations than previously reported.⁵ The most sensitive of the analysed endpoints was fertilisation of sea urchin eggs, where a statistically significant disturbance was observed already at concentrations of 0.0001% scrubber waste-water, or 1 mL scrubber wastewater per m³ of seawater. Scrubber wastewater at concentrations of 0.001% was found to cause significant malformations of larvae of species from three animal phyla including sea urchins, a polychaete (segmented worm), and mussels.

Impacts of scrubber discharges in sensitive and vulnerable waters, and to people

12 The IPCC's *Special Report on the Ocean and Cryosphere in a Changing Climate* summarized that it is "virtually certain" that the global ocean has warmed since 1970 and there is "high confidence" that it has taken up more than 90% of the excess heat in the climate system. The rate of ocean warming has "likely" doubled since 1998, and it is "very likely" that marine heatwaves have doubled in frequency since 1982 and there is "very high confidence" that they are increasing in intensity.

⁴ Hermansson, A. L., Hassellöv, I. M., Jalkanen, J. P., & Ytreberg, E. (2023). *Cumulative environmental risk assessment of metals and polycyclic aromatic hydrocarbons from ship activities in ports*. Marine Pollution Bulletin, 189, 114805. <https://doi.org/10.1016/j.marpolbul.2023.114805>

⁵ EMERGE Deliverable 2.3 *"Report on scrubber water whole effluent toxicity testing, at different geographical regions"*. (2022).

13 It is "virtually certain" that the ocean has undergone increasing surface acidification due to the absorption of CO₂.⁶ There is "very high confidence" that Arctic sea ice extent and thickness has reduced, and that the Arctic Ocean is acidifying faster than the global ocean which could have implications for the Arctic ecosystem - algae, zooplankton and fish - and also for its people.⁷ With diminishing sea ice, the Arctic Ocean is opening up for marine traffic. According to the Arctic Council's Protection of the Arctic Marine Environment (PAME) Working Group, scrubbers generate liquid effluent that has low pH and contains heavy metals and polycyclic aromatic hydrocarbons (PAHs) that pose a risk to the marine environment.⁸

14 Open-loop scrubbers change the primary recipient of waste from the use of high sulphur oil-based fuels from the atmosphere into the sea.⁹ Every year an estimated 10 Gt of scrubber wastewater is discharged into the marine environment.¹⁰ Sea water pH is decreased because of scrubber wastewater discharges in many areas. Results from the North Sea, which is a Sulphur Emission Control Area (SECA) and therefore a Special Area under IMO, show a pH decrease, equivalent to 10 to 50 years of climate change acidification. The largest pH changes occur in areas with high traffic density, e.g. along the Belgian and Dutch coasts and near large ports such as Rotterdam. The impacts are predicted to increase if more ships are equipped with open-loop scrubbers.¹¹

15 Coastal communities that rely on healthy marine species for food and livelihood are impacted, particularly Indigenous Peoples. In this context, it is important to acknowledge the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and obligations under UNCLOS, which direct States to enable Indigenous Peoples to exercise their rights under international and domestic law by not permitting the disposal of hazardous materials. This includes scrubber wastewater in waters that are significant and related to the present, past, and future of Indigenous Peoples. Inuit homeland in the Arctic, Inuit Nunaat, is warming three to four times faster than the rest of the planet. These changes have unprecedented and significant impacts on people in the Arctic who depend on the marine and terrestrial plants and animals supported by the coastal zones of the Arctic Ocean, the tundra, and the sea ice. The Arctic Ocean and its coastal seas not only serve as highways for Inuit over the ice in winter and in the open water season, but also are essential for transmission of culture and Inuit Knowledge, harvesting, and livelihoods. These values are put at risk by wastewater discharges in areas that are essential for Indigenous Peoples' health and well being.

⁶ [Summary for Policymakers — Special Report on the Ocean and Cryosphere in a Changing Climate \(ipcc.ch\)](#)

⁷ [Report Card 2021 - NOAA Arctic](#)

⁸ *Survey of select wastewater discharges* – Arctic Council PAME. <https://pame.is/projects-new/arctic-shipping/shipping-current-projects-2021-2023/421-survey-of-select-wastewater-discharges>

⁹ Hermansson, A. L., Hassellöv, I. M., Moldanová, J., & Ytreberg, E. (2021). *Comparing emissions of polyaromatic hydrocarbons and metals from marine fuels and scrubbers. Transportation Research Part D: Transport and Environment*, 97, 102912. <https://doi.org/10.1016/j.trd.2021.102912>

¹⁰ *Ship scrubber washwater: How much, what's in it, and where it's dumped*. International Council on Clean Transportation. 2021.

¹¹ Dulière V., Baetens K. and Lacroix G. (2020). *Potential impact of wash water effluents from scrubbers on water acidification in the southern North Sea. Final project report*. Royal Belgian Institute of Natural Sciences. Operational Directorate Natural Environment, Ecosystem Modelling. 31 pp. <https://doi.org/10.3390/w14071146>

Non-compliance of scrubbers

16 A study on the southern part of the North Sea by Van Roy et al., 2023 showed significant concerns about the use of scrubbers.¹² The Royal Belgian Institute of Natural Sciences (RBINS) carried out aerial surveillance operations for the monitoring of sulphur emissions by international shipping. The study reveals that from 2015–2019, 14 out of 102 red flags were related to scrubbers – a rate of 14%. A red flag indicates that the ships concerned not only had higher amounts of non-compliance, but of equal concern, they were found to emit substantially higher levels of SO₂ once identified as non-compliant. Since 2020, the percentage has grown to 80%. This means that there is a significant percentage of non-compliance of scrubbers in the southern North Sea. Additionally, it was found that ships equipped with scrubbers and identified as non-compliant, emitted substantially higher levels of SO₂. Recalling that the primary reason for tightening ship emissions regulations was due to serious impacts on human health, these findings are of special concern for coastal inhabitants.

Restrictions on the use of scrubbers and discharge of scrubber wastewater

17 There is clear and increasing evidence of the harmful impacts of scrubbers. It is therefore unsurprising that the number of bans is increasing. In a 2023 report, the International Council on Clean Transportation (ICCT) presents an overview of the scrubber bans and restrictions that were in place as of February 2023. The ICCT report identifies a total of 45 countries that have introduced a total of 80 bans and 13 restrictions, at port, national and sub-national levels.¹³

18 Paragraphs 6 to 16 clearly show that the utilization of scrubbers to limit air pollution results in several flaws. Not only is the discharge of wastewater harmful to the aquatic environment, scrubbers also fail, leading to non-compliance and greater SO_x emissions. Therefore, the co-sponsors believe that additional regulatory measures are necessary.

Recommendations

19 The decision to accept scrubbers as a compliance mechanism has been taken without thorough consideration of the environmental effects on both the marine environment and air quality. In view of the serious impact on the aquatic environment, the co-sponsors recommend that the ultimate goal must be to ban scrubbers worldwide. In the short term, the co-sponsors urge coastal States and ports to take immediate steps to ban the discharge of scrubber wastewater in their jurisdictional waters and urge shipowners to refrain from installing or using scrubbers.

20 Recalling that scrubber wastes degrade water, sediment, and air quality, and also recalling the duties of States to protect and preserve the marine environment, to not transform one type of pollution into another, and to minimize to the fullest extent pollution from installations and devices operating in the marine environment, the co-sponsors recommend that Member States should as a matter of urgency:

- .1 stop approving scrubbers for use on ships, and adopt and implement bans on scrubber discharges in their jurisdictional waters;

¹² Van Roy, W.; Merveille, J.-B.; Scheldeman, K.; Van Nieuwenhove, A.; Schallier, R.; Van Roozendaal, B.; Maes, F. Assessment of the Effect of International Maritime Regulations on Air Quality in the Southern North Sea. *Atmosphere* 2023, 14, 969. <https://doi.org/10.3390/atmos14060969>

¹³ [Global update on scrubber bans and restrictions](#). International Council on Clean Transportation. 2023.

- .2 develop measures through the Organization to ban scrubbers globally, including, but not limited to, prohibiting scrubbers on newbuilds and retrofits, and rapidly phasing out scrubbers on existing ships; and
- .3 recommend the Committee undertake work to develop and implement regional scrubber bans in ecologically, environmentally, and culturally significant areas including the Arctic, Special Areas, Particularly Sensitive Sea Areas, SO_x-ECAs, and international waters with poor environmental status.

Action requested of the Sub-Committee

21 The Sub-Committee is invited to consider the information contained in this document, in particular the necessary urgent follow-up actions detailed in paragraph 20, when considering regulatory matters as per its scope of work and take action, as appropriate.
