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ANY OTHER BUSINESS

Vessel grey water concerns

Submitted by FOEI, Greenpeace, WWF, CSC and Pacific Environment

SUMMARY	
Executive summary:	In this document, co-sponsors outline concerns associated with vessel grey water discharges from international shipping
Strategic direction, if applicable:	2
Output:	No related provisions
Action to be taken:	Paragraph 25
Related documents:	MEPC 60/21/1; MEPC 63/2/18, MEPC 63/23; MEPC 72/INF.21; DE 54/INF.5, DE 54/13/7 and DE 55/12/3

Introduction

1 Vessel sewage has been regulated under MARPOL Annex IV since 2003. Vessel grey water, whose pollution impacts are similar to sewage, is not regulated internationally.

2 Vessel grey water is generally considered accommodation (e.g. shower, bath), laundry, dishwasher, and galley wastewater, and is distinct from drainage from toilets, urinals, hospitals and cargo spaces.[1] Wastewater from shop sinks and deck drains in non-engine rooms, whirlpools, garbage and laundry room floor drains, and refrigerator and air conditioner condensate, inter alia, is also routed through the grey water system. Grey water is produced in greater quantities than sewage on commercial vessels.[2] On cruise ships, grey water can constitute 90% of liquid waste generated on board.[3]

1 *For example*, resolution MEPC.219(63), *2012 Guidelines for the implementation of MARPOL Annex V*.

2 Five times as much grey water is generated and processed compared to sewage every day for a standard size cruise ship of 4,000 passengers and crew (1000 m^3 v. 200 m^3). R. Fiebrandt (Director, Environmental Operations, NCL), Standardization for Marine Sanitation Devices Operator Perspective, prepared for ATSM Committee F25 on Ships and Marine Technology, slide 3, undated.

3 C. Copeland (2008). Congressional Research Service Report for Congress. Cruise Ship Pollution: Background, Laws and Regulations, and Key Issues. Updated July 1, 2008, CRS-4, *available at* https://digital.library.unt.edu/ark:/67531/metadc87283/

Vessel grey water characteristics and environmental impacts[4]

3 Vessel grey water constituents and characteristics include nutrients, elevated temperatures, turbidity, oil and grease, detergent and soap residue, metals (e.g. copper, lead, mercury), bacteria, pathogens, hair, food particles, organic matter, oxygen-depleting substances, suspended solids, bleach, pesticides and phosphates.[5]

4 Bacteria and biochemical oxygen demand levels, among others, are often higher in vessel grey water than black water.[6] Pollutants in grey water can contribute to adverse environmental effects such as shellfish contamination,[7] algal blooms, hypoxic waters, the smothering of benthic biota (e.g. reef-building corals), and invasive species introductions.

5 These contaminants can also impact economically and culturally important fisheries. Grey water discharges can impair phytoplankton, which are the base of the food chain for higher trophic level species such as salmon. Commercial salmon fishing in the state of Alaska generates millions of dollars in revenue annually, while sport fishing is important for tourism. In addition, subsistence salmon fisheries provide food for hundreds of Alaskan coastal communities, including indigenous villages, and help sustain their way of life.

6 Vessel grey water pollutant loads can be substantial. One study determined that in the port waters of Dubrovnik, Croatia, a large proportion of the estimated 1.4×10^{15} of faecal coliforms from cruise ship wastewater is likely attributed to untreated grey water.[8] Other pollutants in grey water, however, may present an even greater environmental threat. The U.S. EPA has remarked that "Graywater has the potential to cause adverse environmental effects because measured concentrations and estimated loadings of nutrients and oxygen-demanding substances are significant."[9] The agency has further indicated that "Copper, lead, mercury (a bioaccumulative chemical of concern), nickel, silver, and zinc were detected in concentrations that exceed acute Federal criteria and State acute water quality criteria."[10]

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4 Since a ship's holding tanks are often interconnected, grey water transport, holding and discharges may interfere with compliant management of regulated waste streams, such as sewage, bilge water, food wastes and ballast water (*see* Norway, MEPC 63/2/18, 23 Dec. 2011).

5 U.S. EPA (2009). Cruise Ship Discharge Assessment Report, 4-1, EPA 842-R-07-005 [hereinafter EPA Cruise Ship Report]; U.S. EPA (2011). Graywater Discharges from Vessels, 2, EPA 800-R-11-001; U.S. EPA (1999). Technical Development Document for Phase I Uniform National Discharge Standards for Vessels of the Armed Forces, Appendix A, Graywater 5-6, EPA 821-R-99-001.

6 EPA Cruise Ship Report, at 3-9; MEPC 72/INF.21; Alaska Cruise Ship Initiative Part 2 Report. Juneau, AK. "The conclusion that [*sic*] can be drawn from the pollutant concentration data in table 4 [table 2 in MEPC 72/INF.21] is that graywater from commercial vessels has the potential to be as environmentally damaging to surface waters as untreated domestic sewage discharged in similar quantities." EPA 2011, at 9.

7 *See* J. Carlos et al. (2014). Environmental transmission of human noroviruses in shellfish waters. Applied and Environmental Microbiology 80 (2014) 3552-3561.

8 T. Peric (2016). Wastewater pollution from cruise ships in coastal sea area of the Republic of Croatia. Scientific Journal of Maritime Research 30 (2016) 160-164.

9 EPA 1999 at Appendix A, Graywater 7; *see also* Wärtsilä, FOEI, and WWF (2015). Marine Wastewater Pollution: Confronting Grey Water and Implementing Annex IV effectively, presentation by Dr. Wei Chen (Wärtsilä) for MEPC 68 side event (May 2015).

10 *Id.*, at 5-15.

7 Micropollutants from vessel discharges are also an emerging concern. Cruise ship grey water effluent may contain UV-filters, ointment residues, caffeine, flame retardants[11] and microplastics.[12]

Vessel grey water generation rates

8 Passenger vessels tend to produce more grey water on a per capita basis than cargo ships.[13] The U.S. EPA, based on 29 cruise ships, indicated average grey water production to be 255 litres per person per day (l/p/d). The Alaskan Cruise Ship Initiative used 189 to 246 l/p/d of grey water as a rule of thumb.[14] A 2009 DNV study found median grey water production rates of 179 l/p/d, which aligned with an earlier Norwegian-based study that revealed passenger ships produced 200 l/p/d.[15] Meanwhile, DNV indicated crew generation rates of 105 l/p/d for tankers, 127 l/p/d for cargo ships, and 175 l/p/d for offshore vessels. VARD, in its 2015 report, estimated grey water production rates of 125 l/p/d aboard cargo ships.[16]

9 Hence, even moderately sized cruise ships can produce extensive amounts of grey water over short durations. WWF Canada estimated that during the **Crystal Serenity's** 12-day transit through Arctic Canadian waters it produced and discharged 5,000 m^3 of grey water.[17] Cruise ship size, though, is increasing substantially, and Royal Caribbean's Oasis-class vessels can carry nearly 9,000 passengers and crew, yielding about 2,000 m^3 of grey water a day. While many cruise ships are equipped with Advanced Wastewater Treatment Systems (AWTS), some cruise ships are being built with traditional, underperforming Type II marine sanitation devices (MSDs)/sewage treatment plants (STPs).[18] Considering all of the sophistication and innovation exhibited on modern cruise ships, it is concerning that decades-old, inferior pollution control technology is still being employed.

10 Aggregate calculations on vessel grey water production or discharge at the national and sub-national levels are relatively scarce. Nevertheless, there is some available information. For instance, ships generated 5,979,640 m^3 of grey water in Norwegian waters, according to a DNV study in 2007.[19] In Arctic Canadian waters, in 2013, vessels

11 L. Westhof et al. (2016). Occurrence of micropollutants in the wastewater streams of cruise ships. Emerging Contaminants 2 (2016) 178-184.

12 *For example*, F. De Falco et al. (2017). Evaluation of microplastic release caused by textile washing processes of synthetic fabrics. Environmental Pollution XXX (2017) 1-10, in press (estimating over 6 million synthetic microfibers released from polyester fabrics per wash load); *cf.* Secretariat, LC 39/9/1, 18 Aug. 2017.

13 This is the case because cruise passengers "are engaged in leisure activities and more likely to use larger quantities of water for bathing, food preparation, etc." EPA 2011, at 6.

14 EPA Cruise Ship Report, *supra* note 5, at 3-3.

15 Det Norske Veritas (2009). Study on Discharge Factors for Legal Operational Discharges to Sea from Vessels in Norwegian Waters, 12, prepared for the Norwegian Maritime Authority (Report No. 2009-0284, rev. 2).

16 VARD (2015). Projections for ship-generated waste traveling through the Canadian Arctic, 27, Report #: 319-000. June 26, 2015.

17 Melissa Nacke, WWF Canada, Harmonizing Grey Water Regulations Nationally & Internationally, CMAC Nov. 15-16 2017, Iqaluit, Canada.

18 "[W]e estimate that at least 47% of newly built capacity over the next 10 years will be using advanced wastewater treatments." EERA (2017). Final Report: Evaluation of Cruise Industry Global Environmental Practices and Performance, prepared for CLIA, at E-2, *available at* http://cruising.org/docs/default-source/research/environment-research-2017.pdf.

19 DNV 2009 report citing Driftsutslipp till luft og sjo fra skistrafikk i norske havomrader. DNV Report No. 2007-2030, Revision 1. On behalf of NIVA and SFT.

rendered 27,445 m^3 of grey water. [20] For the Croatian Adriatic Sea, in 2009, cruise ship grey water generation was 565,080 m^3.[21] And for coastal U.S. waters, a 2011 EPA study ascertained that ships produced 12,521,365 to 14,397,768 m^3 of grey water.[22] Locally, vessel grey water amounts can be sizeable, too. Grey water production by cruise ships at the Port of Dubrovnik for 2009 and August 2014 through July 2015 were 201,253 m^3 and 89,457 m^3, respectively.[23]

11 We are not aware of any consolidated global vessel grey water generation or discharge figures. However, based on European, Arctic Canadian, and U.S. numbers, and making some reasonable assumptions, a worldwide figure for grey water production for the commercial vessel sector would likely be in the hundreds of millions of cubic meters annually.

Grey water regulation in certain areas

12 The present 2013 U.S. EPA Vessel General Permit (VGP)[24] grey water requirements are related to vessel type and location. For example, vessels greater than 400 gt that routinely travel more than 1 nm from the coast and can store grey water would have to discharge it at least 1 nm from shore while underway, treat it to the appropriate standard, or offload it to a landside facility. In addition, cruise ships (both large and medium-sized) at dock must treat the grey water to applicable standards (as defined in 40 CFR 133.102)[25] or dispose of it to a reception facility. These vessel categories, along with large ferries, must keep records estimating all discharges of untreated grey water that reference volume, date, location, and vessel speed at time of discharge.[26] The VGP also includes mandatory best practices, such as minimizing the generation and discharge of grey water in ports, that apply to all relevant vessels. A separate regulatory system in the United States, under the Clean Water Act, pertains to commercial vessels operating on the Great Lakes, and mandates grey water treatment through an approved MSD, or onboard storage for subsequent shore-side disposal.[27]

13 The State of Alaska's treatment of vessel grey water extends nearly two decades and is governed by federal and state legislation.[28] Large cruise ships in Alaskan waters must treat grey water (and sewage) to standards only achievable through an AWTS.[29] These AWTS, if properly maintained, can be "very effective at removing pathogens, oxygen-demanding substances, [and] suspended solids" and moderately effective in reducing levels of nutrients

20 VARD 2015, *supra* note 16, at 32.

21 H. Caric (2012). Cruise Tourism Environmental Risks (Chap. 5) *in* Cruise Tourism and Society: A Socio-economic Perspective, A. Papathanassis et al. (Eds.), Springer-Verlag Berlin Heidelberg.

22 EPA 2011, *supra* note 5, at 7.

23 Caric 2012, *supra* note 21; Peric 2016, *supra* note 8.

24 *See* Final National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges Incidental to the Normal Operation of a Vessel, 78 Fed. Reg. 21,938 (Apr. 12, 2013); EPA VGP webpage *at* https://www.epa.gov/npdes/vessels-vgp/.

25 Grey water discharge standards are 20 CFU/100 ml (30-day geometric mean) for faecal coliform bacteria, 10 µg/L for total residual chlorine, and secondary treatment standards for suspended solids, BOD_5, and pH.

26 EPA 2011, *supra* note 5, at 4. EPA has reckoned that between 43,000 and 50,000 vessels are subject to grey water discharge limitations in the 2013 VGP. *Id.*

27 *See* 33 U.S.C. § 1322(a)(10).

28 *See* Title XIV of Division B of H.R. 5666, 114 Stat. 2763A-315, codified at 33. U.S.C. Sec. 1901 Note; ALASKA STAT. §§ 46.03.460-46.03.490; ALASKA ADMIN. CODE tit. 18 §§ 69.010-69.990.

29 *Id.*

and dissolved metals.[30] The Alaskan regulatory scheme also requires sampling, testing, record-keeping, and reporting of grey water, among other pollutants, for large cruise ships,[31] and institutes an innovative third-party monitoring scheme, called the Ocean Ranger programme, to ensure and verify compliance. Finally, the U.S. EPA can designate grey water no-discharge zones in Alaskan waters.

14 The four California National Marine Sanctuaries and the Olympic Coast Sanctuary in Washington also impose vessel grey water discharge restrictions. As well, California has banned grey water discharge into its marine waters or a marine sanctuary by large passenger vessels and ocean-going vessels with adequate storage capacity. Maine has prohibited the discharge of untreated grey water or a mixture of grey water and sewage into state waters by large passenger ships. These waste streams may be discharged when treated to comply with federal standards established for Alaskan waters, a discharge record book is maintained, and periodic sampling and reporting are undertaken.

15 Operators of new large passenger vessels voyaging in Canadian waters south of 60 degrees north latitude must treat grey water prior to discharging it within 3 nm of the coast or release it outside of 3 nm.[32] Vessel grey water is also prohibited from release in British Columbia's inland waters.[33] But, vessel grey water discharge is allowed in Arctic Canadian waters, if not deemed a "waste" that would degrade the natural environment and attendant human uses.[34]

16 In Europe, the EU Inland Waterway Directive (2012/49/EU) has grey water discharge requirements equivalent to sewage standards and an enforcement regime. HELCOM has also recently discussed vessel grey water matters, and Svalbard has vessel grey water discharge restrictions for certain protected areas.

17 With respect to the Pacific, Australia's Great Barrier Reef Marine Park Authority offers guidance on the types of soaps and cleaners to be used on vessels within the marine park as well as location of grey water discharges.[35] In addition, Vanuatu prohibits the discharge of vessel grey water in port waters.[36]

18 The issue of vessel grey water has been raised by Administrations at IMO, as well.[37] In particular, in paragraph 2.36 of document MEPC 63/23, the Committee agreed "that handling of grey water and sewage water on board ships should be regulated under MARPOL Annex IV and invited Parties to propose relevant amendments to that Annex for consideration at a future session of the Committee."

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30 EPA Cruise Ship report, *supra* note 5, at 2-13; *see also* ADEC (2014). Large Commercial Passenger Vessel Wastewater Discharge Fact Sheet for General Permit No. 2013DB0004 (Revision 1), Appendix D.

31 Title XIV of Division B of H.R. 5666, 114 Stat. 2763A-315, codified at 33. U.S.C. Sec. 1901 Note; ALASKA STAT. § 46.03.460.

32 Pollution Prevention Guidelines for the Operation of Cruise Ships under Canadian Jurisdiction - TP14202E (2013), Secs. 18 & 90.

33 http://www.env.gov.bc.ca/bcparks/explore/gen_info/greywater_fact_sheet.pdf

34 *See* Arctic Waters Pollution Prevention Act, Secs. 2 & 4(1).

35 http://www.gbrmpa.gov.au/onboard/stewardship-and-best-practice/responsible-reef-practices/wastewater-sewage,-greywater-and-bilge-water

36 Secretariat, MEPC 47/12, 6 Nov. 2001.

37 *See also* Norway, MEPC 60/21/1, 12 Jan. 2010; Norway, DE 54/INF.5, 20 Aug. 2010; Norway, DE 54/13/7, 20 Aug. 2010; New Zealand, DE 55/12/3, 17 Dec. 2010.

Current deficiencies with MARPOL Annex IV

19 Compliance monitoring regarding wastewater discharge should be enhanced. MARPOL Annex IV ought to have sampling, testing, record-keeping and reporting features, such as those present in Alaska's cruise ship rules and the U.S. EPA's VGP regime. These measures are vital because we have serious doubts about the efficacy of Annex IV, which have been borne out by the U.S. EPA's Cruise Ship Discharge Assessment Report, two submissions from the Netherlands (MEPC 67/8/1 and MEPC 71/INF.22) and one submission from Norway (MEPC 71/14/2).

20 Seemingly, whenever we evaluate STP (or MSD) performance, the results are abysmal. The latter, above-mentioned submission from the Netherlands revealed that 97% of tested STPs failed to meet all the discharge standards.[38] And many of these exceedances of effluent standards are not trivial; they sometimes surpass the threshold by five, six, or seven orders of magnitude.[39] The Netherlands has gone so far as to state: "The average results showed that the *majority* of the ships are discharging virtually untreated raw sewage from the type approved sewage treatment plants [emphasis added]."[40]

21 In addition, once black water and grey water are collected on ships, they are often interlinked by holding tanks and transfer pipes. Hence, enforcement of Annex IV may not be practicable without establishing appropriate standards for grey water as well.

Grey water treatment technologies and operational issues

22 Due to national and sub-national regulations, technologies for treating grey water, either mixed with black water or not, on board ships have been developed and well-proven. This is particularly true for cruise ships operating in Alaskan waters, wherein wastewater standard compliance has been closely monitored and reported for over a decade.

23 For many years, classification societies also have introduced greener notations for ships that treat grey water. Some shipowners and yards, too, have taken a proactive approach by incorporating grey water treatment requirements for merchant ships.

24 Grey water, however, is sometimes introduced to the disinfection stage of a sewage treatment plant without pre-removal of particulate or dissolved organic pollutants, thereby causing poor performance as well as non-conformity with the latest MEPC Guidelines.

Action requested of the Committee

25 As we believe there is a need to discuss this issue further, we urge Member States and international groups to collate information pertaining to impacts associated with this increasingly large and globally unregulated waste stream and to submit documents to MEPC 73, in accord with the invitation of MEPC 63.

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38 Netherlands, MEPC 71/INF. 22, 28 April 2017.

39 *Id.*

40 *Id.*