

**Ship generated waste in the Arctic Marine Environment:
Marine Pollution, MARPOL and the Polar Code**

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ABSTRACT

This paper focuses on provisions of the Convention for the Prevention of Pollution from Ships or MARPOL and the International Maritime Organization's (IMO) Polar Code amendments to MARPOL Annexes and the obligations of those states party to MARPOL to implement and enforce those international regulations prohibiting the discharge of ship's waste into the oceans. The paper examines the types and amounts of regulated ship generated waste that can be expected, the specific discharge restrictions for oceans and for the Arctic Ocean in particular as covered by the Polar Code amendments and the obligations of Port states to provide reception facilities. Port reception facilities (PRF) play a critical role in protecting the marine environment and special consideration must be given to ship's waste management and port infrastructure supporting Arctic shipping. Regional ship's waste management strategies will almost certainly be required. This paper examines the existing guidance and best practice ship's waste management shipboard and reception facility strategies that may be critical for protecting the Arctic marine environment as shipping increases in the Arctic.

This paper also includes a case study on emerging research on plastics and marine debris in Arctic waters and the role of ocean currents that can carry marine debris into Arctic waters from both the North Atlantic and North Pacific oceans. These base line studies show that plastic marine debris is already accumulating in the Arctic marine environment and highlight the need for immediate action and the critical role of PRFs to prevent further degradation of the Arctic marine environment. Climate change in the coming decades will undoubtedly affect the Arctic ice cover and may present additional challenges for Arctic waters and beyond.

1. INTRODUCTION

1.1 A brief history, Ocean Pollution, IMO and MARPOL

The International Convention for the Prevention of Pollution from Ships (MARPOL) imposes numerous operational and technical requirements on ships. MARPOL also imposes one important obligation to the Government of each Party, which is to ensure the provision for reception of ship-generated residues and garbage that cannot be discharged into the sea. Reception facilities must be *adequate* to meet the needs of ships, *without causing undue delay to ships*. The requirements for port reception facilities create an incentive for ships to comply with MARPOL and to minimize discharges to the marine environment that can contribute to marine pollution. Reception Facilities for waste from ships are covered under MARPOL Annexes I, II, IV, V, and VI.¹

At its second session in 1974 of the IMO's Marine Environmental Protection Committee (MEPC), delegations from Member States and from industry organizations discussed the need for reception facilities for oil, chemicals, sewage and garbage in accordance with the provisions of the 1973 Convention. In 1975 the MEPC established a working group on reception facilities based on reports (from the shipping industry) that adequate PRFs were not being provided. Adequacy of port reception facilities remains an MEPC agenda item to this day and allegations of inadequate PRFs persist.

At a recent meeting of the Arctic Council's Protection of the Arctic Marine Environment (PAME) working group, the Secretary General of the International Chamber of Shipping (ICS) identified high priority challenges facing ships operating in the Arctic. They included protected areas and associated protective measures (APM) for ships plying

¹ Condino, D. and N. Mikelis, *IMO/MARPOL-A GLOBAL GOVERNANCE FRAMEWORK*, Presentation, 5th International Marine Debris Conference, Honolulu, 23 March 2011

Arctic waters and PRF for ship's waste at Arctic and near Arctic ports.²

1.2 A Sea Change in MARPOL discharge regulations for ships

On July 15, 2011, IMO's MEPC adopted Resolution MEPC.201 (62) that fundamentally changed the way the MARPOL will be viewed. On January 1, 2013, for seafarers voyaging on the world's oceans, a general prohibition contained within MARPOL Annex V came into effect that *prohibits* the discharge of ship's garbage into the sea, with very few exceptions.

While the IMO's MARPOL Convention applies to all oceans, including Arctic waters, and the Polar Code amendments to MARPOL are meant to provide better protections for ships operating in Polar Regions, it remains the responsibility of each country to enforce the provisions relating to keeping all types of ship's waste out of the water. Those international regulations include the requirement for each country to ensure that reception facilities are available at ports for ships that need to discharge their operational wastes including all types of garbage that can contribute to the accumulation of marine debris in the ocean and eventual degradation of the Arctic marine environment. But siting, operating and maintaining waste facilities in small, remote ports in the Arctic present additional challenges and risks to both the environment and to culturally sensitive areas in the far north.

1.3 International efforts in the Arctic region

The IMO and its 171 member states have lead international efforts to promote international governance and stewardship of our oceans and to protect the marine environment, including the Arctic Ocean and Antarctic waters. By the early 1990's the Antarctic Area (polar waters south of 60° S. Lat.) had been designated a MARPOL Annex I, II and V Special Area. By 2010 work was already under way at IMO on a Polar Code, having already adopted guidelines for ships operating in polar waters.³ In December of 2014, IMO adopted amendments to SOLAS, Part I A and B, safety measures for ships operating in polar waters and in May of 2015, IMO adopted amendments to MARPOL Annexes I, II, IV, and V, pollution prevention measures for ships operating in polar waters. The Polar Code (amendments to SOLAS and MARPOL) will come into force on January 1 2017. Other provisions in MARPOL, including provisions for port reception facilities, apply in Arctic waters.

One solution may be as simple as the basic concept of "carry in, carry out" for ships operating in Arctic waters, and PAME is presently engaged in a project on the feasibility of using the concept of regional waste management planning where ships discharge all wastes at designated ports outside the arctic and retain wastes until they leave the arctic. The concept would require careful planning and possible redesign and or repurposing of dedicated space aboard ships for waste management and ensuring that designated regional reception facilities (RRF) have the extra capacity to handle the additional ship's waste in an environmentally responsible manner.

Additionally, the United Nations, through its United Nations Environment Program (UNEP), has initiated efforts to bring together experts on the state of the Oceans in a project called the 1st World Ocean Assessment that includes chapters on the Arctic Ocean. At a recent meeting of UNEP's Regional Office of North America (RONA), in Washington, DC, the discussion centered on challenges for managing waste from ship's (and other sources) in the Arctic, and highlighted the fact that more ships transiting highly productive yet relatively pristine Arctic waters increases the risk of pollution from sources both incidental to ship operations and intentional discharges, and from accidental discharges to the ocean. Discharges from ships can include lost fishing gear, illegal discharges of garbage from all ships, debris from groundings and wrecks in remote areas where removal is difficult, and discharges from offshore oil and mineral operations.

1.4 Climate change and shipping in the Arctic

Climate change and the diminishing of both annual and multi-year ice in the Arctic regions over the recent past have lead to an increase in interest in fishing, oil and mineral extraction activities, shipping routes for cargo vessels, and

² Hinchcliff, Peter, Presentation at PAME I 2015, Akureyri, IS (Feb 2015)

³ IMO Resolution A.1024(26), Guidelines for ships operating in polar waters (2 December 2009)

even cruise ships in the Arctic. The Arctic Council countries (Canada, Iceland, Norway, Sweden, Denmark/Greenland, Norway, Russian Federation and the United States) and the PAME Work Group have initiated efforts to meet some of the challenges increased shipping will impose and provide a forum for experts from each of the Arctic Council countries and invited experts from around the world to study the impacts of shipping activities on the environment and indigenous Arctic peoples. Fig 1 gives an indication of the dramatic changes in Arctic Ice cover since 1979.

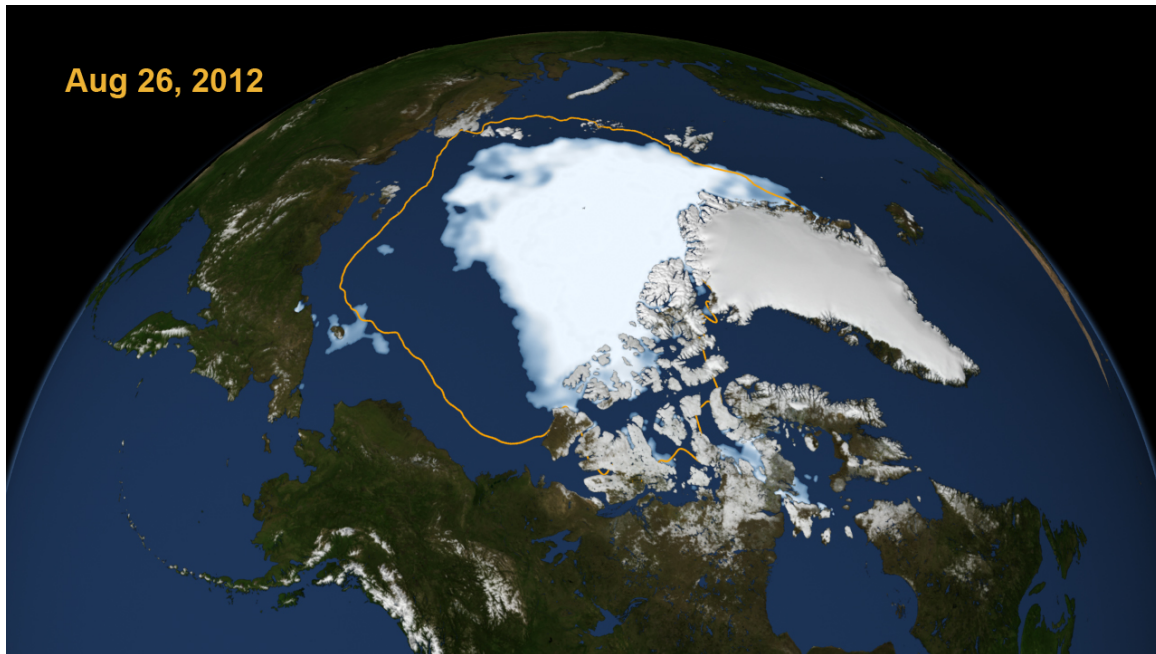


Fig 1 Ice cover, Aug 26, 2012, (white area) is significantly diminished (yellow line on the image shows the average minimum extent from the period covering 1979-2010, as measured by satellites)⁴

1.5 PAME's Arctic Marine Shipping Assessment (AMSA)

Starting in 2006 the Arctic Council's PAME work group undertook a study to assess marine shipping and focus on current and future maritime activity in the Arctic.⁵ Among other topics covered by the AMSA report was an assessment of Arctic Marine Infrastructure, including significant information gaps on infrastructure needed to support emergency response to maritime emergencies, communications infrastructure, navigation and charting for primary shipping routes, availability of adequate PRFs and other port infrastructure. Recommendations included areas of Marine Safety, protecting Arctic peoples and the environment, and addressing Arctic infrastructure deficit. One specific area cited in Part II of the AMSA recommendations was port services and port reception facilities for ship's waste.⁶

2. Current Arctic Activity, sources of marine pollution and immediate challenges for shipping

The graphic at Fig 2, taken from an article in the journal *Le Monde Diplomatique* by French cartographer Philippe Rekacewics, illustrates the present state of the Arctic, as the title indicates, "an sea surrounded by land", and that

⁴ US Government, National Aeronautics and Space Agency, retrieved from: <http://svs.gsfc.nasa.gov/Gallery/ArcticSeaIceResources.html>, 30 June 2015.

⁵ B. Ellis, L. Brigham, Co-Editors, *AMSA 2009 Report, Executive Summary*, Arctic Council Protection of the Arctic Marine Environment Work Group, Akureyri, IS, 2009

⁶ *Ibid*, p. 7

land has already seen considerable development, especially in the areas of the Arctic that are relatively ice free due to warm currents in the North Atlantic (e.g. the coast of Norway and parts of the Russian Arctic).



Fig 2. This Graphic depicts existing Arctic activities and shows sea routes and political boundaries. The information is taken from public sources, including the Arctic Council.⁷

⁷ Rekacewics, Philippe, *The Arctic, a sea surrounded by land*, Le Monde Diplomatique, 2007/09/07, retrieved from: <http://mondediplo.com>, 30 June 2015

2.1 Current Arctic Activity

While many images from the Arctic convey a vast white remote area, which in many ways it is, Fig 2, shows an already complex landscape including longstanding territorial, border and maritime boundary issues between nations, existing land and sea based energy extraction and mining activity, and several urban centers. Much of this existing Arctic activity is supported by and in many cases heavily dependent on shipping. As the future may bring more ice free areas of the Arctic, shipping will likely increase dramatically.

2.2 Sources of marine pollution in the Arctic and adequate port reception facilities

There is no doubt that waste from ships is likely a significant source of marine pollution. A study⁸ by the National Academies of Science of marine pollution discussed in detail the ship based sources of pollution from MARPOL Annex V waste (garbage). The study focused on pre-MARPOL Annex V amendments prohibiting discharges of Annex V waste from ships (i.e. pre-1 January 2013 coming into effect of those prohibitions) that contributed to marine debris and listed sources that included discarded/lost fishing gear, illegal discharge of plastics, allowed discharges of non-plastic garbage from ships, dumping of waste under other IMO conventions, and non-point land based pollution (including run-off from municipal waste disposal sites). While this and other studies have concluded that it is often difficult to pinpoint the source of pollution found in the oceans, especially persistent marine debris, the key to preventing pollution from ships is providing adequate port reception facilities that meet the needs of ships using those ports.⁹

Port reception facilities should¹⁰:

- Conform with national and local permitting schemes or licensing required by environmental and public health laws concerning waste handling
- Must be arranged so as not to interfere with port or terminal operations
- Must be conveniently located so it can be easily found and use is not discouraged
- Must be situated so that wastes and residues removed from ships cannot readily enter the water

2.3 Challenges for Arctic Shipping and ports servicing Arctic shipping

In addition to compliance with all other provisions in MARPOL Annexes, including the provisions for port reception facilities at all ports, the Polar Code Amendments to MARPOL further restrict discharges from oceangoing ships in Arctic watersⁱ:

- No Discharge of Oil (Polar Code Annex I Amendments);
- No Discharge of NLS (Polar Code Annex II Amendments);
- No Discharge of Garbage other than food (Already in force under MARPOL and formerly a major source of Non plastic Marine Debris from Ships) (Annex V Amendments - 2013);
- No Discharge Food near the ice edge (Polar Code - Amendments to Annex V);
- Restrictions on Incinerators (Annex VI regulations. Source of Particulate matter); and
- Lower Sulfur content fuel use (Annex VI with regulations for ships operating in Arctic waters.)ⁱⁱ

The significant challenge that emerges for ships is that if waste cannot be discharged it will have to be stored aboard until it can be discharged to a port reception facility. This could be a challenge for ships and ports in Arctic waters. Challenges include:

- Ships will have to be designed to store all wastes on-board and will need greater capacity to store and manage MARPOL wastes generated on board;
- Longer passages between ports of call;

⁸ *Tackling Marine Debris in the 21st Century*, National Research Council of the National Academies, National Academies Press, Washington, D.C., 2009

⁹ *Ibid.*, p. 7

¹⁰ *Consolidated Guidance for Port Reception Facility Providers and Users, MEPC.1/Circ.834*, International Maritime Organization, London, 15 May 2015

- Delays in passage making due to weather, ice, fog, precipitation;
- Restrictions on discharging to the ocean for all or nearly all wastes including food wastes generated aboard ship due to proximity to ice in the open ocean, far from land;
- Inability to enter some ports due to insufficient or uncharted depths in channels from sea to ports; and
- Inadequate piers/terminals within a port or no port infrastructure to receive ships or wastes from ships at anchor.

Waste management in Arctic and near Arctic ports will be challenged with increased shipping to, from, and transiting the Arctic Ocean, including:

- Difficulty in constructing new infrastructure due to remoteness or geological characteristics of the port;
- Changing ice conditions which would prevent practical use or siting of reception facilities;
- Landside environmental concerns regarding waste processing and disposal facilities sited in Arctic ports located adjacent to environmentally sensitive areas, protected habitats, designated refuges, or culturally sensitive areas; and
- PRFs in logistically challenging remote areas (seasonally or year round) or complete inability to operate at some PRFs during winter months due to seasonal ice conditions.

3. Case study on existing pollution in the Arctic and why immediate action is necessary

The effects of pollution in the oceans are still unknown but there is little doubt regarding the importance of preventing marine pollution from all sources. It is estimated that between 60% and 80%¹¹ of all ocean debris is plastic, despite the prohibitions from discharging plastics into the marine environment that have been in place for decades. Estimates vary as to the amount of pollution that comes from ships, however, it is clear that in certain areas, derelict fishing gear, synthetic rope and other equipment from fishing activities is a major contributor to pollution from plastic. Overall, it is estimated that 10% of all plastics produced, world wide, ends up in the ocean.¹²

In the pristine environment of the Arctic Ocean, the effects of pollution from shipping and other sources are already being detected. Scientists studying ocean currents have discovered that marine debris, especially small bits of plastic already in the ocean at lower latitudes, are being carried on deep ocean currents¹³ into the Arctic ocean, graphically shown in Fig 3, and are accumulating in seasonal and multi-year ice as part of the process by which ice forms in sea water.¹⁴ Studies have shown that concentrations of microplastics in ice cores from the central Arctic ice cap are as much as 2-3 times that found in open ocean waters far from the Arctic.¹⁵

One great concern is that as the ice melts due to climate change, this ice bound plastic debris, which can release toxins and be absorbed in marine plants and animals (including phytoplankton and zooplankton)¹⁶ and fish and marine mammals, will be re-released into the ocean.

¹¹ Derraik, J.G.B., The pollution of the marine environment by plastic debris: a review, *Marine Pollution Bulletin* 44 (2002) p. 842

¹² Cole, Matthew, Pennie Lindeque, Claudia Halsband, Tamara Galloway, *Microplastics as contaminants in the marine environment: A review*, *Marine Pollution Bulletin* 62 (2011) 2588–2597

¹³ Lozier, M.S. 2010. Deconstructing the Conveyor Belt. *Science* 328(5985): 1507-1511. / Lozier, M.S. 2012. Overturning in the North Atlantic. *Annual Review of Marine Science* 4: 291-315.

¹⁴ Obbard, R.W., S. Sadri, Y. Q. Wong, A. A., Khitun, I. Baker, and R. C. Thompson, (2014), Global warming releases microplastic legacy frozen in Arctic Sea ice, *Earth's Future*, 2, 315–320, doi:10.1002/2014EF000240

¹⁵ *Ibid.*, p. 316-317

¹⁶ Andrady, Anthony L., *Microplastics in the marine environment*, *Marine Pollution Bulletin* 62 (2011) 1596-1605



Fig 3. Pathways for Introduction and Transport of Marine Pollution in the Arctic Ocean¹⁷

4. Conclusions

Discharges from shipping in the Arctic can only exacerbate conditions in the Arctic, given the evidence that pollution from lower latitudes is already circulating in Arctic waters and accumulating in Arctic sea ice and on the Arctic sea floor. Although ship generated wastes are only part of the problem of preventing pollution in the marine environment, pollution prevention must be approached from a holistic point of view with the collaboration of all stakeholders.

The Polar Code will face implementation challenges as it comes into effect on January 1, 2017, for both ship owners/operators and for port states. The work of bodies such as the Arctic Council and its PAME working group are already working on baseline studies and possible solutions to meet the challenges in the Arctic that will help ensure safe, sustainable shipping and a collaborative approach to regional waste management on a local, national and regional basis for the reception of ships waste.

Waste management for both ships and port communities in the Arctic is especially challenging given the remoteness, lack of existing port infrastructure, seasonal weather challenges, and sensitivity of the environment, and might beg the question of just how to ensure Arctic ports could, even if they were able to accept ships waste, efficiently and sustainably manage all waste without the risk of pollution to the ocean from their land based facilities.

ⁱ Note: While the Arctic ocean is variously defined in the literature, the Polar Code includes its own definition of Arctic waters. See: Resolution MEPC.264(68), *International Code for Ships Operating the Polar Waters (Polar Code)*, p. 9

ⁱⁱ Note: The Amendments to MARPOL Annexes in the Polar Code are generally specific to ships. MARPOL Annex VI includes previously adopted provisions for ships operating in Polar waters. The provisions for port reception facilities in all ports was not changed and applies to all ports receiving ships requiring reception of MARPOL Annexes I, II, VI, V, and VI wastes.

¹⁷ Bower, A.S., M.S. Lozier, S. F. Gary, and C.W. Böning. 2009. Interior pathways of the North Atlantic meridional overturning. *Nature* 459: 243-247.