



Reception of sewage in the Baltic Sea – The port's role in the sustainable management of ship wastes

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ABSTRACT

In 2019, the special area requirements under MARPOL 73/78 Annex IV will come into effect in the Baltic Sea. This puts pressure on ports to develop reception facilities for sewage from passenger ships. This paper is built on a review of published information about the ports' work to update sewage reception facilities and the results of an e-mail questionnaire that was sent to a number of ports in the region, and interviews with environmental managers from two major ports in the region. During the last 15 years, major investments have been made in port reception facilities in many passenger ports. However, there are still diverging views on the question if the port waste reception capacity in the region is sufficient. A few ports have for a long time been dominant as regards the reception of sewage in the Baltic Sea region, but recent increases in the ports' waste reception capacity have predominantly occurred in smaller ports. This has been brought about by a replacement of mobile means for sewage collection with fixed connection systems or an increase of capacity of existing fixed connection systems. Following HELCOM recommendation, the majority of the ports have introduced a no-special-fee system but there are differences in how this is applied.

1. Introduction

Affordable ocean transportation has been a major “engine” for the economic globalization. Maritime transportation has increased 2.5 times in volume since 1990 [1] and is today carrying 10 billion tons or more than 80% of the total volume of global trade [2]. Large amounts of goods, raw-materials and people are reloaded in the ports, but they are also important industrial locations. This makes them strategically important for developing increasing resource efficiency and more circular flows in society.

In comparison with other transport modes, maritime transports are energy and cost efficient. Shipping has, however, many serious impacts on the marine environment linked to e.g. oil-spills, chemicals in hull-paints, noise, wastewater, solid waste, and diffusion of alien species. The ports can contribute to decreasing the environmental impacts of shipping through offering services such as reception of wastewater and other wastes, environmentally safe hull cleaning and alternative fuels.

The Baltic Sea is an inland sea with intense sea traffic. More than 9% of the global maritime trade volumes and 117 million ferry passengers passed the Baltic Sea ports in 2012 [3]. Recently, the cruise ship tourism has expanded and more than 4 million cruise passengers were recorded in the ports in 2015, compared to 1 million in 2000 [4]. The

Baltic Sea has often been called the most polluted sea in the world [5]. With its limited water volume and irregular oxygenation, it is a particularly sensitive area of the world ocean. With increasing population, industrialization, and intensification of agriculture, the pressures on the sea increased dramatically in the 20th century. Emissions from cities and industries, run-off from agriculture and forests have contributed to high levels of stable organic compounds as well as eutrophication. The rising nutrient levels cause regular algae blooming, oxygen deficiency and dead bottoms, which in recent decades have attracted increasing attention. The wastewater from ships contributes to increasing nutrient levels in the sea but this contribution is small compared to the run-off from surrounding countries, emissions from wastewater plants and air pollution [6].

The Helsinki Commission - Baltic Marine Environment Protection Commission (HELCOM), has long promoted the reception of wastewater and other wastes in the ports. Since 1998, there is a recommendation to apply no-special-fee systems (NSF), where the costs of reception are included in the port fee no matter if the ship uses the port reception facilities (PRF) [7].

In 2011, the Baltic Sea was designated by International Maritime Organization (IMO) as a special area for discharge of sewage from passenger ships. For making such a restriction possible, a radically

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expanded reception capacity in the ports is required. First, the ban on the discharge of sewage was to be introduced in 2016 for new passenger ships, but this date was postponed until 2019 due to insufficient port reception capacity in the region [8]. This study seeks to evaluate how the waste reception capacity has developed in the Baltic ports: Is sufficient port reception capacity available? How and to what extent has the NSF been implemented in the Baltic ports? Which are the ports challenges connected to expanding the reception capacity?

2. Method

This study is based on inventory and analysis of literature on maritime activities in the Baltic Sea region, analysis of the development of the ports in the region and case studies of two major ports in the region. The analysis of the development of ports and port reception facilities is based on data from reports from organizations related to maritime matters such as HELCOM and Cruise Baltic, complemented by data from other studies, as well as our own efforts of data collection via a questionnaire and interviews. The questionnaire was sent to 22 Baltic ports via e-mail, with aim to gather information on collected sewage. Nine ports provided full answers concerning the sewage collected, while four ports responded that such information is either not public, not systematically documented or would require much time to be compiled. Also, one port referred instead to the website where some information was provided. Environmental managers from Helsinki and Gothenburg, two major ports in the region were interviewed about the sewage reception issues and the associated perceived challenges in developing the waste reception.

3. Background

3.1. Environmental impacts of shipping

Shipping cause emissions to both air and water and influences the environment in many other ways. Emissions to air of greenhouse gases, sulphur and nitrogen oxides and particles, are caused by the ships' propulsion. Discharges to water include accidental large oil spills but also small continuous leakages, release of wastewater, use of anti-fouling paints, exchange of ballast water containing potential invasive species, and other littering. Noise from ships disturb both above and beneath the water surface.

Sewage and grey water are waste streams that are generated by people on-board seafaring vessels. Sewage comes from toilets and medical facilities and is known as black water, while drainage from showers, washbasins, laundry facilities and galleys is called grey water [9]. The volumes of sewage and grey water are related to the number of people and the time spent on-board. It is estimated that one person on a cruise ship generates between 20–40 l of sewage and 120–300 l of grey water daily [10]. The discharge of untreated wastewater into sea can spread pathogens to the marine environment, contribute to nutrient enrichment and oxygen depletion. Additionally, these waste streams carry marine litter, for example cosmetic and hygienic products that are disposed of improperly in toilets instead of garbage bins [11].

3.2. The role of ports in reducing the environmental impact from shipping

Most European ports have in recent decades developed environmental policies and set objectives for environmental improvements [12]. Air quality is often the most important priority, but also the handling of ship waste has received increased attention [12].

Besides introducing environmental management systems for improving environmental performance, ports can develop services for ships (i.e well-functioning facilities for waste disposal) and thus extend the area in which their policies have an impact. Ports can also provide information on how to improve practices on-board and sometimes use harder measures such as banning certain ship operations in the port

areas [13], for example sandblasting [14]. The European Sea Ports Organisation (ESPO) has issued a guide for European ports that presents practices that can be used to manage environmental aspects [15]. These practices include air quality monitoring, offering shore-based electricity, encouraging cruise ships to sort and recycle waste via reduced fees and offering free offloading of sewage and grey water. Ports can use differentiated charges to benefit ships that reduce their environmental impacts. For that purpose, tools such as the Clean Shipping Index (CSI) [16] and the Environmental Ship Index (ESI) [17], which rank shipping companies according to different environmental criteria, can be used.

Regulations have often been important for improving ports' environmental performance but ports also motivate environmental initiatives by the need to improve port operations or to develop the port's profile. Pressures from the local society can also increase ports' interest to invest in "environmental performance". [18]

3.3. Regulations for handling of wastes from ships in the Baltic Sea

The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), adopted in 1973 and amended by a protocol 1978, addresses waste management on-board vessels and the reception of waste in ports to offer through adequate waste reception facilities. The Baltic Sea has been amended as a special area under both Annex V Garbage (in effect since 1989) and Annex IV Sewage (will be in effect from 2019 for new passenger ships) [19,20]. These annexes have been ratified by all Baltic Sea countries, which means that all ports are obliged to provide adequate facilities for the reception of garbage, and that passenger ports should provide facilities for the reception of sewage. These facilities should meet the needs of ships using them without causing undue delay [21,22]. Ships of 400 gross tonnage and more that are operating in the Baltic Sea should keep records on wastes that are discharged to the sea, incinerated or disposed in PRF. There is no such requirement for sewage, but passenger ships are since long recommended to offload their sewage in PRF. Discharge of sewage to the marine environment is only permitted under specific conditions; untreated sewage may be discharged, at the predefined pumping rate, further than 12 nautical miles (NM) from the nearest coast [23]. Discharge of treated sewage is permitted closer to the coast if the sewage has been processed on-board by equipment approved according to IMO standards and the resulting effluent meets the quality criteria for e.g. BOD, bacteria and total suspended solids. There are no similar restrictions in MARPOL 73/78 applying to discharges of grey water.

Annex IV that announced the Baltic Sea as a special area was amended in 2011. It introduces a ban on the discharge of untreated sewage and introduces stricter requirements on treated effluents from passenger ships. The special area status could not come into effect before the riparian countries had notified IMO that adequate reception facilities are provided by their ports [24]. This condition was fulfilled when Russia as the last country submitted such a notification in 2016. The new rules will be valid for new passenger ships from 2019 and for other passenger ships in 2021. Passenger ships that go directly from the North Sea to St. Petersburg will not have to comply until 2023 [20].

Based on requirements in MARPOL 73/78, the European Community adopted in 2000 the Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues (PRF Directive), which states that ports should provide facilities that meet the needs of the ships without causing abnormal delays [25]. Port operators are also obliged to develop waste reception and handling (WRH) plans and introduce a fee system where all ships contribute significantly to the costs of the facilities. Ports may differentiate the fee based on the ship category, size or environmental performance. Ships must offload waste in the port reception facilities and declare in advance the amounts of waste that are intended to be disposed in the port. The Directive offers the possibility to grant exemptions from mandatory delivery of waste for ships in regular scheduled traffic.

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