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PORT RECEPTIONS FACILITIES FOR SLUDGE OIL – PRACTICE AROUND THE EUROPE

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ABSTRACT

Oils are one of the most important pollutants at sea. One of the sources of oil pollution is the illegal discharge of oil sludge by ships. During normal operation, ships produce a certain amount of oil sludge, which is stored in separate tanks. One of the measures to prevent illegal discharges is facilitation the discharge of sludge in ports. The MARPOL Convention, Guidelines for the Implementation of MARPOL Annex V, Consolidated guidance for port reception facility providers and users provide technical guidance to States on the organisation of reception facilities. DIRECTIVE (EU) 2019/883 on Port reception facilities for the delivery of ship-generated waste goes deeper into the matter in hand and provides guidance on the economic approach as well. This paper takes a closer look into ship oil waste on board and in ports, namely in the Port of Koper (Luka Koper), the Port of Marseille (Grande Port Maritime de Marseille), the port of Istanbul (Haydarpaşa Port), the Port of Constanta and the Port of Klaipėda.

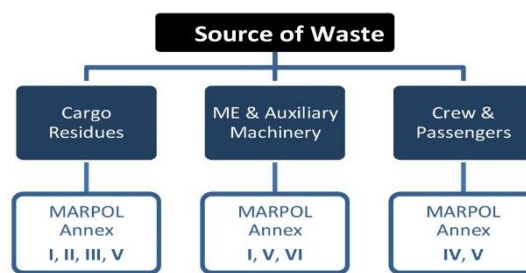
Keywords: Oil pollution, sludge oil, port reception facilities, B4S

1. INTRODUCTION

The shipping industry is the blood system of the global economy. According to UNCTAD, more than 80 per cent of world trade is carried by sea [1], other sources even speak of more than 90 per cent [2], [3], [4]. The entire fleet must operate safely, securely, efficiently and in an environmentally sound manner [2].

2. SHIP WASTE HANDLING

Like any industry, the shipping industry produces waste during its operation. The waste comes from different sources. Generally, we divide it into waste generated by operations, maintenance waste from ship engines (main and auxiliary) and equipment, cargo and waste from people (crew, passengers).



Source: Author

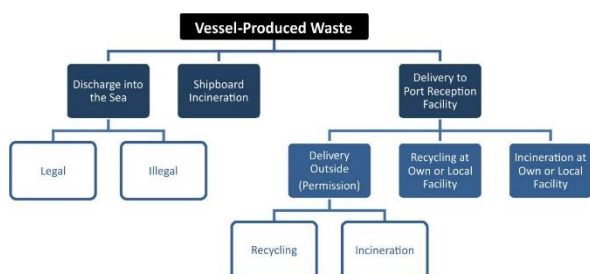
Figure 1: Sources of ship's waste

When a ship is at sea, waste can either be disposed of into the sea itself, incinerated in the shipboard incinerator, or kept on board until reception in port is possible (**Error! Reference source not found.**). Which of these actions are permitted and which are prohibited for a particular substance at a particular place and time is governed by Annexes from I to VI of the IMO MARPOL Convention. The Convention was adopted in 1973 to protect the marine environment following a series of serious tanker accidents involving major oil spills [5]. Most ship-generated waste (**Error! Reference source not found.**) is hazardous waste. This includes bilge oils with different water content. The



hazardous wastes are handed over to authorised organisations for further processing or disposal. Bilge oils could be handed over for use as substitute fuel in other countries.

When a ship is at sea, the waste can either be disposed of at sea, incinerated in the shipboard incinerator or kept on board until it is possible to accept it in port (Figure 2). Which of these measures are permitted and which are prohibited for a particular substance at a particular place and time is regulated in the Annexes from I to VI of the Convention IMO MARPOL. The Convention was adopted in 1973 to protect the marine environment after a series of serious tanker accidents involving major oil spills [5]. Most of the waste generated by ships (Figure 1) is hazardous waste. This includes bilge oils with different water content. The hazardous waste is transferred to authorised organisations for further processing or disposal. Bilge oils could be handed over for use as substitute fuel in other countries.



Source: Authors

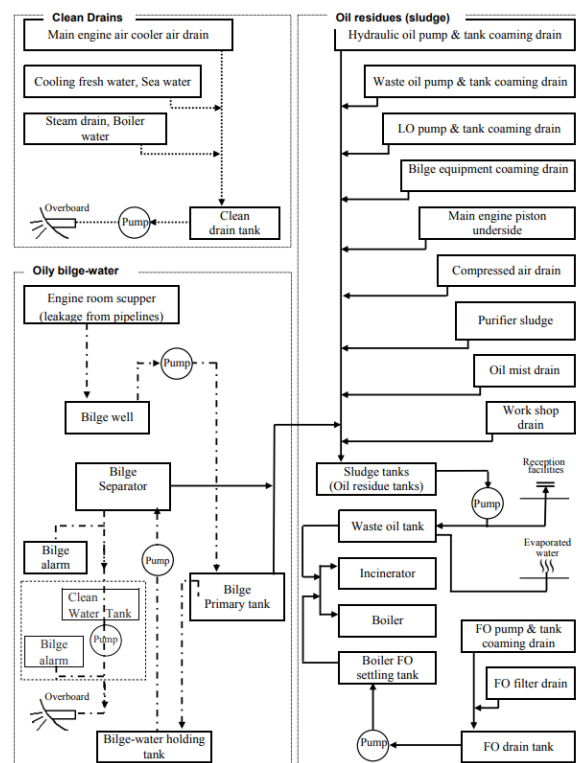
Figure 2: Flow chart of ship-generated waste

Annex I of MARPOL defines oil as: "Petroleum in any form, including crude oil, fuel oil, sludge, oil refuse and refined products (other than petrochemicals, which are subject to the provisions of Annex II of the mentioned convention)." For this reason, companies that receive liquid waste do not make any distinction and their means of collection are versatile [5].

Annex I of the MARPOL Convention regulates all types of waste related to oil and oily mixtures, namely oily bilge water, oily tank wash water, dirty ballast water and sludge. The demand for oily tank wash residues (a result of tank cleaning and ballast water transport in dirty cargo tanks on tankers) usually arises in the oil loading ports, so the demand for discharge such effluents is negligible. Oily mixtures are generated as oil leakages in the machinery spaces. With good separation (15 ppm oil content), clean water can be pumped directly into the sea, while the residues have to be pumped into sludge tanks and stored. The greatest quantity of oil sludge produced on board is generated during the purifying of the ship's fuel. The official definition of oil sludge includes sludge from fuel or lubricating oil separators, as well as lubricating oil waste from main or auxiliary machinery and waste oil from bilge water separators, oil filtering equipment or drip trays [5].

A typical ship discharge volume is between 30 and 80 cubic metres of oily waste. The volume depends on the storage capacity on board and the requirement to maintain sufficient storage space. The oil content in the sludge varies between 30 % and 70 %, depending on the efficiency of the on-board oil-water separator. So the weight of a cubic metre of oily waste varies depending on the oil content. For example: Tex crude oil has a density of 873 kg per cubic metre and water has a weight of 1,000 kg per cubic metre. A typical 70:30 mixture of oil and water would have a weight of about 900 kg [6]

A system on the ship is designed to treat sludge from oil treatment systems in diesel engine plants. The system separates the sludge into its three main components: Oil, sludge and water. The recovered oil is fed into a boiler feed tank, the concentrated separated sludge is fed into a sludge tank for disposal and the water flows into the oil water separator [7].



Source: [7]

Figure 3: Flow Diagram of Integrated Bilge Water Treatment System

Sludge occurs in two forms: liquid and dehydrated. The solution of delivering dehydrated sludge is not included in the flow chart in Figure 3, but it does exist, even though it is usually burnt in the incinerator. The latter can be discharged ashore in drums, which are eventually passed on to authorised organisations.

Each port facility has its own way of dealing with sludge collected from ships. The port can either conduct that by itself or contract competent companies to collect it.



How to do this is recommended in some international guidelines such as "Revised guidelines for systems for handling oily wastes in machinery spaces of ships incorporating guidance notes for an integrated bilge water treatment system" [7].

3. SHIP WASTE DELIVERY NOTIFICATION

In some ports, for logistical reasons, the providers of port reception facilities may require the ship to give advance notice of its intention to use the facilities. This is regulated by IMO MEPC Circular 644/Rev.1 entitled "Standard format for the advance notification form for waste delivery to port reception facilities". According to this, the master of a ship should forward the information below to the designated authority at least 24 hours before arrival or upon departure of the previous port if the voyage is less than 24 hours [8]. The notification form is also mandatory for ships calling at EU ports and is regulated by the EU Commission Directive 2015/2087 on port reception facilities for ship-generated waste and cargo residues [9].

MARPOL Annex I – Oil	Quantity (m ³)
Oily bilge water	
Oily residues (sludge)	
Oily tank washings	
Dirty ballast water	
Scale and sludge from tank cleaning	
Other (please specify)	

Source : [8] [10] [11]

Figure 4: Type and amount of waste for discharge to facility

Waste management is subject to regular inspections. To facilitate these, the ship must indicate the approximate quantity of waste and residues remaining on board and the percentage of the maximum storage capacity on a recommended form.

Type	Maximum dedicated storage capacity (m ³)	Amount of waste retained on board (m ³)	Port at which remaining waste will be delivered (if known)	Estimate amount of waste to be generated between notification and next port of call (m ³)
MARPOL Annex I – Oil				
Oily bilge water				
Oily residues (sludges)				
Oily tank washings				
Dirty ballast water				
Scale and sludge from tank cleaning				
Other (please specify)				

Source : [8] [9] [10] [11]

Figure 5: Declaration of approximate amount of waste and residues remaining on board

In the case that the master of a ship has difficulty in discharging waste in reception facilities, he should forward the following information to the flag State administration together with the relevant documentation [11].

Type of wastes/residues	Amount for discharge (m ³)	Amount not accepted (m ³)	Problems encountered
Indicate the problems encountered by using one or more of the following code letters, as appropriate. A No facility available B Untrue delay C Use of facility technically not possible D Inconvenient location E Ships had to shift berth involving delay/cost F Unreasonable charges for use of facilities G Other (please specify in paragraph 3.2)			
MARPOL Annex I - related			
Oily bilge water			
Oily residues (sludge)			
Oily tank washings (slope)			
Dirty ballast water			
Scale and sludge from tank cleaning			
Other (please specify			

Source : [11]

Figure 6: Format for reporting alleged inadequacies of port reception facilities

4. SHIP WASTE COST RECOVERY

Port authorities need to provide information on fees/costs for the use of the facilities. The reception facility services should be offered at a reasonable cost [11][12].

In principle, port reception facilities can collect fees directly from port users based on the polluter-pays principle. However, such a system can sometimes discourage people bringing marine litter to the reception facilities. In order to overcome this matter, some countries have adopted an indirect fee system ("no special fee" system), whereby the relevant costs of disposing of marine litter (garbage) generated by ships are included in a harbour fee, regardless of whether the ships use reception facilities or not [13].

States that agree on a regional framework can set their own fees. For example, the European Union (EU) adopted the Directive on Port reception facilities for the delivery of ship-generated waste 2000/59/ EC, which was amended by Directives 2010/65/EU, 2015/2087/EU and the currently applicable 2019/883/EU [9][10].

The Directive ensured that all ships contribute to the costs of port reception facilities in a fair and transparent manner and provided sufficient and comparable incentives for ships to deliver their waste.

5. SLUDGE HANDLING IN THE PORT OF KOPER

The port of Koper has established port reception facilities in accordance with the EU Directive [10] and Slovenian national regulations [14][15].

The subsidiary Luka Koper INPO collects marine oils in the bilge facility and delivers them to authorised organisations. As a collector of such waste, the company has obtained an environmental permit for this activity. The facility is in the process of obtaining a construction permit to increase its collection capacity.

Liquid oily waste collected from ships is stored in a designated area. The tank farm for liquid oily waste has a storage capacity of 109 m³, which will increase to 201 m³ in the near future. From there, the oily waste is shipped to authorised collector for further treatment.

The existing tariff for the provision of mandatory utility services for waste collection from ships in the Port of



Koper is published on the basis of the Ordinance on the Establishment of Prices for Mandatory Utility Services for Waste Collection from Ships in the Port of Koper [14].

In the Port of Koper, the collection of liquid waste from a ship is charged by volume (Table 1); the minimum chargeable quantity is 1 m³.

Table 1: Tariff for the liquid waste collection in Koper

Type of liquid waste	€ per cubic meter (€/m ³)
Wastewater, including transfer of same into the municipal sewage system	45.07
Oil/water mixtures and similar liquid wastes	77.20

Source : https://www.luka-kp.si/wp-content/uploads/2021/06/zbiranje-odpadkov-javna-sluzba-EN_star-2006.pdf

The transport of solid and liquid waste by auxiliary vessels from the ship to the port facilities is calculated on the basis of the cost of removal by auxiliary vessels (Table 2).

Table 2: Tariff for the collection of solid and liquid waste by an auxiliary vessel.

Service	Cost
Use of auxiliary vessel for the removal of solid waste from a vessel at anchor	40.06 €
Per hour (or part thereof) charge for the removal of oil/water mixtures and similar liquid wastes from a vessel by an auxiliary vessel	751.13 €/h

Source: https://www.luka-kp.si/wp-content/uploads/2021/06/zbiranje-odpadkov-javna-sluzba-EN_star-2006.pdf

6. SLUDGE HANDLING IN THE PORT OF MARSEILLE

The Grand Port Maritime de Marseille, or GPMM, bases its waste management exclusively on Directive 2000/59/ EC (amended by Directive 2007/71/ EC of 13 December 2007 and Directive EU 2015/2087 of 18 November 2015) on "Port reception facilities for ship-generated waste and cargo residues" [10]. The port only treats sludge, oil waste and solid waste

As it is the case with all international conventions, the responsibility for implementing the provisions of MARPOL lies with the government. As a result, the provision of waste reception services can be carried out by private companies (for which this may provide a business opportunity) or by public enterprises under government responsibility, as is the case with GPMM.

The latest available waste oil statistics are shown in the figure below (quantity in m³):

Table 3: Waste oils delivered in Marseille

Sludge oil	Bilge water	Oils	Others
15105,162	3798,180	94,685	106,750

Contractors are free to charge rates as they see fit, provided that:

- they inform the ship's agents in a timely and transparent manner,
- comply with the Commercial Code,
- do not engage in unfair competition, and
- notify the G.P.M.M. of the tariffs applied.

Any ship that does not have its operational waste collected by one or more of these approved contractors will be required to pay a fee in euros, which constitutes a port fee and is equivalent to 30% of the cost estimated by the Grand Port Maritime de Marseille for the reception and treatment of the ship's operational waste.

The "Waste Fee" applicable to ships is made up of the sum of two taxes:

- a "fixed" tax applied to operational waste covered by MARPOL V; a lump sum evaluated at €190;
- a "liquid" tax applied to operational waste covered by MARPOL I by applying a coefficient of €0.0102 per cubic metre to the taxable volume of the vessel.

The amount of the liquid tax is limited by a minimum collection amount of € 64 (Article R.* 5321-51 of the Transport Code) and may not exceed a ceiling of € 675.

The deficiency reports for the reception facilities for ship-generated waste and cargo residues are made on the IMO deficiency notification forms (see figure 6). The notifications are forwarded to the Harbour Master's office where they are the subject of a case study, which may involve corrective action or even a modification of procedures. Corrective action should be taken as soon as possible. To date, no notifications of deficiencies have been reported by vessels or shipowners. It should be noted that no vessel has been prosecuted for pollution by the GPMM since 2013.

7. SLUDGE HANDLING IN THE PORT OF ISTANBUL

The main body for waste collection in Istanbul Port or Haydarpaşa Port is ISTAÇ (Marine Services Directorate of the Department of Environmental Protection and Control of Istanbul Metropolitan Municipality). ISTAÇ is a member of EUROSHP, the association of port reception facility providers in Europe, which started collecting waste from the vessels in 2005. Since 2005, more than 2,110,000 m³ of waste has been collected from around 95,000 ships that have passed through the Istanbul Strait and ports, contributing to the protection of the Istanbul Strait.

ISTAÇ collects and manages ship-generated waste in a controlled manner in accordance with the provisions of international agreements. As a member of the



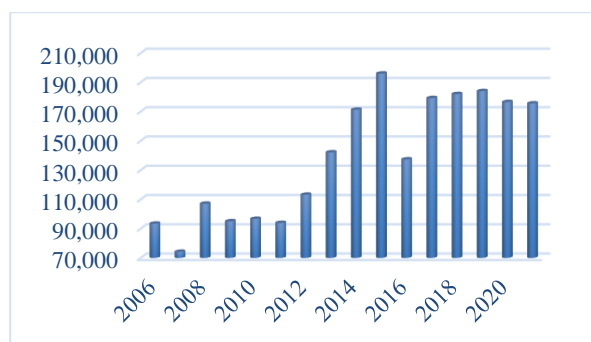
Association of Port Reception Facility Providers, EUROSHPRE, ISTAÇ follows the latest local and international regulations and their implementation.

At the Haydarpaşa Port Reception Facility, oil and oil-derived waste from ships is recycled and reused. In this way, the port makes an important contribution to the economy while keeping pollution in the Istanbul Strait under control. At the plant, which has an annual waste treatment capacity of 110,000 m³, oil and oil derived wastes such as bilge, slop oil and oil sludge are treated through chemical processes. Of this, 20,000 m³ of waste oil is recycled for economic purposes.

The Port of Istanbul has a 1040 m² waste reception facility. The facility was put into service in 2006. The Haydarpaşa Waste Reception Facility is the first and largest facility in this area in Turkey. The main units include:

- waste receiving and storage unit,
- heating unit,
- decanter (de-sedimentation) unit,
- separator (dewatering) unit,
- chemical treatment unit,
- electrical and automation unit,
- firefighting unit and
- laboratory unit

In 2021, a total of 149,110 m³ of petroleum-derived waste was collected from ships and recycled or disposed of at the relevant Istanbul Metropolitan Municipality facilities.



Source : Authors

Figure 7: Graph of oil collected in Istanbul

The upper graph shows the quantities of oil-derived waste taken to the waste recycling plant.

8. SLUDGE HANDLING IN THE PORT OF CONSTANTA

In Romania, port authorities must ensure that port reception facilities are able to take over the types and quantities of ship-generated waste, the formalities and practical issues related to the use of port reception facilities, and that the fees for delivery are not discouraging for ships requesting to use the facilities. Port reception facilities shall ensure environmentally

sound management of ship-generated waste and separate collection of ship-generated waste in accordance with the provisions of Government Emergency Ordinance No. 92/2021 [16]. The port reception facilities collect the separate fractions of waste according to the waste categories defined in the MARPOL 73/78 Convention [2].

It is estimated that the average daily volume of waste generated by ships calling at Romanian seaports must ensure the following take-over capacities:

- Oil waste: 32 m³/day
- Wastewater: 1.5 m³/day
- Garbage: 3.5 m³/day

The takeover of oil residues, wastewater and liquid cargo residues is carried out by the Port Administration.

The capacity of the port reception facilities regarding sludge management is as follows:

- Reception capacity for oil waste: 880 m³ and
- Temporary storage capacity for oil waste: 970 m³.

For sludge treatment, the Port of Constanta has its own wastewater treatment plant with a total capacity of 814000 m³ per year. The wastewater treatment plant aims to treat oil wastewater and bilge water from the Oil Terminal's area of activity, as well as oil waste from ships. The biological water treatment system includes a low-density material separator and sand and activated carbon filters. The treated wastewater is within the permitted emission limits for discharge into seawater.

The wastewater treatment process in the port of Constanta includes the following stations.

The treatment plant operates with two treatment stages. The first is mechanical and the second is biological.

Mechanical pre-treatment station has the task of removing suspended solids and rough materials from the wastewater before the purification treatment. The treatment is carried out with a grate system mounted in a stainless-steel box. Each grate is coupled with a propeller compaction plant for dehydration and evacuate the material retained in a waste container.

Leachate treatment plant has a capacity of 20 m³/day and includes storage tanks and equipment for the technological stages of physical-chemical and biological wastewater and sludge treatment.

The treatment process includes the following steps:

- storage and homogenization of the leachate,
- biological stage,
- precipitation stage,
- treatment with activated charcoal powder and
- mud treatment.

The treated water is discharged into the sewerage system of the area. The wastewater must meet the quality conditions set out in the regulations in force for the disposal of wastewater into the sewerage networks.



Subsequently, this wastewater is mixed with the other types of wastewater collected in the port's sewerage network. The port of Constanta has also been equipped with 5 mini-stations for the mechanical and biological treatment for sewage.

The tariff for wastewater treatment is 1.43 €/m³. The tariff for taking oil waste from ships is 7 €/t.

9. SLUDGE HANDLING IN THE PORT OF KLAIPEDA

In the State Port of Klaipeda, the procedures for the reception of ship-generated waste are governed by:

- Directive (EU) 2019/883 of the European Parliament and of the Council of 17 April 2019 on port reception facilities for the delivery of waste from ships, amending Directive 2010/65/EU and repealing Directive 2000/59/EC [10];
- Regulations on the Management of ship-generated waste and cargo residues from ships, approved by Order No 3-552/D1-708 of the Ministers of Transport and Environment of the Republic of Lithuania of 6 December 2021 [17].

There are also other documents regulating the procedures related to ship generated waste, such as the Shipping Rules of the Klaipėda State Seaport [17]. The rules set out the procedures and requirements for ships entering the port of Klaipėda, including the procedure for submitting notifications regarding ship-generated waste.

It should be noted that the Baltic Sea is designated as a special area for the regulation of discharges from passenger ships under Annex IV of the MARPOL Convention. Under HELCOM 92, all countries that have ratified HELCOM 92 have developed and applied general requirements for reception facilities for ship-generated waste, taking into account the special needs of passenger ships operating in the Baltic Sea. HELCOM 92 obliges ports and terminals in the Baltic Sea region to install waste water reception facilities without disrupting ships' schedules and to meet the needs of ships using these facilities. Therefore, the waste reception facilities in the port of Klaipeda and the waste discharge procedures must also be in accordance with this convention [2].

The Port of Klaipeda has three types of reception facilities for ship-generated waste: fixed (or stationary), floating and mobile (Fig.8). The stationary reception facilities belong to the stevedoring company "Klaipėdos Nafta", an international owner and operator of LNG and oil terminals. The oil terminal of this company is additionally responsible for receiving and handling of waters polluted with petroleum products (oil bilge water, sludge, dirty ballast water, oily tanks washings). The company has a Hazardous Waste Management Certificate for these activities..

During treatment, process involves the separation of the concentrated fraction of petroleum products and water is separated from the contaminated mass. The resulting concentrate is certified and marketed as fuel oil, while the separated water is treated in the terminal's treatment plant. Waste treatment takes place in two 4200 m³ tanks. The company has its own treatment plant. The annual treatment capacity is up to 400 000 m³ or 160 m³/h. The company has installed a biosorptive water treatment system. This is a unique technology developed by the company for the treatment of collected water. The biological water treatment system purifies wastewater to the required level of purity.

To collect the liquid waste from the incoming vessels, the waste management company uses the vessels (inland tankers) "Banga", "Flora" and "Dane". The collection is carried out by centrifugal pumps. The capacity of the pumps ranges from 18 m³/h to 100 m³/h. Shipboard tanks are designed to collect and store lighter water contaminated with oil products and at the same time to carry out the separation of oil products by means of separation. The process of separating oil-contaminated water in the ship tanks follows the technological principle of buffer tanks. Buffer tanks separate about 90 to 95 % of the oil-containing materials.

With this capacity, the volume of handling oil, bilge water and other liquid waste containing petroleum products increases from 14k to 37.3k tonnes per year.

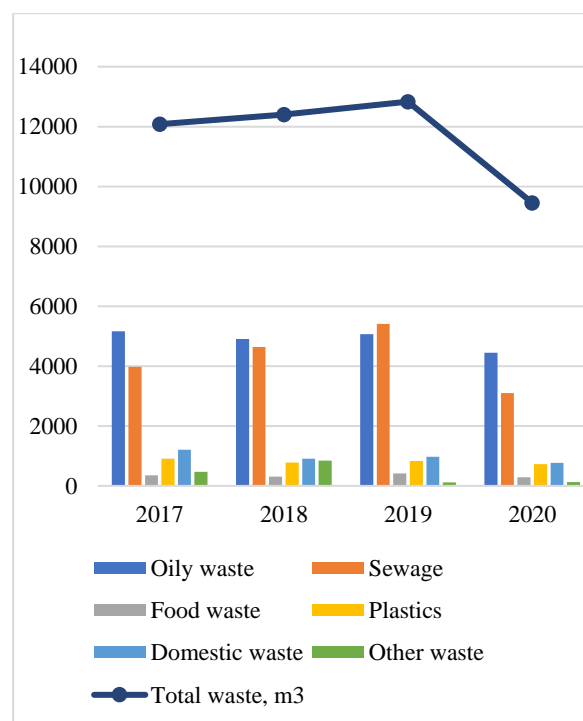


Figure 8: Graph of waste collected in Klaipeda

Source : Authors

The total amount of MARPOL I waste collected and recovered from ships from 2017 to 2020 was 19583 m³. The Port Control Department stated that about 2200 ships per year used the waste reception service. In the



future, the wastewater reception rate is expected to be around 200 m³/h and at least 300 m³ of waste will be received at any given time. The indicative annual quantity of oily waste and sludge is about 3900 m³ according to MARPOL 73/78 Annex I.

10. CONCLUSION

There are different practices in the ports in Europe. What all ports have in common is that they comply with the requirements of MARPOL. In the countries that are part of the European Union, EU Directive 2019/883 is also complied with. Each port takes a different approach to dealing with waste oil and charging ships that discharge this type of oil. The next logical extension of this paper is to find out the best practices also in other ports and find the best solution for the environment around the world.

REFERENCES

- [1] UNCTAD: Review of Maritime Transport. United Nations Conference on Trade and Development (UNCTAD), Geneva, 2020, p. 146.
- [2] IMO: International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended. International Maritime Organization (IMO), London, 2017, p. 384
- [3] ILO: Conditions in the maritime industry, International Labour Organisation. 2001; https://www.ilo.org/global/about-the-ilo/multimedia/video/video-news-releases/WCMS_074526/lang--en/index.htm (accessed 20.04.2022)
- [4] ICS: Shipping Fact - Shipping and World Trade: Predicted Increases in World Seaborne Trade, GDP and Population, International Chamber of Shipping, 2022; <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-predicted-increases-in-world-seaborne-trade-gdp-and-population/> (accessed 8.05.2022)
- [5] IMO: International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 and 1997 Protocols with amendments,. IMO Publishing, London 2017, ISBN 978-92-801-16571
- [6] ReCycled Refuse International Ltd.: Marine Oily Water and Sludge Treatment, <https://rcrcommodities.com/> (accessed 8.05.2022)
- [7] IMO: Revised guidelines for systems for handling oily wastes in machinery spaces of ships incorporating guidance notes for an integrated bilge water treatment system (IBTS), MEPC 54/21 Annex 17, 2012 (<https://www.crclass.org/chinese/download/ti-tc/27/mpec-circ511.pdf> (accessed 8.05.2022)
- [8] IMO: Standard format for the advance notification form for waste delivery to port reception facilities, MEPC.1/Circ.644/Rev.1; London 2013
- [9] EU COMMISSION: Directive (EU) 2015/2087 amending Annex II to Directive 2000/59/EC of the European Parliament and the Council on port reception facilities for ship-generated waste and cargo residues; Official Journal of the European Union 19.11.2015; <https://eur-lex.europa.eu/legal-content> (accessed 8.05.2022)
- [10] EU COMMISSION: Directive (EU) 2019/883 of the European parliament and of the Council of 17 April 2019 on port reception facilities for the delivery of waste from ships, amending Directive 2010/65/EU and repealing Directive 2000/59/EC; Official Journal of the European Union 7.6.2019; <https://eur-lex.europa.eu/legal-content> (accessed 8.05.2022)
- [11] IMO: Consolidated guidance for port reception facility providers and users, MEPC.1/Circ.834/Rev.1, 2018; <https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.1-Circ.834-Rev.1.pdf>; (accessed 8.05.2022)
- [12] IMO: Guidelines for ensuring the adequacy of port waste reception facilities (resolution MEPC.83(44)), 2000, [https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.83\(44\).pdf](https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/MEPCDocuments/MEPC.83(44).pdf) (accessed 8.05.2022)
- [13] UNEP, IMO: Guidelines for providing and improving port reception facilities and services for ship-generated marine litter in the Northwest Pacific region, 1999 <https://wedocs.unep.org/bitstream/handle/20.500.11822/26160/guidelineprovideportrec.pdf> (accessed 8.05.2022)
- [14] Republic of Slovenia: Regulation on the establishment of prices for obligatory utility services for waste collection from vessels in the Port of Koper (Official Gazette No 120/05 of 29 December 2005) and the amendment to the said Regulation (Official Gazette No 17/06 of 17 February 2006).
- [15] Republic of Slovenia: Regulation on the establishment port facility reception services for waste collection from vessels in the Port of Koper (Official Gazette No 78/08) with amendment
- [16] Republic of Romania: Government Emergency Ordinance no. 92/2021
- [17] Republic of Lithuania: Order No 3-552/D1-708 of the Ministers of Transport and Environment of the Republic of Lithuania of 6 December 2021.
- [18] Republic of Lithuania: The Shipping Rules of the Klaipėda State Seaport