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Study on the implementation of the port reception facilities regulations of MARPOL in Vietnam

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STUDY ON THE IMPLEMENTATION OF THE PORT RECEPTION FACILITIES REGULATIONS OF THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS (MARPOL) IN VIETNAM

By

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): .....Thank.....

(Date): .....17/09/2017.....

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Abstract

Title of Dissertation: **Study on the implementation of the Port Reception Facilities regulations of MARPOL in Vietnam**

Degree: **MSc**

This dissertation has assessed the current status and provided a proposal for the implementation of port reception facilities in the ports of Vietnam. The study is based on an analysis of publicly available data, and data collected from the Vietnam Maritime Administration, Port Authorities and environment companies in Vietnam.

A port reception facility in Vietnam is anything that can receive ship-generated waste/residue including oil and oil mixtures, sewage, and garbage. However, with the development of the global economy, the number of vessels entering the seaports is also increasing. As a result of this escalation of vessel arrivals, an increase in the amount of waste discharged. If Vietnam does not undertake assessments and upgrade existing port waste reception facilities to meet the demand for receiving and treating of ship-generated waste, it will not only lead to pollution at the seaports, but also adversely affect the environment of the surrounding areas.

The current status of the port reception facilities in Vietnam seaports was ascertained based on assessment data collected from the Vietnam Maritime Administration, Waste Treatment Centers, and available public data. The main methodologies employed consist of both quantitative and qualitative data analyses, as well as the estimation method to analyse the IMO Manual on Port Reception Facilities. A SWOT analysis is used to evaluate internal strengths and weaknesses of the current situation of port reception facilities as well as external opportunities and threats of the proposal.

This dissertation indicates the level of adaptability of the port reception facilities in Vietnam regarding technology and regularity. A proposal is given to help Vietnam complete the legal document system for regulating and guiding the implementation of the port reception and treatment system as well as support the installation of equipment and means of facilities to receive and treat waste from ships in the Vietnam seaports.

KEYWORDS: Implementation, Assessment, Port Reception Facilities, Vietnam

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List of Abbreviations

DWT	Deadweight Tonnage
EMSA	European Maritime Safety Agency
GT	Gross Tonnage
IMO	International Maritime Organization
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee
MONRE	Ministry of Natural Resources and Environment
MOT	Ministry of Transport
OILPOL	International Convention for the Prevention of Pollution of the Sea by Oil
PSC	Port State Control
PSCO	Port State Control Officer
PWHP	Port Waste Reception and Handling Plan
SWOT	Strengths, Weaknesses, Opportunities, Threats
UK	United Kingdom of Great Britain and Northern Ireland
UNCLOS	United Nations Convention on the Law of the Sea
VINAMARINE	Vietnam Maritime Administration

CHAPTER 1: INTRODUCTION

1.1. Background

Pollution from ships in the world oceans is a significant threat that is recognized as one of the most serious environmental issues of today. The oceans are used as trading routes, tourism, transportation, and military in the world. With the development of the worldwide shipping fleet, waste from the ships generated at sea has severely impacted the marine environment. The issue of providing port reception facilities is the responsibility of the Port State as well as being an essential service for the operation of vessels. The International Maritime Organization (IMO) has developed several tools to encourage and assist the Member States to minimize pollution to the marine environment and implement adequate waste reception facilities in ports to accommodate the ship waste.

More importantly, MARPOL is one of the main Conventions focusing on the protection of the marine environment. The Convention outlines regulations to prevent and reduce pollution caused by oil, chemical, harmful substances, as well as by sewage, garbage, and emissions from ships (IMO, n.d.a). Vietnam ratified Annexes I and II of the MARPOL Convention on March 18, 1991. Annexes III, IV, V, and VI were ratified on September 19, 2015 (Tran, 2013). Ratification and implementation of international treaties related to marine environmental protection, safety, and security aspects are one of the best solutions to overcome marine pollution not only in the world but also in Vietnam.

After ratifying six Annexes of the MARPOL Convention to include the responsibilities of Flag States, Port States, and the Coastal States, Vietnam has implemented all regulations of the MARPOL Convention. According to Vietnam's maritime master plan for the period from 2016 to 2020, Vietnam will conduct a review to improve the legal framework to effectively manage ship-generated waste in maritime activities, offshore oil and gas exploration activities, investigations and detection of violations, and reduce maritime accidents (Pham, 2015). Thus, it is necessary to deploy fully and comprehensively the provisions of Annexes I, II, III, IV, V and VI of the MARPOL

Convention for the legal framework of Vietnam on the prevention of environmental pollution from ships.

Currently, according to statistics from the Vietnam Maritime Administration, it is possible to receive and treat ship-generate waste in ports such as Ho Chi Minh City, Vung Tau Province, Da Nang City, Hai Phong City. For instance, the waste reception activities in this area are operated by private companies after the operation of these companies is approved by the port authorities (VINAMARINE, n.d.a). On the other hand, most of the other ports are not equipped with adequate reception facility equipment for treating of waste, especially sewage. These ports commonly connect with the local environmental companies with specific functions for treating waste to transport and treat ship-generated waste from their ports. Recognizing the economic and environmental benefits of waste treatment, these private companies have invested in the necessary equipment to carry out these activities. Also, in recent times, the Vietnamese government has developed some regulations to encourage the expansion of waste reception activities at the port.

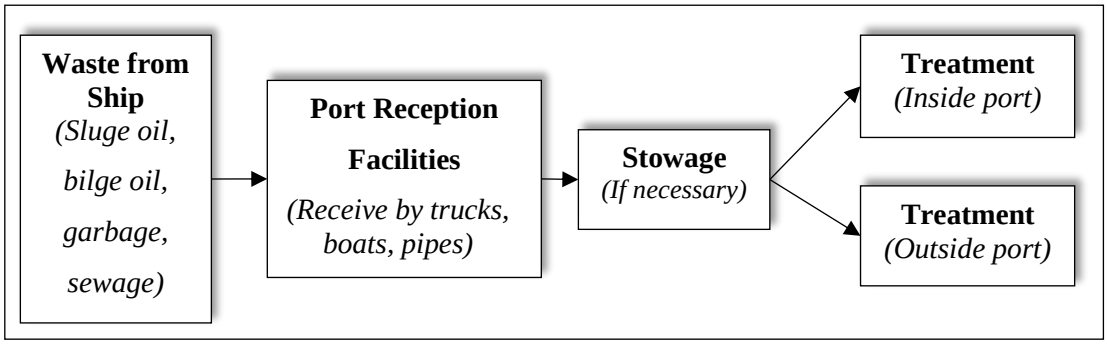


Figure 1: Reception facilities processes in Vietnam
(Source: Vietnam Maritime Administration)

The MARPOL Convention's six Annexes require that member states provide and make accessible, adequate waste reception facilities with undue delay at their port, in accordance with Regulation 38 of Annex I, Regulation 18 of Annex II, Regulation 12 of Annex IV, Regulation 7 of Annex V and Regulation 17 of Annex VI. Specifically, these regulations require that each member state party to the present Convention ensures the provisions at oil loading terminals, repair ports, and other ports where ships

have oily residues and other substances to discharge are met. Therefore, the port states must take specific measures to ensure proper implementation of the regulations of the MARPOL Convention. Also, they are responsible for ensuring that ports are fitted with adequate waste reception facilities and are available for ships operating within their jurisdiction.

According to Vietnam Maritime Administration, Vietnam has some chemical ports capable of receiving chemical cargo from ships, but almost all chemical cargo is transported by road in Vietnam. Therefore, Vietnam has not yet developed the reception facilities to receive chemical waste from chemical tankers, in accordance with Regulation 18 of Annex II. On the other hand, under Regulation 17 of Annex VI, if ships have a demand for removing ozone-depleting substances, it has to prepare a specific plan for arriving at specialized repair ports that are already equipped with port reception facilities to discharge their substances (Cao, 2015). Therefore, the planning and development of port reception systems at ports in Vietnam frequency focuses on commercial vessels to meet the requirements of Regulation 38 of Annex I, Regulation 12 of Annex IV and Regulation 7 of Annex V.

In fact, Vietnam has not yet completed the legal framework to fully implement waste reception facilities to meet the regulations of MARPOL Convention for ships desiring to dispose of residues and wastes. Therefore, the research "Study on the implementation of the port reception facilities regulations of MARPOL in Vietnam" is essential for the improvement of policies and regulations of Vietnam. Strengthening the marine environment protection policies and regulations in Vietnam will also minimize the marine pollution in the world.

1.2. Aims and objectives

The aim of the study is to assess the current status of the port reception facilities in Vietnam seaports and provide a proposal for the implementation of port reception facilities in the ports of Vietnam. The requirements of the port reception facilities is regulated in MARPOL Convention's Annexes, including Regulations 38, 12, and 7 of Annex I, IV, V respectively.

Based on the aim, the objectives of this study is to conduct assessments in specific areas and focus on the following tasks:

- To assess the current situation of maritime activities in Vietnam;
- To assess the volume of waste generated from ships in Vietnam;
- To assess the capacity of the reception system for receiving and treating ship-generated waste; and
- Assess the compatibility of legal documents relating to port reception facilities in Vietnam.

1.3. Research questions

The study seeks to answer the overall research questions:

- How much ship-generated waste will be discharged in Vietnam by 2020 and 2030?
- What are the existing regulations in Vietnam relevant to this issue?
- What is the current capacity of Vietnam seaports in collecting and treating waste from ships?

1.4. Methodology

The benefits and challenges of implementing the regulations of the MARPOL Convention on the port reception facilities will be analyzed and assessed by the data obtained from surveys conducted by Port Authorities. Moreover, the available data from the EMSA's guideline for estimating the quantities of waste generated from a ship, local data concern receiving and treating ship-generated waste from local environment companies, and forecasting data from the Master Plan for the development of Vietnam seaport are compared and assessed.

Their surveys have been conducted at seaports in Vietnam. Instead of collecting data by carrying out first-hand interviews with the managers of seaports and the masters of vessels which are calling in various ports, and other stakeholders, the data can be collected from the advanced notification form according to MEPC.1/Circ.834 of IMO. Annually, this data will be gathered by Port Authorities and sent in Annual reports to

the Vietnam Maritime Administration. Therefore, the data relating to the status of vessels and the volume of cargo transiting through Vietnam's seaports in the Annual report of Port Authorities consolidates and offers for a prediction of the volume of waste discharged from ships at Vietnam's seaports. According to IMO Manual on Port Reception Facilities 2016, the prediction method for waste is based on averaged amounts. In this dissertation, estimating the amount of waste involves three principal steps:

- Step 1: Determining the number of each type of vessel and cargo through Vietnam's seaports by 2020 and 2030 based on the Master Plan on development of Vietnam's seaport system
- Step 2: Calculating the average volume of waste for each type of ship based on data collected from VINAMARINE, guidelines, and articles.
- Step 3: Multiply the result of step 1 with step 2 to get the estimated amount of waste by 2020 and 2030.

In addition, the analysis will highlight the barriers and limitations of current Vietnam regulations based on the MARPOL Convention, resolutions and documents of IMO, and other legal documents concerning port reception facilities in Vietnam. Thus, it is necessary to compare and assess the requirements of the port reception facilities regulated in the MARPOL Convention' Annexes with the legal documents related to the management of receiving and treating ship-generated waste at Vietnam's seaports.

To help assess the benefits and challenges of port reception facilities in Vietnam in both technical and legal aspects, both quantitative and qualitative methodologies have been used in this dissertation. Besides, a SWOT analysis was conducted to evaluate internal strengths and weaknesses of the current situation of port reception facilities in Vietnam, together with emerging external opportunities and threats to provide a reasonable proposal for the implementation of port reception facilities at seaports in Vietnam. A systematic and structured method for analysing all available data associated with port reception facilities in Vietnam is as follows:

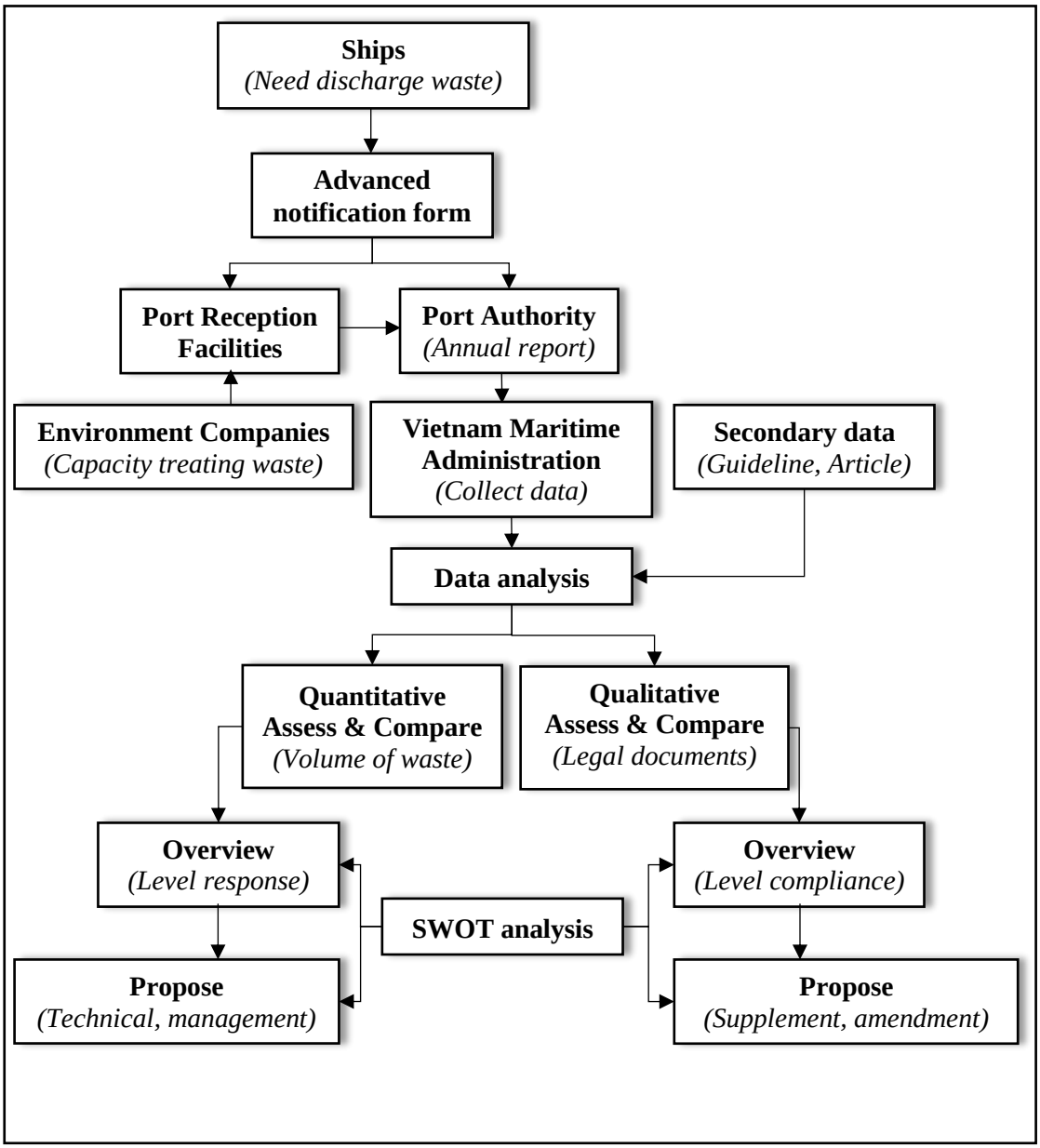


Figure 2: Method of collecting and analysing data related to Port Reception Facilities in Vietnam
Source: Author

CHAPTER 2: LITERATURE REVIEW

Since the provision requiring an adequate facility for the reception of ship-generated waste has become mandatory for all contracting parties of the MARPOL Convention, much works has been done by individuals and organizations to implement Port Reception Facilities.

2.1. International Maritime Organization

IMO issued several documents with guidance to assist the Member States with proper implementation of the regulations that are relevant to port reception facilities such as the IMO Comprehensive Manual on Port reception facilities, Circular MEPC.1/Circ.834 on consolidated guidance for providers and users of port reception facility and Resolution MEPC/Res.83(44) on guidelines for ensuring the adequacy of port waste reception facilities, et al.

The first publication of the Comprehensive Manual on Port Reception Facilities was agreed at the thirty-second session of the MEPC of the IMO in March 1992. This dissertation will use the latest Manual on Port Reception Facilities which was published in 2016 and titled 'How to do it'. The Manual provides practical information on the technical and regulatory issues and proactive measures to deal with possible inadequacies to ensure a party State fully complies with the MARPOL Convention on Port Reception Facilities. The method of collecting data and estimating the amount of waste in this Manual was considered and applied to the study of forecasting volume of waste and evaluating the capability of receiving and treating waste from ships until 2030.

Also, on 15 April 2014, Marine Environment Protection Committee (MEPC) approved Circular MEPC.1/Circ.834 on consolidated guidance for providers and users of port reception facility. Guidance in MEPC.1/Circ.834 of the Marine Environment Protection Committee also highlights the role of the Captain, the Ship owner, and the Operator in the management of waste generated on board, and how the transferring of wastes from ships should be done in accordance with the ISM Code. For the port role, Port Authorities have a responsibility for the preparation of a Waste Management Plan

for the port and also for ensuring that the information is always available for ship operators to assist their ship in entering the port (MEPC, 2014). From the requirement of advanced notification, it has supported the Port Authorities to manage the amount of ship-generated waste when ships enter their port.

2.2. Ports around the world

However, to be effectively implemented in practice, some ports around the world have issued waste handling plans for users of port reception facilities. The scope of this study considered the following ports: Port of Hamburg, Port of Rotterdam, Port of Antwerp, and ports of the regions of Singapore and the Malacca Straits.

One of the world's largest ports, Antwerp (Belgium) has launched procedures and availability of equipment for handling all wastes from vessels at this port. The brochure describes the cooperation and communication between the stakeholders in the notification, delivery, and fee for ship's waste. Furthermore, the Port of Hamburg (Germany) has issued a Port Information Guide for seagoing vessel and shipping lines when they operate in this Port. This guideline also provides information related to the disposal of oil and oil waste to include the capacity of port reception facilities around the port, contact information, and tariffs for receiving waste. Similarly, in the Netherlands, the Rotterdam port provided the Port Waste Reception and Handling Plan (PWHP) that draws a sustainable plan for receiving and treating waste from ships based on a draft that was drawn from advice from stakeholders including shipping companies, shipping agents, receivers, handlers and the Port Authority. Rotterdam's PWHP not only details the costs of receiving, storing and treating waste but also gives the economic benefits for waste treatment units. All three Plans above provided the tariff for receiving waste, but each port has different methods of calculation, which should be considered when making a proposal for charging of ship-generated waste in Vietnam's seaports.

For the ports of the regions of Singapore and the Malacca Straits, the Maritime Authorities of the three countries including Singapore, Indonesia, and Malaysia have worked together in sharing information related to port reception facilities. In particular,

the Port Reception Facilities Booklet for the Straits of Malacca and Singapore have provided specific information about reception facility operators in the ports including advance notifications, communications, type of facility, and the type and maximum amount of residues/waste that can be received. Advance notifications ensure reception facility operators have adequate preparation time for preparing equipment, storage, and treatment systems. This study should refer to the process of advanced notification of this booklet together with the Circular MEPC/Circ.834 of the IMO, which will be explained below when making a proposal for notification. However, this booklet has not given the cost of receiving, which is a limitation and should be noted by other ports when publishing booklets on port reception facilities.

2.3. Studies of researchers

Besides the IMO documents, some of the research that was previously carried out specifically focused on the "Adequacy of waste reception facilities in Greek ports" by researchers Giziakis and Mahairas. Other researchers such as Satir, Alkan and Sarikaya conducted research into establishing port reception facilities in the Republic of Turkey in their work titled "Ship's waste reception facility for the marine environment." Furthermore, Iwan Ball's article on "Port waste reception facilities in UK ports" examined ways to ensure adequate provisions are in place for reception facilities and detailed the UK's approach to reduce the amount of marine environmental pollutants from ships deliberating discharging waste into the seas.

The research of Giziakis and Mahairas about Adequacy of waste reception facilities in Greek ports was done through the analysis of the results of a survey at various Greek ports and the results of this survey detailed the satisfaction levels of port reception facilities in various ports in Greece. However, the research was limited to an analysis of this survey and examining the main aspects of the legal framework concerning the provisions of port waste reception facilities. It is limited in the scope as it only focused on the ports vice the ships entering the ports of Greece. Specifically, only a small number of ports were surveyed and they had to conform to the requirements related to waste reception facilities (Giziakis, & Mahairas, 2008). Thereby, this will be a good

thing to notice when evaluating the data obtained from the surveys as it does not shed light on the adequacy of reception facilities as a whole in Greece.

The research "Port waste reception facilities in UK ports" of Iwan Ball has indicated what the reception facilities need to achieve in order to receive and process different types of ship-generated waste, and the importance of constructing a Waste Management Plan for the Port Authorities to ensure that ports provide adequate reception facilities for arriving ships (Ball, 1999). The research also provided two approach methods for calculating the fees that the users have to pay when using port reception facilities.

Furthermore, the benefits of port reception facilities that are contributing to the preservation of the marine resources and ecosystem and the protection of the marine environment have been provided in the research of Satir, Alkan and Sarikaya. Specifically, the waste treatment centers have contributed to the country budget through the recycling of waste oil. However, Rinkesh, a researcher on clean and green energy, pointed out some disadvantages of recycling waste oil as it requires building a waste treatment center which is a burdensome capital investment (Rinkesh, 2017). Hence, this issue needs to be carefully evaluated when considering proposals for the selection of oil treatment methods.

The guidelines, cases, and research highlighted above has shown important components in implementing adequate port reception facilities in all aspects from making a plan, surveying, evaluating, and developing methods to improving its system as well as economical aspects. This study will use these materials as a foundation to examine the advantages and overcome shortcomings to assess and propose a realistic plan for implementing Port Reception Facilities in Vietnam.

CHAPTER 3: LEGAL FRAMEWORK

3.1. International regulations related to port reception facilities

3.1.1. UNCLOS

United Nations Convention on the Law of the Sea 1982 (UNCLOS) provided a comprehensive legal framework for marine environment protection.

- Under Article 192 of UNCLOS, States have an obligation to protect and preserve the marine environment.
- According to Article 194, States have an obligation to implement necessary measures, including the use of means or policies in the area, and exercise their sovereign right or jurisdiction to prevent, control, and minimize all sources of marine pollution which include the release or discharge of waste, toxic substances from vessels, or marine exploration operation.
- Article 211(2) states that Flag States acting through the competent international organization such as the International Convention for the Prevention of Pollution from Ships (MARPOL), IMO Instruments, Implementation Code, and Ballast Water Management Convention which are adopted by the IMO shall establish international rules and standards to prevent, reduce, and control pollution of the marine environment from vessels.

3.1.2. MARPOL

The maritime industry has raised many threats to the marine environment. The first threat concerning the international community is oil pollution. In 1921, representatives of Ship-owners, Oil Industries, and Maritime Authorities organized the first conference in the United Kingdom for the prevention of pollution by oil from ships. Then, in 1954, representatives of 33 countries that covered a total fleet's tonnage of over 100,000 GT and ten observers attended the Oil Pollution Prevention Conference in London and adopted the International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL 1954). Entering into force on 26 July 1958, the OILPOL 1954

regulated the discharge of oil wastes and prohibited discharge within certain distances from land and special areas. Also, OILPOL 1954 required that the ship must have a record book to record the information of the oils onboard including crude oil, fuel oil, heavy diesel oil and lubricating oil (IMO, n.d.b).

The development of the industry as well as oil trading in this period caused the increase of pollution to the marine environment. For example, the Torrey Canyon accident of 1967 raised many questions about measures in place to prevent oil pollution prevention and exposed the shortcomings of the existing instruments. In 1967, the oil tanker Torrey Canyon ran aground on Pollard's Rock of Great Britain and released approximately 120,000 tons of crude oil into the sea. Following the accident, there were a number of legal problems that needed to be addressed such as the intervention of the coastal state in case of an immediate threat of oil pollution to their territory and international rules to deal with liability and compensation regarding oil pollution and measures to prevent oil pollution from ships (Wene, 2002). As a direct result of the Torrey Canyon accident, the International Conference on Marine Pollution from 8 October to 2 November 1973 adopted the International Convention for the Prevention of Pollution from Ships (MARPOL 1973) that entered into force in this year. Until 1978, IMO held a Conference on Tanker Safety and Prevention Pollution that supplemented the 1978 Protocol including the 1978 SOLAS Protocol and 1978 MARPOL Protocol. The Convention that is amended by the Protocol 1978 is called International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating to it or MARPOL 73/78. In 1997, MARPOL 73/78 was supplemented by the 1997 Protocol as Annex 6 on Regulations for the Prevention of Air Pollution from Ships (IMO, n.d.b).

According to the book "The Impact of Marine Pollution" of Robin Churchill in 1980, the coming into force of MARPOL 1973 would make a significant contribution to reducing pollution from ships. In fact, until 1976, only three countries ratified the Convention, although the Convention permitted member States to become Party of this Convention by only ratifying Annexes I and II. To facilitate a State to ratify the Convention, the MARPOL 1978 Protocol allowed States three years to overcome the

technical issues and implement Annex II after the Protocol entered into force. Finally, sufficient states ratified Convention in 1982, and the MARPOL 1973/78 Convention entered into force on 2 October 1983. The MARPOL Convention contains six Annexes:

Table 1: The annexes of the MARPOL 73/78 Convention

Annexes	Title	Entry into force
Annex I	Regulations for the Prevention of Pollution by Oil	02/10/1983
Annex II	Regulations for the control of Pollution by Noxious Liquid Substances in Bulk	06/04/1987
Annex III	Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form	01/07/1992
Annex IV	Regulations for the Prevention of Pollution by Sewage from Ships	27/09/2003
Annex V	Regulations for the Prevention of Pollution by Garbage from Ships	31/12/1988
Annex VI	Regulations for the Prevention of Air Pollution from Ships	19/05/2005

Source: International Maritime Organization

In the six Annexes, Annexes I and II are mandatory for all Parties, while other Annexes are optional. From the entry into force in 1973, the Annexes are constantly amended and supplemented by the advancement of science and technology as well as the development of the world's fleet. The Annexes required that the member states must equip port reception facilities at their port in accordance with Regulation 38 of Annex I, Regulation 18 of Annex II, Regulation 12 of Annex IV, Regulation 7 of Annex V and Regulation 17 of Annex VI.

Content of Annex I

Annex I include provisions for the prevention of oil pollution caused by ship and entered into force on 27 September 2003. Annex I includes seven chapters, 39 regulations, and eight appendices. In those, regulation 38 details requirements for port reception facilities. This provision requires the State party to the Convention should

provide an adequate system for receiving mixtures and residues oil (sludge) from ships. Besides, ports in the particular area must provide a system for receiving and treating all types of ballast water and tank washing water from oil tankers. These port reception facilities must ensure that it has sufficient capacity to meet the demand of discharged waste from the ship while not affecting the normal operation of vessels.

Content of Annex IV

Annex IV details regulations for the prevention of pollution caused ship-generated sewage and entered into force on 27 September 2003. Annex IV includes five chapters and one appendix. In those, regulation 12 regulates about port reception facilities. According to regulation 12, the contracting government of the MARPOL convention has an obligation to ensure adequate port reception facilities for vessels operating in their water areas and has a responsibility to inform arriving ships to the current situation of port reception facilities.

Content of Annex V

Annex V details regulations for the prevention of pollution caused ship-generated garbage and entered into force on 31 December 1988. Annex V includes nine Chapters and one appendix. In those, regulation seven details requirements for port reception facilities. Specifically, member state government should ensure their port and port terminals equipped port reception facilities to meet the demand of vessels' waste discharges as well as should not result in the disruption of the operation of vessels in this area. In addition, the member state government has a responsibility to inform interested parties about the availability of this equipment as well as the receiving capacity of garbage.

3.2. Implementation and enforcement regulations related to the port reception facilities in Vietnam

Vietnam became a member of the United Nations Convention on the Law of the Sea (UNCLOS) in 1994 and the MARPOL Convention in 1991. Annexes I and II, and Annexes III, IV, V and VI entered into force for Vietnam on 29 August 1991, and 19

March 2015, respectively (Lam, 2015). After the ratification of the MARPOL Convention, Vietnam improved compliance with marine environment protection standards through the issuance of domestic regulations as well as the enhancement of environmental government structure. Moreover, Vietnam has integrated and promulgated the national rules in the management of waste generated from maritime activities in the Vietnam's Environmental Protection Law 2014, Maritime Code 2005 and the rules under the law (Green4sea, 2016).

Specifically, the regulations relating to the management of waste from maritime activities are provided in the Law on Environmental Protection 2014 including:

- Control and treatment of marine pollution (Article 50);
- Prevention and response to marine environmental incidents (Article 51);
- The waste management must be monitored throughout the process in the steps including from generation, collection, and classification to transport, re-use, recycle and treatment (Article 85);
- The management of hazardous waste including filing, registration, licensing, classifying the collection, storage and transportation shall be carried out in accordance with the provisions and guidelines of government bodies (Article 91);
- Solid waste management (Article 95, 96, 97; and
- Sewage management includes management, collection and treatment sewage (Articles 99, 100).

In addition, Vietnam Maritime Law 2005 described the protection of the marine environment from ships' operation such as implementing the inspection and examination of maritime safety, maritime security and prevention of environmental pollution from ships according to Article 29, and enhancement of maritime safety, maritime security and prevention of environmental pollution at seaports in accordance with Article 65.

Vietnam also has developed regulations for the implementation of the port reception facilities at the seaports under the provisions of the Circular No. 50/2012/TT-BGTVT

of the Ministry of Transport dated 19 December 2012 and for enhancing the inspection of Port State Control (PSC) under the Circular No. 24/2014/TT-BGTVT dated June 30, 2014.

In order to ensure compliance with Regulation 38 of Annex I, 12 of Annex IV, and Annex V of the MARPOL Convention related to the port reception facilities, together with the obligation and responsibility of the State party to the MARPOL Convention on the roles of Flag State, Port State and Coastal State, Vietnam should meet the requirements of the MARPOL Convention and provide appropriate equipment for vessels arriving and leaving its jurisdiction water. Measures to implement and enforce the regulations related to port reception facilities in the Annexes of MARPOL Convention in Vietnam are mentioned below (Pham, 2016).

- First, Vietnam should carry out measures to ensure full implementation of the commitments signed under the MARPOL Annexes. Vietnam should also takes the necessary steps to ensure the compliance of vessels flying Vietnamese flags and Vietnamese organizations or other individuals related to the provisions of the Annexes, as well as supply sufficient human resources to carry out the inspection and certification of Vietnamese vessels.
- Second, port reception facilities in seaports and terminals should be provided and constructed promptly to comply with the traffic density and the demand of discharged waste from vessels in the area so as to not disrupt the incoming and outgoing activity of vessels. Besides, Vietnam has a responsibility to issue legal documents for the assessment, inspection and monitoring of seagoing vessels in accordance with the provisions of the MARPOL Convention. In addition, Vietnam has an obligation to carry out accident investigation, adequately and promptly handle violations, and train inspectors who conduct Port State Control activities. Education and training of PSCOs will facilitate reliable and accurate inspections and assessments with respect to waste management systems, equipment, and records keeping on board such as Oily Water Separator (OWS), Oil

Discharge Monitoring Equipment (ODME), Oil Content Meters (OCM), Oil Record Book, and Garbage Record Book.

- Finally, the issuance and implementation of appropriate procedures to monitor and observe the operation of ships are necessary to prevent and minimize accidents as well as environmental pollution incidents occurring in the national jurisdiction promptly and accurately. Implementing physical inspections for vessels when there is a clear ground, which exists when a Port State Control Officer finds evidence of condition or certificates of vessel or crew do not substantially meet the relevant requirements of a relevant instrument, shown that the ship has illegally discharged in the jurisdiction waters of Vietnam.

However, the cost of port reception facility equipment is very expensive, and ports must handle the waste after it has been received. Therefore, Vietnam needs to encourage socialization such as private companies or public service organization to collect the different types of waste and prioritize using approved mobile reception complying with the regulatory requirements such as trucks, boats with an appropriate mechanism. In some cases of oil residues, it can be recovered to save cost by recycling (Lam, 2015). To develop the facilities appropriately, the seaport should monitor and record the demand of vessels discharging waste to build the plan of receiving waste discharge that is suitable for their capacity.

Although Vietnam has planned to build waste collection and treatment centers in Decision No. 855/2011/QD-TTg of the Prime Minister on 06 June 2011, there is not yet definite guidelines that have been issued for the implementing this decision. In fact, there is no official legal document system for regulating and guiding the implementation of the waste reception and treatment system to meet the requirements of the MARPOL Convention as well as support for the installation of equipment, means and facilities to receive and treat waste from ships in the Vietnam's seaports (TransportNew, 2011). This has led to fragmentation in the construction of a system for receiving and handling waste from ships at ports as well as causing difficulties for port authorities in managing and monitoring this issue.

Viet Nam has recently ratified Annexes III, IV, V and VI of the MARPOL Convention so the development of national regulations to guide the port authorities in inspection of foreign vessels arriving in Vietnamese seaports is necessary, as well as ensuring the prohibition of discharged and polluted marine from foreign ships within the national jurisdiction is limited (An, 2016).

Given the rapid development of the economy, there is an increase in the number of foreign ships arriving and departing Vietnamese seaports, which has led to the potential risks of environmental pollution in the seaport's waters in particular as well as the national jurisdiction in general (TransportNew, 2016). For example, the results of researching water resources at Cai Lan seaport in Quang Ninh Province has shown the concentration of oil in the water exceeds the average permissible value of standard approximately 0.6 mg/l (Van, 2016). Hence, Vietnam should encourage the participation of shipping companies, organizations and seaports to ensure effective implementation of these regulations.

CHAPTER 4: ASSESSMENT OF THE PORT RECEPTION FACILITIES IN VIETNAM

4.1. Current status of maritime activities in Vietnam

Over the past years, the Government of Vietnam has mobilized and utilized all economic resources including government budget, corporate capital, Foreign Direct Investment (FDI) and Official Development Assistance (ODA) to invest in infrastructure development of Vietnam's seaports. The Vietnam seaport system has formed, creating a traffic network to meet the demand of socio-economic development of local, regional and national (Whelan, 2016). In 2014, the Ministry of Transport established coastal transport routes for domestic vehicles from the harbors of coastal provinces such as Quang Ninh, Hai Phong, Thai Binh, Nam Dinh, Ninh Binh, Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri. The establishment of coastal transport routes has directly reduced the traffic density and removed difficulties for shipping enterprises at that time (Quang, 2016). According to regions, Vietnam seaport system is divided into six groups (MOT, 2009a):

- Group 1: Northern seaport group from Quang Ninh to Ninh Binh;
- Group 2: Northern Central seaport group from Thanh Hoa to Ha Tinh;
- Group 3: Middle Central seaport group from Quang Binh to Quang Ngai;
- Group 4: Southern Central seaport group from Binh Dinh to Binh Thuan;
- Group 5: Eastern South seaport group including Con Dao and ports on Soai Rap river of Long An, Tien Giang; and
- Group 6: Mekong delta seaport group including Phu Quoc and Eastern south islands.

Although the international and national maritime economy has been affected by the economic downturn, the volume of goods through Vietnam's seaport system is still relatively stable. According to the report of VINAMARINE in May 2017, cargo through Vietnam's seaport system in the first three months of 2017 reached 121.7 million tonnes, up 3 percent from the same period in 2016. However, some port enterprises in the South of Vietnam still face some difficulties due to lack of goods (Dung, 2017). Therefore, in the coming time, it is necessary to continue drastically

implementing the proposed solutions, especially to improve transport infrastructure and supporting services to distribute goods through seaports. Details of the volume of goods and maritime transport activities for 2013, 2014, 2015, 2016 are presented in Appendix 3, 4, 5, and 6.

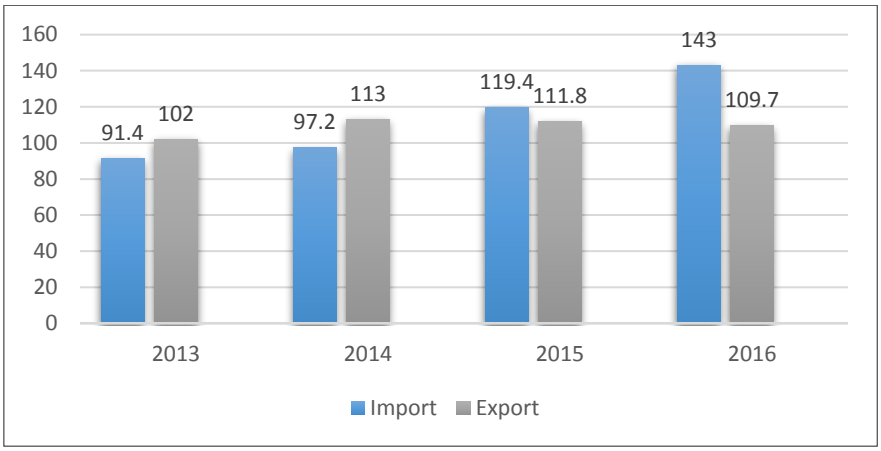


Figure 3: Import and export goods through Vietnam seaport from 2013 to 2016
(Source: Vietnam Maritime Administration)

In recent years, due to the influence of the world market in general, Vietnam's shipping industry has not yet shown signs of recovery. The maritime freight tonnage is low, sources of goods for carrying are scarce and operating costs are rising, creating many difficulties in the shipping industry. In the past time, due to the efficient policy in restricting foreign vessels in domestic transportation, the goods transported by sea, especially domestic containerized cargo has been increased significantly (VNN, 2016). Currently, the Vietnamese fleet is approximately 1,700 ships, but only about 400 ships operate on international routes such as Southeast Asia and China, North East Asia, Middle East or Africa. Besides, only a few large enterprises including state-owned enterprises, foreign invested enterprises, and private enterprises have general cargo ships that have enough ability to operate on the routes to America and Europe. Most container vessels only operate in feeder container ports in Southeast Asia, China, Hong Kong, and Taiwan and are not yet available for direct routes. The oil tanker fleet is mainly imported petroleum from Singapore, Malaysia and the Middle East, of that carriage, the domestic transport accounts for 12%, and international transport accounts for 88% of volume (Tran, 2015).

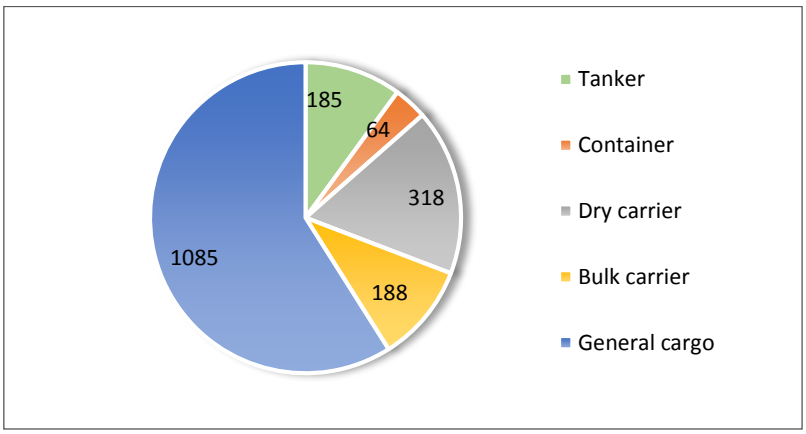


Figure 4: The structure of the Vietnamese fleet by type in 2015
Source: Vietnam Maritime Administration

Currently, Vietnam has 120 shipyards with the capacity of building and repairing ships that have a tonnage of over 1,000 tonnes. These shipyards belong to corporations, government enterprises, military enterprise, foreign investment enterprises and private business. Of those, the Hyundai Vinashin Shipyard and Hai Phong Equipment Manufacture and Shipbuilding Co., Ltd are taking a significant part in the shipbuilding industry of Vietnam with high-quality products and established the trust in the world shipbuilding market (Dong et al., 2016). By geographic location, shipbuilding industry facilities are divided into three clusters: Southern, Central and Northern (VINAMARINE, 2015).

- The North has 92 ship building/repairing facilities more than 1,000 DWT with the capacity to build 70,000 DWT ships, floating docks 150,000 DWT, repair ship up to 20,000 DWT;
- The Central has 13 ship building/repairing facilities more than 1,000 DWT with the capacity of building and repairing the largest ship up to 400,000 DWT; and
- The South has 15 ship building/repairing facilities more than 1,000 DWT with the capacity of building up to 12,500 DWT and repairing the largest vessel up to 50,000 DWT.

4.2. The current situation of port reception facilities in Vietnam

4.2.1. The current situation of receiving and treating waste at Vietnam seaports

Currently, according to statistics of VINAMARINE, waste generated from a ship is received and treated in various ways, depending on the capacity of each port. In general, the types of waste from the ship when the ship moored at the port can be handled in one of the following ways:

- Port receives and handles within the port;
- Port receives then contracts with the environment companies that have functions to transfer and treat at their centers; or
- Port supports ship owners contracted with functional Units for collection, transferring and handling.

4.2.2. Statistical data of receiving and processing the waste from ship at ports

Currently, according to statistics from the Vietnam Maritime Administration, only some ports have the capability of receiving and handling waste from ships. Some areas such as Ho Chi Minh City, Dong Nai, and Vung Tau signed contracts with outside Units that have the capability to receive and handle waste. Most of the ports are not equipped with adequate equipment or have the necessary port reception facilities equipped to receive and handle waste, especially sewage. Some other areas such as Kien Giang, An Giang, Dong Thap are not equipped with reception facilities in their port; and these ports commonly contract with environment companies outside the port for collecting and treating waste.

Table 2: Current situation of receiving and treating waste from ship

Group Ports	Port			Company		
	Hazardous substance	Sewage	Garbage	Hazardous substance	Sewage	Garbage
Group 1						
Quang Ninh	Receive	Receive	Receive	Treating	Treating	Treating
Hai Phong	Receive	Receive	Receive	Treating	Treating	Treating
Thai Binh						
Nam Dinh	Receive	Receive		Treating	Treating	
Group 2						

Thanh Hoa	Receive			Land fill		
Nghe An	Receive			Land fill		
Ha Tinh	Receive		Receive	Treating		Treating
Group 3						
Quang Binh						
Quang Tri				Treating	Treating	Treating
TT Hue	Receive			Treating		
Da Nang	Receive	Receive	Receive	Treating	Treating	Treating
Quang Ngai						
Quang Nam						
Group 4						
Quy Nhon	Receive			Treating		
Nha Trang	Receive			Treating		
Binh Thuan	Receive			Treating		
Group 5						
Vung Tau	Receive	Receive	Receive			
HCM	Receive	Receive	Receive	Treating	Treating	Treating
Dong Nai						
Group 6						
Can Tho	Receive			Treating		
My Tho	Receive			Treating		
An Giang	Receive			Treating		
Kien Giang	Receive	Receive	Receive	Treating	Treating	Treating
Dong Thap	Receive	Receive		Treating	Treating	
Ca Mau						

Source: VINAMARINE, 2016

4.2.3. The statistics information of receiving and processing the waste from ships at centers and companies in each area

According to group ports, there are a number of centers or companies that are licensed by the Vietnam Government to receive and treating wastes. Most of these are private companies with private investments and get benefits from the fees for the collection and treatment of waste and sewage. The source of waste for the company to operate is mainly from contracts with ports and ship owners. At the same time, in order to

increase profits, companies also have the waste from other Units that collect and treat waste from the ship. Thus, the current situation shows that in each port group area, there are some existing ports have been able to receive waste and some companies outside the port that can handle waste.

Table 3: Detailed statistics on the capacity of receiving and treating wastes from the ships of at the port and companies in Vietnam

Group ports	Capacity treating of ports (per day)			Capacity treating of companies (per day)		
	Hazardous substance	Sewage	Garbage	Hazardous substance (Tonnes)	Sewage (M^3)	Garbage (Kg)
Group 1				140	50	6505
Group 2				10	0	25700
Group 3				243	0	24950
Group 4				0	0	3300
Group 5				450	750	6000
Group 6				5	25	4400

Source: VINAMARINE, 2016

4.3. Forecast amount of waste generated from ships

Within the scope of this study, the data is estimated based on the amount of the ship calls at the port and the averaged amounts of waste per ship. The average value of waste will be estimated for each group of ships including foreign ships, domestic ships, and passenger ships.

4.3.1. Oil waste

Annex 1 of MARPOL Convention defined oil as petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products. Moreover, Circular MEPC.1/Circ.834 defined oil waste onboard is mainly a combination of oily tanks washing, oily bilge water, dirty ballast water, oil sludge, and used lubricating oil.

Based on the actual reception of some inland waterway port and calculated on the average size of the ship, the estimated amount of oil waste of domestic ships is approximately 1.0-1.5 tonnes per ship call (Delft, 2017).

According to the study from The Ocean Conservancy Cruise Control, the volume of oil waste generated on passenger ships is from 1,300 to 37,000 gallons per vessel per

day depending on the ship size and the age of the ship. However, more than half of this volume has been treated on board and pumped into the sea, so only about one third of this waste needs to be discharged at the port. Thus, with small to medium sized passenger ships, the estimated average volume of oil wastewater is nearly 3.0 to 3.5 tonnes per ship call.

Through the statistics of the foreign ship calls going into the seaport area of Hai Phong, Quang Ninh, the number of ships unloading cargo is approximately 400 ships per month with a total cargo of approximately 350,000 tonnes per month. Based on the demand of vessels discharging waste oil and their mixtures in port, it shows that only unloading cargo ships need to discharge oil waste at the seaport. In particular, from the statistics from the Hai Phong Port Authority, the volume of oil waste that needs to be discharged in the seaport area is in the range of 5.0 to 6.0 tonnes per ship call or 0.0065 tonnes per ton cargo.

Table 4: Statistics of oil wastewater in Hai Phong Port from 2008 to 2012

Year	Ship calls	Volume cargo (ton)	Volume of oil waste (ton)					Average per ship calls (ton)	Average per ton cargo (ton)
			Cleaning tank water	Waste ballast water	Sludge	Bilge water	Total		
2008	180		150.7	70.0	95.2	542.3	858.2	4.77	
2009	197		135.6	65.4	120.8	612.2	934	4.72	
2010	289		396.5	134.7	148.4	819.7	1.499.3	5.19	
2011	345		425.2	165.3	162.2	955.8	1.708.5	4.95	
2012	394	350.000	355.0	506	256.1	1.156	2.273.1	5.77	0.0065

Source: Hai Phong Port Authority

4.3.2. Sewage

According to Regulation 1 of Annex IV, sewage means:

- Drainage and other wastes from any form of toilets and urinals;
- Drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubs and scuppers located in such premises;
- Drainage from spaces containing living animals; or
- Other waste waters when mixed with the drainages defined above.

On average, each journey between two ports takes about seven days. For foreign ships with a crew 20 people, the amount of sewage generated can be estimated up to 5.6 tonnes per ship (Delft, 2017).

Domestic ships have approximately 5-10 crew members and navigate for a period of seven days, generating an average amount of sewage estimated at approximately 1.0 - 2.0 tonnes per ship. However, in fact, most domestic ships do not have sewage reserves tank on board and most of them are discharged along the shipping route at sea (Delft, 2017).

With passenger ship, the daily sewage discharged of a passenger is about 30-40 liters. However, according to statistics from The Ocean Conservancy Cruise Control, only about 25% of this waste water needs to be treated at the port, equivalent to about 7.5-10 liters per passenger per day.

4.3.3. Garbage

Under Regulation 1 of Annex V, garbage is defined as all kinds of food waste, domestic waste, operational waste, all plastics, cooking oil, incinerator ashes, cargo residues, animal carcass, and fishing gear generated during the normal operation of the ship and liable to be disposed of continuously or periodically. Garbage does not include fresh fish and parts thereof, and those substances which are listed in other Annexes.

According to reports of The Professional Emergency Services Association (PEMSA), for each foreign ship, the average garbage is approximately 1.2-2 kg per person per day. That means that each journey from port to port is about seven days and carries 20 seafarers, the average amount of garbage generated at the port can be estimated at 280 kg per ship. Of those, mainly including glass and can garbage is about 0.7 - 1.0 kg per person per day; dry garbage is about 0.3 - 0.5 kg per person per day and garbage from drinks: 0.2 - 0.5 kg per person per day.

With domestic ships, almost all of them do not have installed garbage treatment systems, so the amount of domestic garbage that needs be treated in the port is very large. This large amount of domestic garbage will cause significant pollution to the

port area if it's not received and treated. The amount of garbage for domestic ships with the crew about 5-10 people and the journey period about seven days is estimated at 70 – 140 kg per ship.

According to statistics from The Ocean Conservancy regarding passenger ships, the amount of garbage generated is about 2.5 kg per person per day. However, according to this document, for ships equipped with garbage treatment systems, up to 75-85% of this garbage can be treated on board.

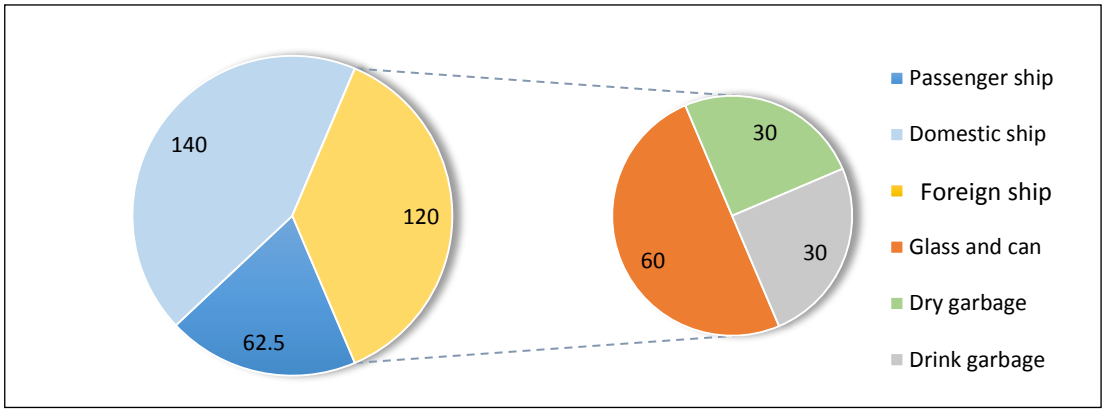


Figure 5: Percentage allocation of garbage between groups of ship
Source: Author

Table 5: The summary of estimated amount of ship-generated waste for each type vessel

Type of vessel	Oil waste	Sewage	Garbage
Foreign	1.0-1.5 tonnes per ship call	5.6 tonnes per ship	280 kg per ship
Domestic	5.0 to 6.0 tonnes per ship call or 0.0065 tonnes per ton cargo	discharged along the shipping route	70 – 140 kg per ship
Passenger	3.0 to 3.5 tonnes per ship call	7.5-10 liters per passenger per day	0.625 kg per person per day

Source: Author

4.4. Evaluate the capability of receiving and treating waste from ships in Vietnam until 2030

4.4.1. Master Plan on development of Vietnam's seaport system

The establishment and development of the seaport system in association with the coastal transportation network are the leading priorities for the formation and development of urban centers, industrial parks, and tourist service center. On the other hand, the development of seaports also creates a strong force to promote other sectors such as shipping, shipbuilding, and maritime services. Besides, Vietnam's seaport system is not only a part of the transportation infrastructure to meet the requirements of loading, unloading, storage and forwarding of goods, arrival and departure of passengers, but also serves as a motivation to promote the development and integration of coastal regions, locals and the whole country economy in relation to the world economy. It is also the foundation for reaching out to the sea and developing the shipping and maritime services to become the leading spearhead in the maritime economy while at the same time contributing effectively to the consolidation of national security as well as sovereignty over the territorial sea.

By 2020 and orientation toward 2030, Vietnam will invest in a synchronous and modern way for the seaport system which includes infrastructure, harbours, and channels. This investment include the construction of an international gateway port in Hai Phong, Ba Ria - Vung Tau and the economic center-point area in Central Vietnam. The international gateway ports will have be capable of receiving ships that are over 10,000 DWT or container ships from 9,000 TEU (Lach Huyen - Hai Phong) to 15,000 TEUs (Ba Ria - Vung Tau) and can be combined as an international container transshipment. Expanding specialized ports used for bulk and liquid cargoes to serve industrial parks with the capacity to receive ships of between 20,000 and 20,000 DWT (bulk cargo) and between 15 and 30,000 DWT (liquefied petroleum) is also required. Upgrading passenger terminals at major tourist centers with modern terminals reaching international standards for international passenger ships which have a tonnage of up to 10 thousand GT is necessary. Upgrading passenger terminals at major tourist centers by modernizing the terminal to meet international standards for international cruise

ships which has a tonnage of up to 10 thousand GT is required. Focus on renovating and upgrading existing ports to overcome the poor quality and backward technology is a major priority.

4.4.2. Forecast the volume of ship-generated waste to 2030

According to the master plan of development Vietnam's seaport system for the period up to 2020, with orientations toward 2030 as indicated by the Ministry of Transport in 2016, the data on projected growth and change of cargo, ship calls and passengers through group ports in 2020 and 2030 is expressed as follows:

Table 6: Volume of cargo through group ports in 2020 and 2030

Group	2020 (Million Tonnes/Year)	2030 (Million Tonnes/Year)
Group 1	177 - 192	312 - 365
Group 2	107 - 141	179 - 238
Group 3	54 – 61	108 - 124
Group 4	56 – 62.5	133 - 150
Group 5	238 – 247.8	358.5 - 411.5
Group 6	44 - 50	97.2 - 156

Source: Master Plan on development of Vietnam's seaport system

Table 7: Amount of ship calls and passengers through group ports by 2020 and 2030

Group	Foreign Ship (Ship calls)		Domestic Ship (Ship calls)		Passenger Ship (Passengers)	
	2020	**2030**	**2020**	**2030**	**2020**	**2030**
Group 1	15577	26525	9596	13527	278300	870100
Group 2	13292	22544	10822	16302	9100	10200
Group 3	2305	3972	9839	26056	115300	129100
Group 4	3149	4437	9596	13527	32500	36400
Group 5	11739	17686	10822	16302	161100	180500
Group 6	5951	15765	9839	26056	13937	15609

Source: Master Plan on development of Vietnam's seaport system

Based on forecasting data about the change and growth of cargo, ship calls and passenger entry ports in 2020, 2030 (Table 6, 7) and the estimated amount of waste from ship (Table 5), the volume of waste from the ship that needs to be processed at the ports by 2020 and 2030 is shown in the table below:

Table 8: Volume of waste generated from ships by 2020 and 2030

Group	Oil waste (Tonnes/Year)		Sewage (M^3/Year)		Garbage (Tonnes/Year)	
	2020	2030	2020	2030	2020	2030
Group 1	151038	240312	95580	148946	6401	11496
Group 2	144684	233076	74708	126552	5260	8620
Group 3	72864	180161	16367	26116	2311	5083
Group 4	45516	17964	18609	25939	2306	3227
Group 5	176550	203928	70571	104457	5205	7686
Group 6	94740	250926	33743	88752	3079	8101

Source: Master Plan on development of Vietnam seaport system

4.5. Assess the adaptability of the port reception facilities by 2020 and 2030

Based on forecasting data of the volume of waste generated from ships by 2020 and 2030 (Table 8) and detailed statistics on the capacity of receiving and treating wastes from the ships of the port and companies in Vietnam (Table 3), the response level of existing facilities to the reception and treatment of ship-generated waste are shown in the three figures below:

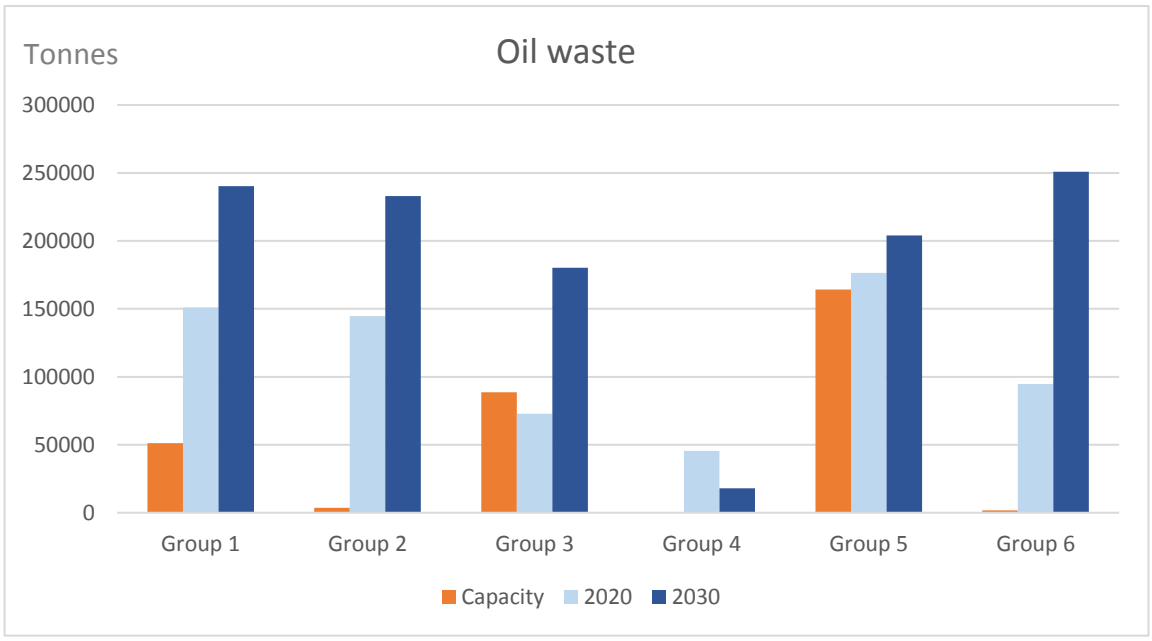


Figure 6: Assess the capability of existing facilities to receive and treat the current capacity of oil waste generated from the vessels and projected volumes in 2020 and 20130

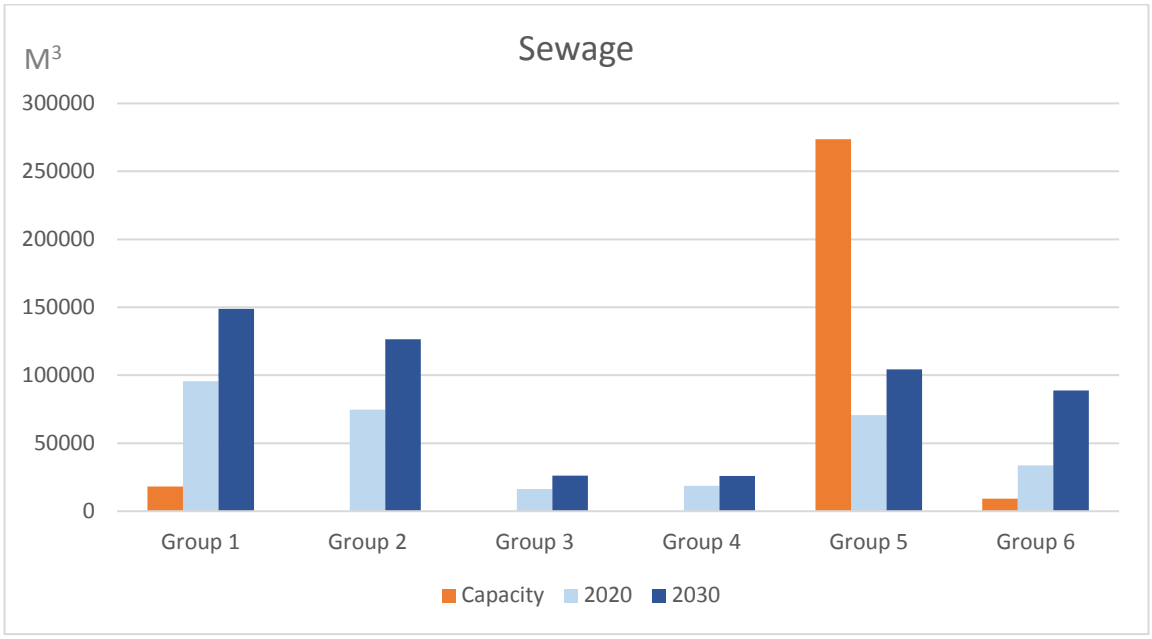


Figure 7: Assess the capability of existing facilities to receive and treat the current capacity of sewage generated from the vessels and projected volumes in 2020 and 2030

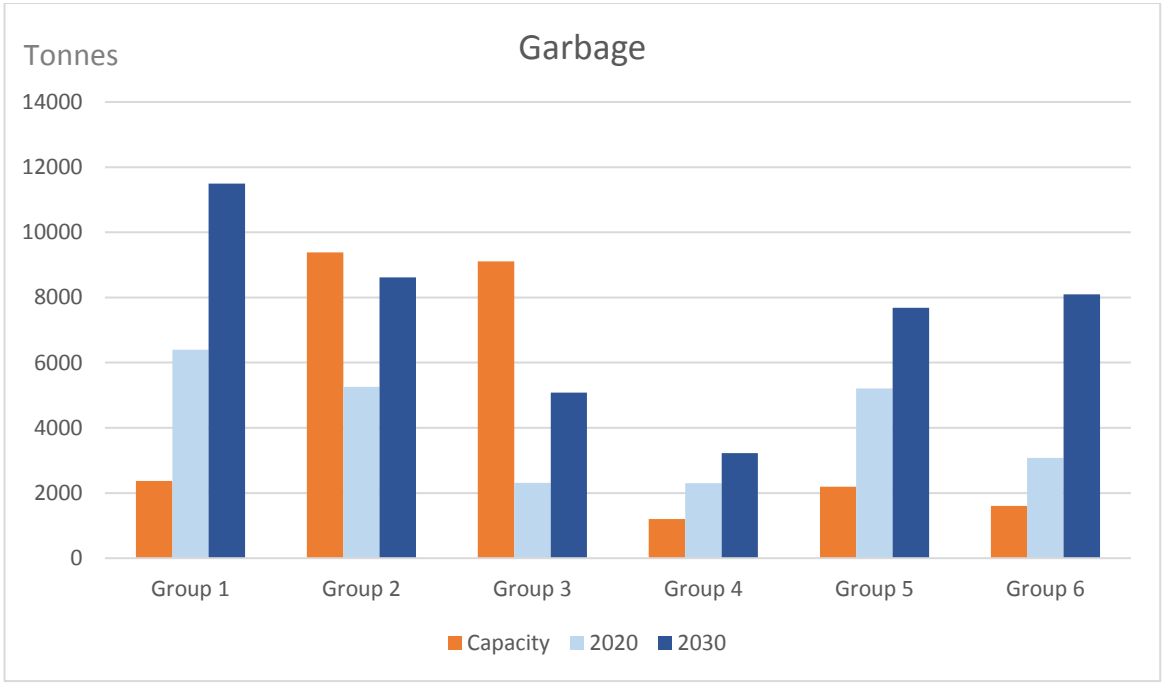


Figure 8: Assess the capability of existing facilities to receive and treat the current capacity of garbage generated from the vessels and projected volumes in 2020 and 2030

Estimated results show that in the case of using only the existing receiving system, the level of response to receiving and treating the waste from the vessel is as follows:

- With hazardous substance: by 2020, there will be one port group which can meet the demand for receiving and treating hazardous waste from ships, accounting for 16 %. By 2030, there are no group ports, accounting for 0%.
- With sewage: By 2020 and 2030, only 1/6 group ports can meet the demand for receiving and treating sewage from ships, accounting for 16%.
- With garbage: By 2020 and 2030, 2/6 port groups can still meet the demand of receiving and treating waste from the ship, accounting for 33%.

Therefore, along with the growing up of the shipping industry, it is necessary to step by step invest in the development of the system of receiving and treating of all kinds wastes from ships to ensure the sustainable development.

4.6. Assess the viability of legal documents relating to the port reception facilities

Parallel with assessing the capacity of the current system of receiving and treating waste from the ships in various Vietnam seaports, it is necessary to review the current legal framework and regulatory system in place in Vietnam to ascertain the ability of adapting and level of support of the current legal framework to port reception facilities in order to propose amendment and supplement for the implementation this system.

4.6.1. Annex I

Content of Annex	Content of regulation in Vietnam	Comment
Regulation 38: Reception facilities **A. Reception facilities outside special areas** 1. The Government of each Party to the present Convention undertakes to ensure the provision at oil loading terminals, repair ports, and in other ports in which ships have oily residues to discharge, of	Currently, some ports in Vietnam have facilities equipped to receive and treat residues and oil mixtures. However, the capacity of these systems is still not able to meet the requirements of the Annex.	It is necessary to develop more policy and support finance to encourage private enterprises to participate in the implementation.

facilities for the reception of such residues and oily mixtures as remain from oil tankers and other ships adequate to meet the needs of the ships using them without causing undue delay to ships.	Ports in these areas already have port reception facilities, but there is still a lack of centers to treat the waste after being received.	
2. Reception facilities in accordance with paragraph 1 of this regulation shall be provided in: 1 all ports and terminals in which crude oil is loaded into oil tankers where such tankers have immediately prior to arrival completed a ballast voyage of not more than 72 hours or not more than 1,200 nautical miles; 2 all ports and terminals in which oil other than crude oil in bulk is loaded at an average quantity of more than 1,000 tonnes per day; 3 all ports having ship repair yards or tank cleaning facilities; 4 all ports and terminals which handle ships provided with the sludge tank(s) required by regulation 12 of this Annex; 5 all ports in respect of oily bilge waters and other residues that cannot be discharged in accordance with regulations 15 and 34 of this Annex; and	Article 4 of Circular No.50/2012/TT-BGTVT. Requirements for seaports and domestic ports: 1. all ports and terminals in which crude oil is loaded into oil tankers where such tankers have immediately prior to arrival completed a ballast voyage of not more than 72 hours or not more than 1,200 nautical miles; 2. all ports and terminals in which oil other than crude oil in bulk is loaded at an average quantity of more than 1,000 tonnes per day; 3. all ports having ship repair yards or tank cleaning facilities; 4. all ports and terminals which handle ships provided with the sludge tank(s) required by regulation 12 of this Annex; 5. all ports in respect of oily bilge waters and other residues that cannot be discharged in accordance with regulations 15 and 34 of this Annex; and	This requirement has been provided for in Article 4 of Circular No.50/2012/TT-BGTVT dated 19 December 2012 of the Ministry of Transport regulating the management of the receiving and treating residues and oily mixtures from ships at the seaports in Vietnam. However, Vietnam's ports have not invested in the construction of reception facilities in accordance with regulations.

6 all loading ports for bulk cargoes in respect of oil residues from combination carriers which cannot be discharged in accordance with regulation 34 of this Annex.	6. all loading ports for bulk cargoes in respect of oil residues from combination carriers which cannot be discharged in accordance with regulation 34 of this Annex.	
3. The capacity for the reception facilities		
B. Reception facilities within special areas	At present, Vietnam has not yet announced the special area.	

4.6.2. Annex IV

Regulation 12: Reception facilities 1. The Government of each Party to the Convention, which requires ships operating in waters under its jurisdiction and visiting ships while in its waters to comply with the requirements of regulation 11.1, undertakes to ensure the provision of facilities at ports and terminals of the reception of sewage, without causing delay to ships, adequate to meet the needs of the ships using them.	Some ports have been equipped means of receiving and facilities of treating, but their capacity has not yet met the requirement of the Annex.	Vietnam needs to supplement regulations regarding reception facilities of sewage from ships
2. The Government of each Party shall notify the Organization for transmission to the Contracting Governments concerned of all cases where the facilities provided under this Regulation are alleged to be inadequate.	Currently, Vietnam has not yet implemented and there is no regulation on the notification to IMO of the information of reception facilities.	This regulation should be issued.

4.6.3. Annex V

Regulation 7: Reception Facilities 1. The Government of each Party to the Convention undertakes to ensure the provision of facilities at ports and terminals for the reception of garbage, without causing undue delay to ships, and according to the needs of the ships using them.	Article 78 of Decree 21/2012/ND-CP on the management of seaports and navigable channels of the Prime Minister of Vietnam dated 21 March 2012 regulating ships operating in port must dispose of garbage in accordance with the regulations and instructions of the port authority or the port enterprise. The organizations providing sanitation services at ports must arrange means to receive garbage and sewage from ships and collect service charges in accordance with the tariffs already issued.	Compliance with the Annex
2. The Government of each Party shall notify the Organization for transmission to the Parties concerned of all cases where the facilities provided under this Reg. are alleged to be inadequate.	Currently, Vietnam has not yet implemented and there is no regulation on the notification to IMO of the information of reception facilities.	This regulation should be issued.

CHAPTER 5: PROPOSED MASTER PLAN OF PORT RECEPTION FACILITIES

5.1. Foundation of the Plan

The statistics and forecasts show that most of the groups of ports have not yet met the requirement of reception and treatment of waste from the ship at present and in the future, only a few groups have developed the system to handle the increased demand for waste disposal such as group 2, group 3 and group 5.

Vietnam is an official member of Annex III, IV, V, VI of the MARPOL Convention from 19 March 2015, so Port Authorities need to develop an adequate legal framework to ensure compliance with the Annexes of foreign vessels when they arrive ports in Vietnam. Moreover, with the increasing speed of economic development, the number of vessels including Vietnamese and foreign ships arrivals in Vietnam's ports has increased, leading to the high risk of environmental pollution in Vietnam's Seaport waters. This will lead to some difficulties for port authorities as well as seaport enterprises in managing the waste of ships in the port.

Foreseeing these changes in the future, on June 6, 2011, the Prime Minister issued Decision No. 855/QD-TTg approving a project on environmental pollution control in transport activities. Accordingly, the specific goals of the period 2011-2015 are to have at least 30% of international seaports equipped with facilities for collection and treatment of ship-generated waste. In the period 2016-2020 and orientation toward 2030, 70% of international seaports and 50% internal terminal will be equipped with port waste reception facilities. Based on the above-mentioned goals, Vietnam should create a step by step plan to develop port reception facilities in general and enhanced monitor the activities of Seaport enterprises in receiving and treating waste from ships in particular.

Planning for the system of receiving and treating waste from ships should achieve the following objectives:

- Assess the capacity of the port reception facilities associated with the Plan of developing Vietnam’s seaport system;

- Propose solutions for the management of receiving and treating waste from ships in Vietnam's seaport in accordance with the provisions of the MARPOL Convention and Vietnam legal documents;
- Develop and complete a system of legal documents relating to the port reception facilities in compliance with the provisions of the MARPOL Convention; and
- Ensuring conditions for environmental protection as well as sustainable development.

5.2. Content of the Plan

5.2.1. Propose plan options

By actual condition and circumstance, each port may choose one or more forms that are suitable for receiving and treating ship-generated waste in order to meet the requirements of the MARPOL Convention and Vietnam legal document.

Form 01: The port has general responsibility for reception and treatment. The receiving, transporting and treating will be handled by the companies.

At present, this form is being applied in most ports in Vietnam. It is suitable for ports that are not equipped with port reception facilities but the surrounding area has companies that have been licensed to collect and treat waste from ships. In addition, due to the cooperation with the companies, the port can mobilize capital from socialization.

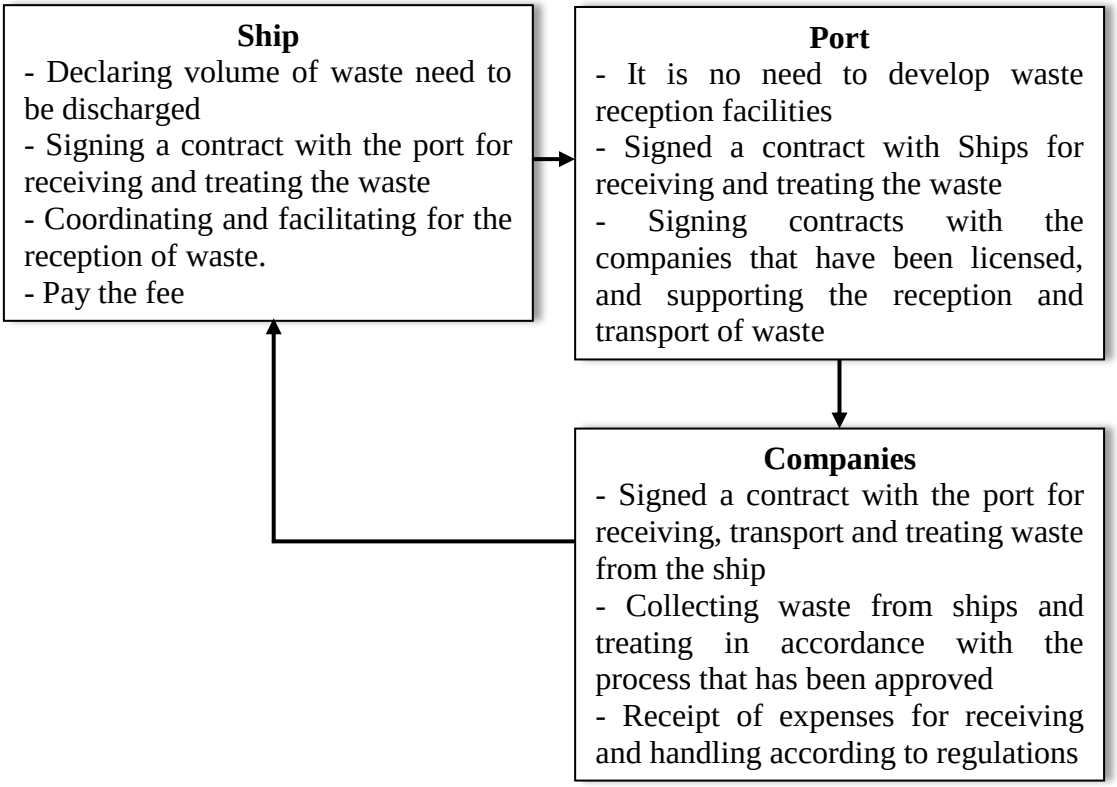


Figure 9: Responsibilities of the Port, Ship owner and the Company in receiving and treating waste from vessel in form 01

Form 02: The ports receive waste from ships. The transport and treating will be handled by the companies.

Form 02 will be appropriate for ports that have facilities for reception and collection, or enough funds to invest in these facilities, the surrounding area has companies that have been licensed to collect and treat waste from ships. Similar to the Form 01, with the cooperation with the companies, the port can mobilize capital from socialization.

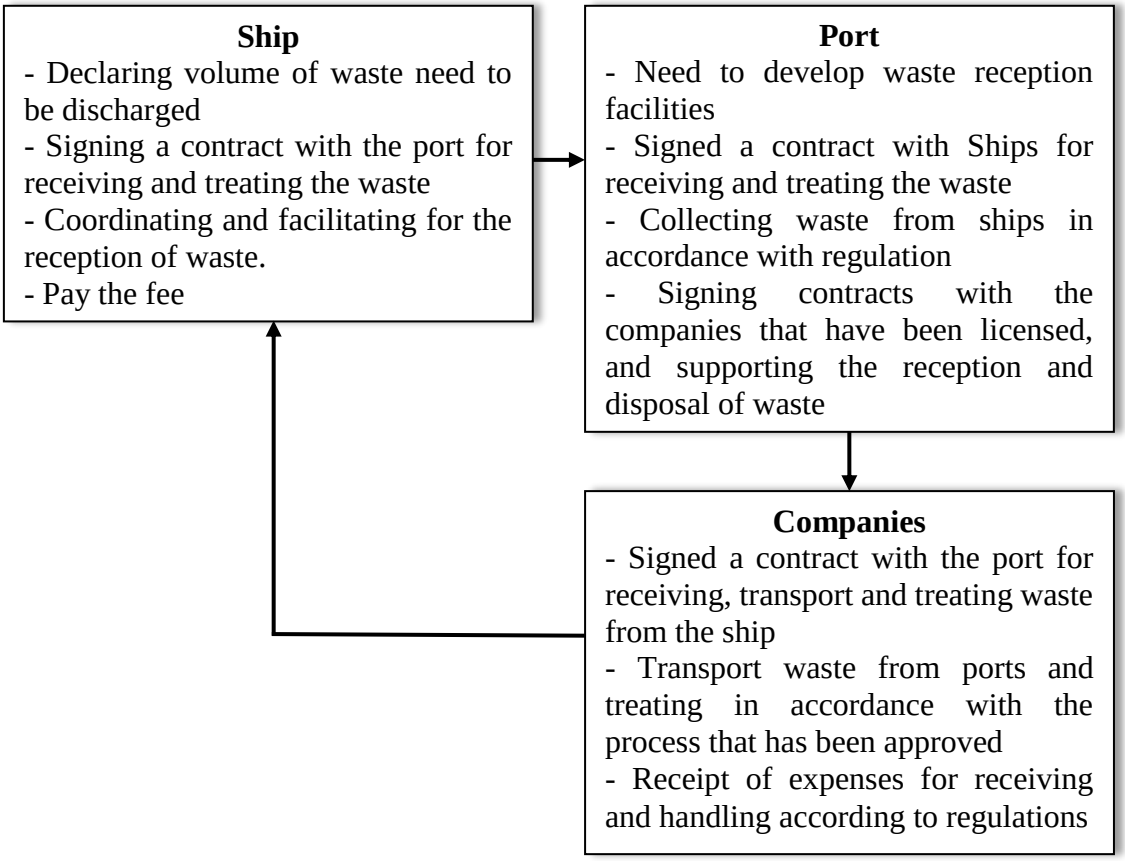


Figure 10: Responsibilities of the Port, Ship owner and the Company in receiving and treating waste from vessel in form 02

Form 03: Ports equipped port reception facilities and build waste treatment center within the port.

This is the complete form and will be oriented in the future. However, on the financial aspect, the invested capital for building waste treatment center and operating costs are very expensive. This is an issue for ports to consider before deciding to invest or soliciting for social capital from the outside. This form is suitable for ports that have enough land for construction of waste treatment center and already equipped reception facilities.

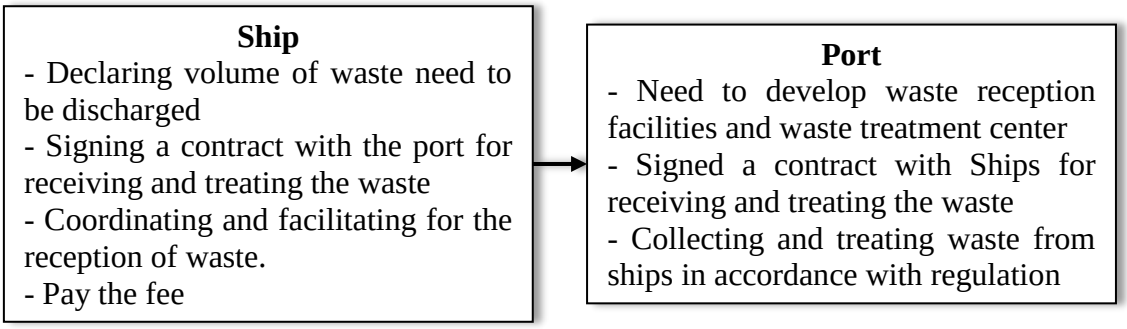


Figure 11: Responsibilities of the Port and Ship owner in receiving and treating waste in form 03

5.2.2. Proposed procedures for receiving, storing, transporting and treating waste from ships

The procedures can be divided into three stages including collection (storage if necessary), transportation and treatment. Depending on each Plan option, there will have appropriate methods for each stage.

5.2.2.1. Oil collection and treatment process

Management of the collection and treatment of liquid waste containing oil from vessels must comply with the provisions of Circular 50/BGTVT and Article 13 of Annex 1 of the MARPOL Convention.

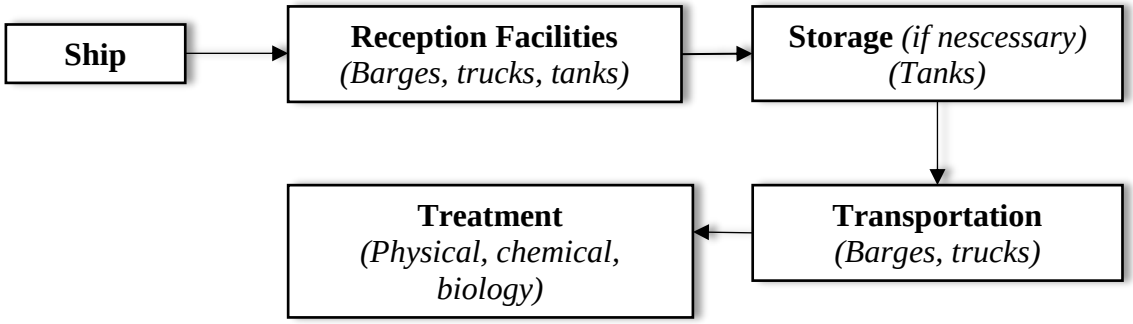


Figure 12: The process of receiving, storing, transporting and treating residues and oil mixtures from ships

For residues and oil mixtures, after being separated, oil will be passed through the detention tank. The waste oil will be processed at the waste oil treatment system. This treatment system follows the methods mentioned below:

- Physical: settling, filtration, separation and flotation.
- Chemical: oxidation.
- Physical and chemical: colloidal suspension
- Biological: using anaerobic bacteria, nitrogen in batch form and activated sludge.

5.2.2.2. Sewage collection and treatment process

Sewage from ships is mainly processed on board and discharged directly on the journey, only about 25% need to be discharged at the port. Ports or companies outside the port are responsible for collecting this sewage, then transporting it to the treatment center.

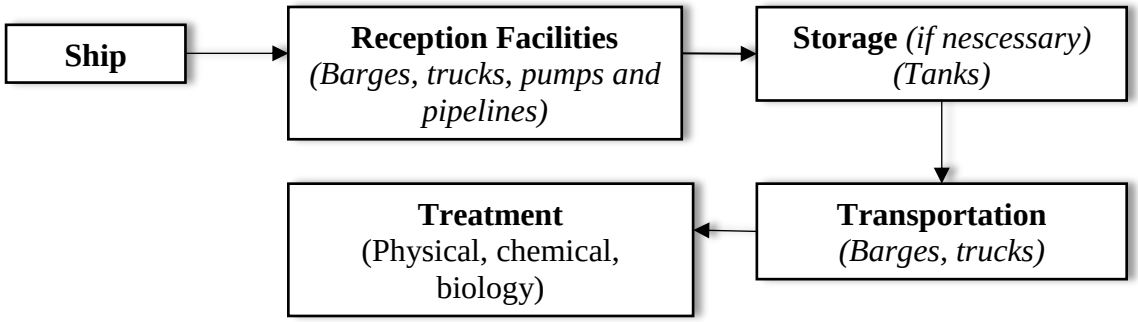


Figure 13: The process of receiving, storing, transporting and treating garbage from ships

Sewage treatment technology

Sewage that has not been treated may contain such water, solids, nutrients, oils and greases, pathogens, toxic chemicals and heavy metals. Sewage treatment is the process of treating contaminants, microorganisms and other types of pollutants before returning them to the environment or reusable sources. Selection of methods for treating sewage is usually based on the characteristics of the contaminants in sewage. The methods that are commonly used in sewage treatment are: physical, chemical and biological.

Physical

Physical treatment method include isolating and removing insoluble substances and colloidal substances from the sewage. For these methods, sewage will be passed through the following equipment: trash rack, strainer, stabilize tank and sedimentation tank to separate the suspended sediment.

Chemical

Chemical methods used in sewage treatment systems including neutralization, reduction/oxidation reaction, deposition or decomposition of toxic compounds. The basis of this method is the chemical reaction that takes place between the pollutants and the additives. The advantage of this method is that it is highly efficient, often used in closed water treatment systems. However, chemical methods have the disadvantage that operating costs are expensive.

Biological

The essence of biological methods of sewage treatment is to use the viability and activity of beneficial microorganisms to disintegrate organic matter and pollutant components in sewage. Bioprocessing processes include major stages: aerobic, anoxic anaerobic, anaerobic, combine anoxic-anaerobic anaerobic.

5.2.2.3. Garbage collection and treatment process

With garbage, the reception and collection at the port will be handled by the port or the environment companies. Then the waste will be transported to the treatment centers for treating. Due to the particularity of garbage, garbage treatment centers need to have a wide area to allocate garbage. So garbage treatment centers cannot be located within the port.

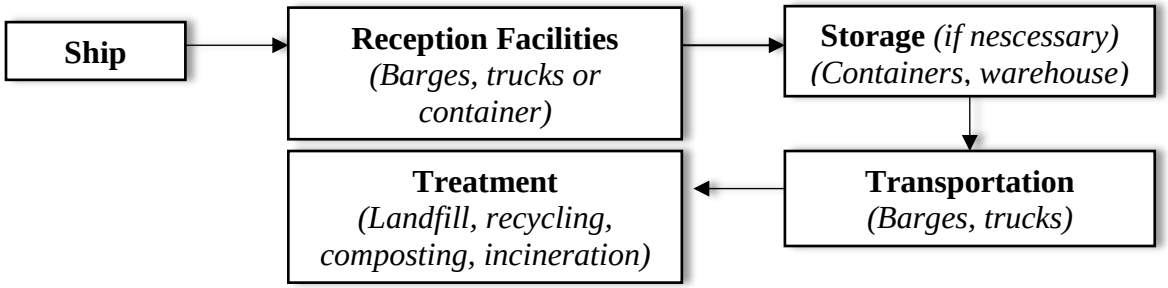


Figure 14: The process of receiving, storing, transporting and treating garbage from ships

Garbage treatment technology

Vietnam is currently using garbage treatment technologies as follows: landfill, composting, incineration and recycling.

Landfill

The use of a landfill is the most common method for the disposal of garbage, without treatment. This method is used for solid waste that contains non-recyclable components or components that are subsequently classified or cannot be decomposed in organic fertilizers such as ash left after garbage is burned. The landfill is an area or a land that is chosen to bury waste to minimize negative impacts of the landfill on the environment. Landfill sites include waste burial sites, buffer zones and other auxiliary buildings such as waste water and gas treatment units, power supply stations and operating offices.

Composting

This method is being implemented in some localities. This treatment method does not cause odor and pathogenic microorganisms. Substances will convert the organic matter in the waste into a stable form, then degrade the microbial activity and recover nutrients to make the fertilizer. The method of using waste for composting has the advantage of reducing the amount of organic waste that needs to be buried, providing fertilizer for agriculture.

Incineration

This method is used in many places to treat solid waste. This method brings advantages such as thorough treatment of hazardous substances in garbage, not much space and time as landfill and especially a method of recovering energy for electricity or heating. However, it has the disadvantages of causing air pollution.

Recycling

Types of solid waste can be reused such as glass, copper, aluminum, iron, paper, etc. will be collected and classified. The recovery of solid waste contributes significantly

to reducing the amount of waste treated and utilizing input material for production processes.

5.2.3. Proposed waste fee

5.2.3.1. Methods of calculating waste fee at some ports around the world

In the world today when ships enter the port and want to dispose of the waste, they must pay a certain fee. According to statistics from a number of ports in Europe, there are two common charging options for this charge:

- Option 1: Charges are calculated on the tonnage of the ship
- Option 2: Charges are calculated on the demand of discharge

The port of Hamburg

All ships entering the port will be charged a mandatory environmental fee to the Port Authority and this fee is assessed in accordance with the gross tonnage of the ship. Part of this fee is used to reimburse the actual cost of collecting and treating the ship's waste for the collectors. When the vessel pays a mandatory fee as stated above, the vessel will be discharged free a volume of oil waste. The fees and volume are specified in the table below:

Table 9: Fees and maximum volumes of waste disposed of in the Port of Hamburg

Size of ship (GT)	Factor for oil disposal	Max. volume of disposal (M3)	Fixed amount for ship disposal waste (EUR)
Up to 1.500	0.02 EUR/GT However, the minimum fee must pay is 28 euros and maximum is no more than 770 euros	4	70
1.501- 3.500		6	70
3.501- 6.000		10	100
6.001- 10.000		16	200
Over 10.001		30	200

Source: Port of Hamburg

The Port of Rotterdam

All ships entering the port will be charged a mandatory environmental fee to the Port Authority and the fee will be based on the gross tonnage of the ship. Part of this fee is used to reimburse the collector based on a fixed amount which every waste collector receives per disposal and a variable amount of waste disposed. The fees and reimbursements are specified in the table below:

Table 10: Fee for ship-generated waste and reimbursements for collectors in the Port of Rotterdam

Annex	Fee	Reimbursements
Annex I	Fixed amount 200 EUR Plus 0.02 EURO/GT	200 EUR plus 25 EUR per Collected M3
Annex IV		
Annex V		200 EUR plus 25 EUR per Collected M3 plus 50 EUR (small dangerous waste)

Source: Port of Rotterdam

The Port of Antwerp

All vessels entering the port have to pay the Port Authority a waste fee irrespective of whether ship waste is in fact disposed of while in port. The fee is determined based on the capacity of the vessel, as shown in the table below:

Table 11: Waste fee based on type and size of vessel in the Port of Antwerp

Vessel Type/GT	<5.000	5.000-9.999	10.000-14.999	15.000-19.999	20.000-24.999	25.000-30.000	>30.000
Bulk	65	130	130	130	130	130	195
Container	65	130	130	195	195	260	390
Cargo	65	130	130	130	195	195	195
Reefer	65	130	130	130	195	195	195
Gas	65	130	130	130	130	260	260
Obo	65	130	130	130	130	130	325
Roro	65	130	130	130	195	260	260
Vehca	65	130	130	130	130	130	130
Tank	65	130	130	130	195	195	195
Other	65	130	130	195	195	260	325

Source: Port of Antwerp

5.2.3.2. Proposed options to collect waste fees in Vietnam

Regarding the collection and treatment of waste from ships, the port authorities should determine a fee that will contribute to the budget for the maintenance of the collection facilities as well as lend support to the funds for activities of conservation and environmental protection in the seaport areasand Vietnam in general.

Basic principle for calculate the fees:

- The fees for receiving and treating wastes from seagoing vessels at Vietnamese seaports are built on the basis of the costs for receiving and treating wastes from the seagoing vessel plus normal profits in accordance with standards and norms of the Vietnam Government;
- The fees is calculated based on the volume of waste, the tonnage of the vessel and the distance from this vessel to the waste treatment center;
- Referring and comparing with the tariff of collection and treatment waste of some seaports in the world and considering the current socio economic conditions in Vietnam; and
- The fees must cover the costs of operating and ability to recover the investment capital of the investor.

Options for calculating the fees:

Table 12: Comparison of proposals for the collection waste fee from ships

Option	Option 1	Option 2
Content	Collecting the fee based on actual volume of waste to be discharged	Waste fee include a fixed fee and a variable fee - Fixed fee are collected by the government from each ship enter the port. This fee is used for management environment in seaport waters, investing and upgrading of reception facilities. This fee partially reimburses the costs of collection, transportation, and treatment of waste. Ships no need to pay a charge for the volume of waste which is regulated by port authority. - Variable fee is charged based on the volume of waste that exceeds the regulations and it is collected from each ship by companies that have responsibility of collecting, transporting and treating waste from that ship.
Advantage	Reduced costs for ship owners	- This option ensures the operation of companies, reduces the burden on the government budget and actively recovers investment capital.

		- Managing the collection of costs will be an opportunity for seaports to develop synchronized manner and protect the marine environment around the port.
Disadvantage	Exploiting the weakness in the management, some companies can collect oil waste from seagoing vessels free of charge. Oil waste collected is recycled and traded on the market with other types of gasoline. These illegal activities cause disorder in the seaports, affecting the quality of gasoline in the market as well as the local socio economic activities.	- This option ensures the operation of companies, reduces the burden on the government budget and actively recovers investment capital. - Managing the collection of costs will be an opportunity for seaports to develop synchronized manner and protect the marine environment around the port.

5.2.4. Proposed solutions for management.

According to the laws of Vietnam, the Government has the responsibility for unified management of the state in the field of environment, including the marine environment. The Ministry of Natural Resources and Environment carries out the State management function on environment in Vietnam as assigned by the Government. In addition, the People's Committees at all levels have also the responsibility to participate in state management on environment and natural resources. The ministries, including the Ministry of Transport, in accordance with their functions, duties and powers, coordinate with the Ministry of Natural Resources and Environment in the management of using resource and protect environmental. The People's Committees

of provinces and cities carries out the function of State management of environment in the local (MONRE, 2014). It can be said that there are many Vietnamese agencies and organizations participating in state management on the environment, however, sometimes their tasks have been overlapped.

The above problem points out the essential of management solutions to effectively implement regulations on prevention of environmental pollution in general and port reception facilities in particular.

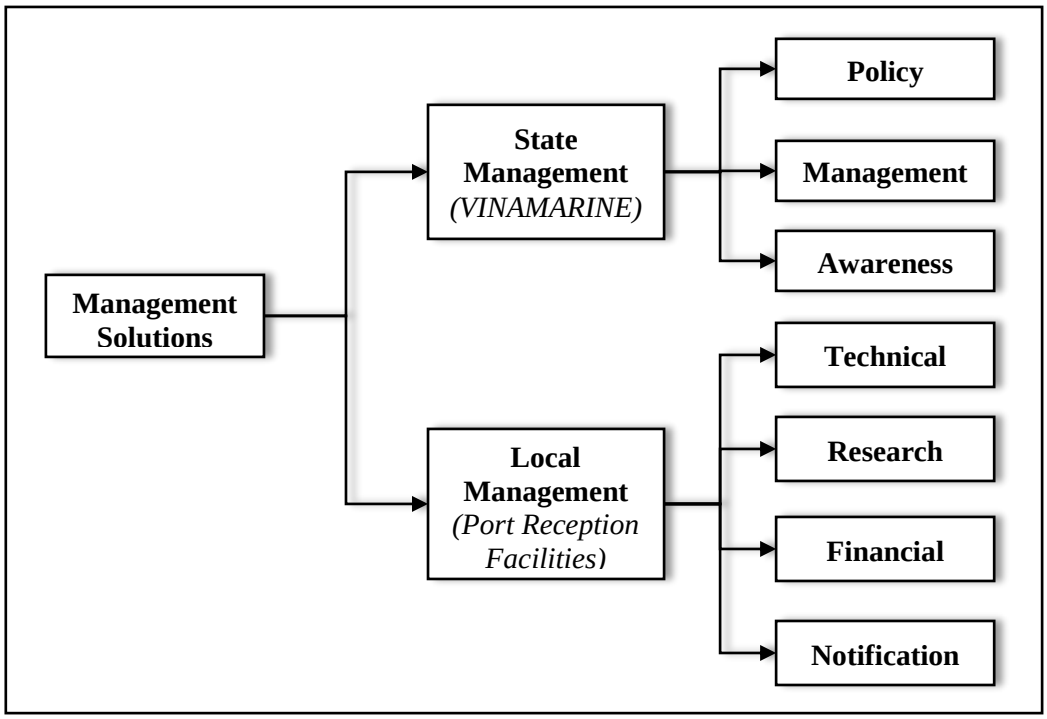


Figure 15: Proposed solutions for management

5.2.4.1. Solution on policy

According to assessment of the viability of legal documents relating to the port reception facilities in Vietnam seaport, work discussed below should be performed in order to ensure Vietnam meet the requirement of regulations Annexes I, IV, and V on port reception facilities.

- Promoting regulations on the notification to IMO of the information of port reception facilities.

- Supplementing regulations regarding reception facilities of sewage from ships

- Formulating a policy to encourage private enterprises to participate in the investment system of receiving and treating ship-generated waste.

5.2.4.2. Solution on management

- Promoting activities to include inspecting and examining the observance of regulations of vessel on environmental protection. Especially the activities related to the supply of oil, fuel to the ship

- Enhancing the coordination between Port State Control and Environmental Inspector in order to detect, prevent and handle acts of polluting the environment such as disposing solid waste or pumping liquid with oil into the water around the seaport.

- Coordinating among Central and Local authorities to guide, inspect and handle individuals and organizations involved in receiving and treating waste from ships at seaports to ensure they meet the regulations of the Circular No.12/2011/TT-BTNMT dated April 14, 2011 of the Ministry of Natural Resources and Environment on hazardous waste management.

- Sharing environmental information in maritime activities from ministries, sectors, agencies, local authorities to company, and enterprise operating in the maritime field in order to all of them can take an overview of the status situation of the environment in their area.

5.2.4.3. Solution on enhancing awareness

- Dissemination and thorough understanding of the resolution, guidelines and policies of the Government on the program of improving the implementation of environmental protection to agencies, companies, officials, workers in maritime industry through meeting, seminars.

- Publishing and distributing information about seaports including services, pilotage, safety as well as port reception facilities. Using regulations on environmental protection as a tool to propagate and integrate contents of maintaining environmentally into the development planning of ports.

- Training on environmental management skills for managers, officials in the maritime industry such as port enterprises, shipyards, shipping companies.

5.2.4.4. Solution on technical

- Assessment, design and construction specialized transshipment areas for oil tankers and dangerous cargo ships in each seaport to ensure the requirements on maritime safety, prevent fire, explosion and protect the environment.

- It is required that all ports, including existing and new ports, must be equipped with the port reception facilities in accordance with the regulations on port reception facilities in Annexes I, IV, and V of the MARPOL Convention.

- Applying advanced technologies in the process of investing and acquiring equipment for collection, transportation and treatment of waste from ships.

- Surveying and assessing the current status of the environment in maritime activities, giving reports about the situation of factors affecting the environment in the seaports. Developing and implementing plans to overcome pollution and environmental incidents at Vietnamese seaports.

5.2.4.5. Solution on research

- To study the construction of the port reception facilities, waste treatment centers and publicize the process of collecting, transporting and treating wastes in maritime activities.

- Implementing energy saving programs designed to reduce emission, encourage recycling and reuse of waste.

5.2.4.6. Solution on financial

- Legal documents on support and investment incentives for the system of receiving and treating waste from ships, creating favorable conditions to attract investment from society.

- Legal documents on the price of receiving and treating waste from the ship in the direction of reducing the government budget, attracting investment from the society.

- Legal documents on the sanctioning of administrative violations of dishonest acts of ship owners when declaring the amount of waste and acts of collecting wastes beyond the permitted areas of the port authority.

5.2.4.7. Solution on notification

- Providing the list of companies or units in seaports that directly receive and process waste from seagoing vessels at sea ports and fee for this service in the public information including areas and website of the Seaport.

- Conversely, vessels entering seaports must declare the type and total amount of wastes present on the vessel and this declaration shall be made concurrently with the process of carrying out procedures for vessels entering seaports.

CHAPTER 6: CONCLUSION

6.1. Introduction

With the development of the international maritime transport sector fueling global economic growth, the number of vessels entering the seaports of Vietnam is also increasing. As a result, there is an increase in the amount of ship generated waste required to be discharged at port reception facilities. If appropriate measures are not taken to create adequate facilities to properly dispose of waste, this situation shall lead to the high risk of environmental pollution in Vietnam's Seaport waters. Vietnam has not completed the legal framework to fully implement port reception facilities to meet the regulations of MARPOL Convention for ships desiring to dispose of wastes and residues. A majority of ports are not equipped with adequate reception facility equipment for treating of waste, especially sewage. A proposal for an adequate facility for the reception of ship-generated waste as well as a legal framework for ensuring requirements of the MARPOL Convention on port reception facilities is put forward in this dissertation.

This dissertation set out to assess the current status of the port reception facilities in Vietnam seaports and provide a proposal for the implementation of port reception facilities in the ports of Vietnam. A port reception facility in Vietnam is anything that can receive ship-generated waste/residue including oil and oil mixtures, sewage, garbage. To achieve these aims, the dissertation focused on the following key issues:

- Assessment of the current ability to meet the MARPOL's requirements on port reception facilities in terms of technology and policy.
- Forecast of the amount of ship-generated waste in 2020 and 2030 as well as the current planning for the port reception facilities.
- Proposed plan options for the system of receiving and treating waste from the ship.
- Proposed management solutions to support the implementation of the plan.

6.2. Hypothesis

The hypothesis of this dissertation - the adaptability of the port reception facilities in Vietnam by 2020 and 2030 has been formulated from the following research questions:

- How much ship-generated waste will be discharged in Vietnam by 2020 and 2030?
- What are the existing regulations of in Vietnam relevant to this issue?
- What is the current capacity of Vietnam seaports in collecting and treating waste from ships?

The solution provided for answering the above questions is to carry out a quantitative data analysis. Specifically, with regard to the first question, the solution is to use an estimation method to forecast amount of waste. The solution for the next question is to compare the regulations of MARPOL Convention with the provisions of Vietnamese law relating to the port reception facilities. The solution for the last question is to synthesize data concerning port reception facilities in Vietnam from the annual reports of Port Authorities.

In the next steps, the data obtained from the quantitative analysis on each of hypothetical questions is further examined with a qualitative analysis methodology. Particularly, the variable from questions 1 and 3 will be compared and evaluated to determine the level of technical adaptability; the variable from question 2 is compared and assessed to determine the level of regulatory adaptability. The results of these two experiments above will lead to the initial hypothesis - the adaptability of the port reception facilities in Vietnam by 2020 and 2030. This has shown that the analysis of relevant data as outlined in the methodology section, supports the anticipated outcome and backs up the stated hypothesis.

6.3. Analysis

This study assessed the current status of the port reception facilities in Vietnam. The study is based on primary data that was compiled by VINAMARINE by mean of synthesis from the annuals report from 2013 to 2017 of Port Authorities. Besides the

primary data, secondary data was gathered from publicly available data, literature review, and waste planning procedures of ports around the world. The classification of primary and secondary data is based on the reliability and validity of the data. Next, the data was analyzed; the process of analyzing this data is divided into three steps.

The first step was data collection and preparation. Data was identified based on the relationship between the data and the research questions/hypothesis. The next step was an exploration of data. In this step, the data was divided into two groups including qualitative data (regulations) and quantitative data (amount of ship-generated waste, ship calls, cargo, passengers). The final step was analysis of the available data. The qualitative analysis was used to compare and evaluate the correlation among the current capacity of port reception facilities and amount of waste by 2020 and 2030, and the change in the amount of waste by 2020 and 2030. Similarly, the qualitative analysis is used to compare and assess the relevant Regulations 38, 12, and 7 of Annex I, IV, V of MARPOL Convention and legal documents to which Vietnam regulates relating to port reception facilities. Besides, a SWOT analysis was used to evaluate internal strengths and weaknesses of the current situation of port reception facilities.

6.4. Findings

According to the analysis, it was found that:

- The amount of ship-generated waste by 2020 and 2030 will increase significantly, so the environmental management at the Seaport requires timely attention. Seaports should have specific guidelines on the implementation of measures to protect the environment at seaports such as planning to reduce waste from port operations and planning for constructing port reception facilities.
- The adaptability to meet the MARPOL's requirements on port reception facilities in terms of technology and policy by 2020 and 2030 is insufficient. The data analysis shows that if Vietnam does not upgrade existing port reception facilities, Vietnam will not be able to meet the demand of discharge waste of ships by 2020 and 2030. By comparison and assessment of the legal documents, Vietnam needs to promulgate regulations on the controlling and monitoring of waste from ships, and

provide a waste tariff for organizations and individuals involved in the collection, reception, and treatment of waste from ships at seaports.

- Proposed plan options for the system of receiving and treating waste from the ship. The plan should provide technical solutions including forms for receiving and treating ship-generated waste; procedures for receiving, storing, transporting and treating oil waste, sewage, and garbage; methods of calculating waste fee. Each solution has its advantages as well as disadvantages, so it would be careful analysis when choosing the solution.
- Proposed management solutions to support the implementation of the plan. In order to synchronously implement the above solutions, measures to strengthen the state management should be implemented. This study has provided management solutions for improving the legal framework to effectively manage ship-generated waste in maritime activities, with particular emphasis on the role of state management.

In general, the result of the findings shown that the amount of ship-generated waste discharged in Vietnam will increase by 2020 and 2030 and the current capability of port reception facilities will not be able to meet the demand of discharge waste of ships in that time. It clearly argues for several technical and management solutions that should be undertaken by Vietnam Government in order to ensure the prevention of pollution caused ship-generated waste at seaports as well as requirements of the MARPOL Convention on port reception facilities.

6.5. Limitations

Besides the findings, the study has encountered some limitations that have been formed from the planning of this study to assess the analyzed data as follows:

First is time. Time is not sufficient, so the study only analyzes and assesses the port reception facilities on the technical and legal aspects. Other areas such as economic and environmental benefits have not been evaluated given the time constraints. When evaluating these areas, proposals on the roadmap and finance have not yet provided.

Second is scope of the study. The study assessed Annexes I, IV, and V; Annexes II and VI have not yet been assessed. Meanwhile, Vietnam has 120 shipyards with the

capacity of building and repairing ships with a tonnage of over 1,000 tons. Ozone depleting substances and exhaust gas cleaning from these factories can lead to the potential risks of environmental pollution surrounding areas.

Third is research methodology. The study conducted an analysis and assessment of the port reception system on six group ports instead of 44 seaports. This does not affect the results of the study but it will be a limitation for the proposal on implementation the port reception facilities at specific ports in Vietnam.

Final is reliability of data. Besides the primary data collected from Vietnam Maritime Administration, the study used secondary data from the publicly available data for estimating the amount of waste at Vietnam seaports. This can be overcome in further studies using the methodology of directly surveying stakeholders concerning the using port reception facilities in Vietnam seaports.

6.6. Further studies

During the course of this study, several issues for further research have been discovered as follow:

Proposed funding for the implementation of the proposal.

The initial capital for investing and operating the reception facilities and treatment center is one of the barriers to the implementation of the proposal. Hence, in order to the proposal can be implemented, financial solutions are indispensable.

Proposed roadmap for the implementation of the proposal.

Establishing port reception facilities is essential. However, the cost of construction is not small. Therefore, there should be a roadmap for implementation to ensure the reasonable distribution of investment capital and meet the requirements of the MARPOL Convention.

The proposal for deploying the port reception facilities at specific ports in Vietnam.

After completing the Master Plan of Port Reception Facilities, it is necessary continues to propose the deployment of the port reception facilities at some specific ports to

evaluate the effectiveness of the current proposal and prepare for deploying to all of the ports in Vietnam.

Study on the implementation of the port reception facilities regulations of MARPOL's Annexes II and VI in Vietnam.

In order to meet the requirements of the MARPOL Convention on Port Reception Facilities, it is necessary to have a study on assessing the compliance of Vietnam's seaports with requirements of Annex II and VI of MARPOL Convention. This study will undertake the assessment the system of receiving and treating ship-generated waste at Vietnam seaport and propose solutions for implement this system. Moreover, the result of this study will contribute to the National Plan for the IMO Member State Audit Scheme program which came into force in 2016.

6.7. Conclusion

This dissertation provides the proposal of implementing the requirements of the Annexes of the MARPOL Convention. Specifically, in order to ensure that the requirements of the MARPOL Convention on port reception facilities are correctly implemented, Vietnam should develop guidelines on technical and legal solutions so that ports can implement the process of receiving and treating ship-generated waste in a step by step manner.

List of References

6, P., & Bellamy, C. (2012). Principles of Methodology: Research Design in Social Science. Retrieved November 19, 2016.

An, N. (2016). Prevention of pollution caused by the ship. Retrieved June 29, 2017, from http://kinhtevadubao.vn/chi-tiet/221-5890-ngan-ngua-o-nhiem-do-tau-bien-gay-ra.html

APA (Antwerp Port Authority). (2010). Waste handling procedure 2010–2012. Waste Management, 18(1), 73. doi:10.1016/s0956-053x(98)90617-1.

Ball, I. (1999). Port reception facilities for chemicals. Port Waste Reception Facilities in UK Ports, 260. doi:10.1016/0025-326x(87)90478-4.

Cao, T. N. (2015). Situation Investment and Development of Vietnam seaport. Retrieved November 15, 2016, from http://interserco.com.vn/thuc-trang-dau-tu-phat-trien-cang-bien-viet-nam/

Delft. (2017, January). The Management of Ship Generated Waste On board Ships. Retrieved July 7, 2017, from http://www.emsa.europa.eu/emsa-documents/latest/download/4557/2925/23.html

Dong, H. V., & Tran, T. V. (2016). Development of Ship Industry in Vietnam. *2*(5). Retrieved July 4, 2017.

Giziakis, K., & Mahairas, A. (2008, September 1). Adequacy of Waste Reception Facilities in Greek Ports. Retrieved November 19, 2016, from http://www.sname.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=876d5d58-0f79-494c-9274-d20afe11a6aa.

Green4sea. (2016, May 24). Vietnam approves plan for MARPOL regulations. Retrieved from http://www.green4sea.com/vietnam-approves-plan-for-marpol-regulations/

IMO (International Maritime Organization). (2014). Summary of Status of Conventions. Multilateral Treaties Deposited with the Secretary-General Multilateral Treaties Deposited with the Secretary-general: Status as at 31 December 2006, 407-425. Retrieved November 15, 2016.

IMO (International Maritime Organization). (n.d.a). Introduction MARPOL Convention. Retrieved November 15, 2016, from http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-%28MARPOL%29.aspx

IMO (International Maritime Organzation). (2016, December 08). Port reception facilities: How to do it. Retrieved July 12, 2017.

IMO (International Maritime Organzation). (n.d.b). MARPOL73-78: Brief history - list of amendments to date and where to find them. Retrieved July 2, 2017, from http://www.imo.org/en/KnowledgeCentre/ReferencesAndArchives/HistoryofMARPOL/Documents/MARPOL%2073-78%20Brief%20History%20-%20List%20of%20amendments%20and%20how%20to%20find%20them.htm

ISM (The Littoral States of Indonesia, Malaysia and Singapore). (2013). Port reception facilities. Marine Pollution Bulletin, 18(6), 260. doi:10.1016/0025-326x(87)90478-4.

Lam, T. (2015). Linking develop seaport with environmental protection in Vietnam. Retrieved June 30, 2017, from http://www.daibieunhandan.vn/default.aspx?tabid=81&NewsId=358150

MEPC (Marine Environment Protection Committee). (2014). MEPC.1 / Circ.834 Consolidated guidance for port reception facility providers and users. Electronic Structure of Metal Phthalocyanines on Ag (100) Springer Theses, 115-140. doi:10.1007/978-3-319-026-2_6.

Michael, H., & Joseph, D. (2002). The Ocean Conservancy Cruise Control. Retrieved November 20, 2016.

Mikelis, N. (2012). 1 MARPOL requirements for port reception facilities Dr. Nikos Mikelis Head, Marine Pollution Prevention and Ship Recycling Section International Marit. Retrieved November 19, 2016, from http://slideplayer.com/slide/7858731/

Minh, T. (2016). Pollution in Haiphong port. Retrieved July 5, 2017, from http://www.thiennhien.net/2016/12/21/nuoc-cac-song-o-hai-phong-deu-co-dau-hieu-o-nhiem/

MONRE (Ministry of Natural Resources and Environment). (2014). Joint Circular No. 50/2014/ TTLT BTNMT-BNV - the responsibilities and organizational structure of MONRE in all provinces and centrally administered cities. Retrieved September 5, 2017, from https://thuvienphapluat.vn/van-ban/Bo-may-hanh-chinh/Thong-tu-lien-tich-50-2014-TTLT-BTNMT-BNV-huong-dan-nhiem-vu-quyen-han-to-chuc-So-Phong-Tai-nguyen-Moi-truong-256813.aspx

MOT (Ministry of Transport). (2009a, October 15). Approving the master plan on development of Vietnam's sea transport up to 2020, with orientations toward 2030. Retrieved July 3, 2017, from http://www.vpa.org.vn/english/regulations/1601-QD-TTg.pdf

MOT (Ministry of Transport). (2009b). Decision No.26/2009/QD-TTg defining the functions, tasks, powers and organizational structure of Vietnam Maritime Administration. Retrieved September 4, 2017, from http://www.vinamarine.gov.vn/DownLoad/Law/262009Q%C4%90-Tg.pdf

Pham, T. V. (2015). Vietnam Law on Marine Environment Protection and the Implementation of Marpol Convention 73/78. Retrieved November 15, 2016, from http://www.iiste.org/Journals/index.php/JLPG/article/viewFile/29007/29771

PRA (Port of Rotterdam Authority). (2016, October 21). Ships' waste from seagoing shipping. Retrieved November 16, 2016, from https://www.portofrotterdam.com/en/shipping/sea-shipping/ships%E2%80%99-waste-from-seagoing-shipping.

Quang, T. (2016, December 11). Facilitate the development of coastal transport. Retrieved July 3, 2017, from http://baotintuc.vn/kinh-te/tao-dieu-kien-phat-trien-tuyen-van-tai-ven-bien-20161212163045736.htm

Rugg, G., & Petre, M. (2007). A gentle guide to research methods. Retrieved November 20, 2016.

Rinkesh. (2017, January 16). Advantages and Disadvantages of Recycling. Retrieved August 4, 2017, from http://www.conserve-energy-future.com/advantages-and-disadvantages-of-recycling

Satir, T., Alkan, G., & Sarikaya, B. (2010). Waste Discharge Into the Marine Environment. A Ship's Waste Reception Facility for the Marine Environment. doi:10.1016/c2013-0-03416-0

Sowton, C. (2012). 50 steps to improving your academic writing.

T. D. (2017, March 19). Cargo through seaport increased slightly. Retrieved July 4, 2017, from http://thoibaotaichinhvietnam.vn/pages/kinh-doanh/2017-03-19/tong-san-luong-hang-hoa-thong-qua-cang-bien-tang-nhe-41663.aspx

Tran, H. T. (2015). The inadequacies of the Vietnamese fleet. Retrieved July 5, 2017, from http://interserco.com.vn/nhung-bat-cap-cua-doi-tau-bien-viet-nam/

Tran, M. (2013, June 3). The International Convention for the Prevention of Pollution from Ships (Công ước MARPOL 73/78). Retrieved November 15, 2016, from http://www.mt.gov.vn/moitruong/tin-tuc/1091/21973/cong-uoc-quoc-te-ve-ngan-ngua-o-nhiem-do-tau-gay-ra-1973--duoc-sua-doi-boi-nghi-dinh-thu-1978-(cong-uoc-marpol-73-78).aspx

TransportNew. (2011). Project on control of environmental pollution in transport. Retrieved July 1, 2017, from http://www.mt.gov.vn/mmoitruong/tin-tuc/993/21252/de-an-kiem-soat-o-nhiem-moi-truong-trong-hoat-dong-giao-thong-van-tai.aspx

TransportNew. (2016). Prevention of pollution from ships, waste arising from shipping. Retrieved July 1, 2017, from http://www.mt.gov.vn/moitruong/tin-tuc/1091/45994/ngan-ngua-o-nhiem-tu-tau-bien--chat-thai-phat-sinh-do-hang-hai.aspx

VINAMARINE (Vietnam Maritime Administration). (2016). Vietnam Maritime Administration-Maritime statictis. Retrieved November 14, 2016, from http://www.vinamarine.gov.vn/Index.aspx?page=reportshipdetail&id=44

VINAMARINE (Vietnam Maritime Administration). (n.d.a). Reception Equipment Waste from Ships in Ports. Retrieved November 14, 2016, from http://www.mt.gov.vn/DuThao/20150107083735_phu-luc-5--tong-hop-thiet-bi-tiep-nhan-chat-thai-tu-tau-tai-cac-cang.pdf

VINAMARINE (Vietnam Maritime Administration). (n.d.b). Departmant of Vietnam Maritime Administration. Retrieved September 4, 2017, from http://www.vinamarine.gov.vn/Index.aspx?page=about&tab=pbchh

VINAMARINE (Vietnam Maritime Administration). (2015). Ship breaking planning. Retrieved July 5, 2017, from http://www.vinamarine.gov.vn/DownLoad/plan/TM%20Bao%20cao%20dau%20ky%20-%20QH%20pha%20do%20tau.pdf

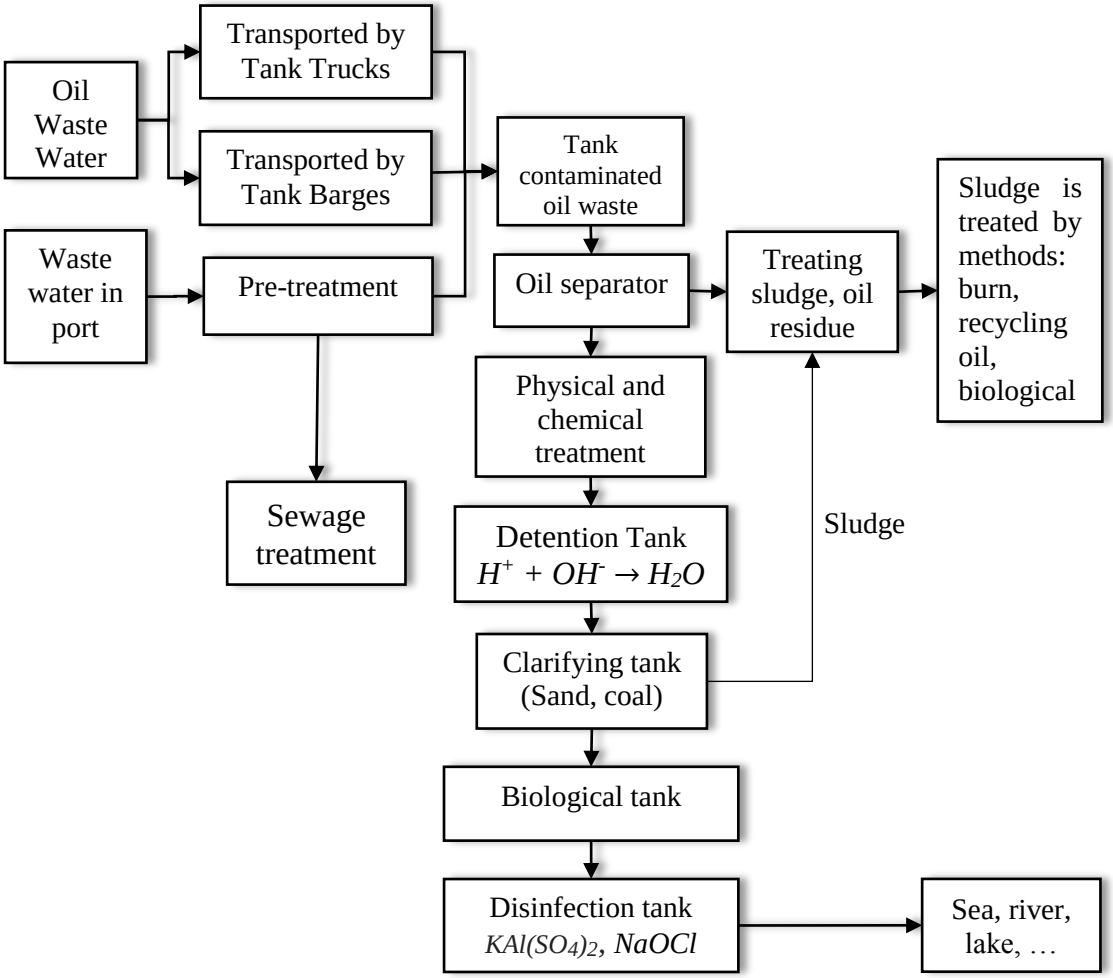
VNN (Vietnam New). (2016). Shipping sector still faces difficulties, although BDI increases. Retrieved July 4, 2017, from http://vietnamnews.vn/shipping-sector-still-faces-difficulties-although-bdi-increases/52

Wene, J. (2002). The Development of International Conventions Relating to Marine pollution. Retrieved July 17, 2017, from http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=1562944&fileOId=1566125

Whelan, S. (2016, April 25). Vietnam launches new bid to bring more private investment into its 19 seaports. Retrieved from https://theloadstar.co.uk/vietnam-launches-new-bid-to-bring-more-private-investment-into-its-19-seaports/

Van, H. (2016). Warning about marine pollution. Retrieved August 21, 2017, from http://dantri.com.vn/xa-hoi/bao-dong-do-ve-o-nhiem-moi-truong-bien-20160604094307966.htm

Appendix 1 **Example of process of treating oil wastewater in Quang Ninh Waste Treatment Center**



Description: *Ship-generated waste is transported and stored in oil wastewwater tank before being passed throung the oil separator tank. Due to oil's density being less than water's density, the oil is floating on the water, is removed from the water by the picking device, and sent to the treatment by burning, recycling, or biological. The remaining water is sent to the Physical and chemical treatment tank. At the Physical and chemical reactor tank, under the action of coagulants and polymers, the droplets settle into larger cotton. The liquor is then passed over the detention tank to adjust the pH with NaOH, and then through the clarifying tank to filter the residues in the liquor by sand and active coal. In the next stage, water is supplied to microorganisms to decompose the organic matter in waste water. Finally, water is passed through the disinfection tank. Using alum or javel eliminates harmful bacteria in water. It can then be taken to the nature without affecting the environment.*

Appendix 2	**The existing equipment for receiving waste from the ship at the seaports of Ho Chi Minh, Vung Tau, Da Nang, Hai Phong.**

Port	Name of seaport, harbor, terminal	Reception facility	Name of management agency	Address	Type of waste treated	Treatment method	Capacity
Ho Chi Minh	Nha Be Oil Terminal - Warehouse A	Waste Water Treatment Center	Nha Be Oil Terminal	Quarter 7, Nha Be District, Ho Chi Minh City	Sewage	01 Garbage Treatment Center	750 m^3/day
	Nha Be Oil Terminal - Warehouse D	Waste Water Treatment Center					450m^3/day
	Nha Be Oil Terminal - Warehouse B & C	Waste Water Treatment Center					12 equipments x 12m^3/day
	Nha Be Oil Terminal	Garbage Treatment Center			Garbage	Treated by Nha Be District Public Service Company Limited	
	Petrolimex Saigon	Garbage Treatment Center					
Vung Tau	PTSC Downstream Port	- Small ship - Container - Store - Truck - Crane	PTSC Services Joint Stock Company	65A 30-4 Road, Thang Nhat Ward, Vung Tau City, Vietnam	Only collecting, Storing and transporting		
	Vietsovpetro Port	-Tank truck -Truck -Store	Thanh Danh Company	Street 51B, Ward 10, Vung Tau City	Only collecting, Storing and transporting		
	PTSC Phu My Port	-Small ship -Container -Store -Truc	PTSC Services Joint Stock Company	30-4 Road Thang Nhat Ward Vung Tau City	Only collecting, Storing and transporting		

Da Nang	Port X50 of Song Thu Corporation	-Small ship -Truck -Drum	Song Thu Corporation	96 Yet Kieu Street, Son Tra District, Da Nang City	Sewage Oil waste Hazardous substance	-Storage area: 630-966 m^2 -02 Store -01 water separator machine -Incinerator -07 vehicles: 02 ships 900 DWT. 1 crane truck 1.4 tons and 04 truck 3-12 tons	- 10m^3/h - 1000 kg/h
	Tien Sa Port	-Truck -Tank truck -Barge	Da Nang Urban Environment Limited Company	471 Nui Thanh Street. Hai Chau District. Da Nang City	Garbage Oil waste Hazardous substance	-02 hazardous substance Incinerator -Landfill area of 0.5 ha -Area to expose sludge before curing -02 truck 5 tons	-100 - 200 kg/h -23.800 m^3 -240m^3
Hai Phong	All ports in Hai Phong seaport	-Truck -Barge	Environment Limited Company	01 Ly Tu Trong Street, Hai Phong City	Domestic waste Industrial waste	-01 Japan Incinerator -01 Euro Incinerator -Oil Reclying System	6500 kg/day
	All ports in Hai Phong seaport	Ship HP-1484, HP-1827 with 180 DWT Ship HP-2743 with 136 DWT. Ship HP-1477 with 103 DWT	Hoa Anh Company	37/33 Ngo Quyen Street	Oil waste	Sewage treatment system	60m^3/day 30m^3/day

Source: Vietnam Marritime Administration, 2016

Appendix 3 The details of the shipping activites throughout the Vietnamese seaport in 2013

No.	Port	Ship calls						Cargo		Passenger
		The total of ship calls	GT	Domestic ship		Foreign ship		Tons	Teus	
				Ship calls	GT	Ship calls	GT			
1	Quang Ninh	8,043	76,045,435	3,900	11,060,000	4,143	64,985,435	48,914,373	153,500	94,900
2	Hai Phong	16,650	85,724,211	9,575	22,756,550	7,075	22,756,550	57,237,291	2,800,060	9,700
3	Thai Binh	40	60,000	40	60,000	0	0	68,000	0	0
4	Nam Dinh	21	47,600	21	29,527	0	0	24,415	0	0
5	Thanh Hoa	3,348	4,944,940	3,034	2,978,810	314	1,966,130	7,135,605	0	0
6	Nghe An	2,388	2,123,411	2,082	1,470,248	306	653,163	2,602,469	7,272	0
7	Hà Tinh	1,626	3,197,032	1,128	804,176	494	2,392,856	3,089,884	0	0
8	Quang Binh	540	930,112	453	475,236	37	34,922	1,154,206	0	0
9	Quang Tri	759	393,559	748	293,020	11	100,539	219,864	0	1,084
10	TT. Hue	660	5,516,434	487	444,202	173	5,072,232	1,607,134	0	39,467
11	Da Nang	3,784	29,219,126	2,142	3,941,580	1,642	25,277,546	10,166,237	160,793	51,841
12	Quang Ngai	3,619	19,110,516	2,845	8,595,423	774	10,515,093	22,614,187	0	0
13	Quy Nhon	4,751	20,397,555	3,352	4,192,407	1,399	16,205,147	9,963,029	71,111	951
14	Nha Trang	3,715	14,509,052	3,079	5,778,612	636	8,730,440	6,294,065	0	32,204
15	Vung Tau	7,595	127,009,837	3,459	13,678,732	4,136	113,331,099	49,230,946	908,667	76,582
16	TP. HCM	17,970	170,486,364	8,551	30,796,962	9,419	139,689,403	87,891,049	4,338,166	45,030
17	Dong Nai	3,292	10,218,801	2,262	3,675,913	1,030	6,542,888	5,619,579	11,062	0
18	Can Tho	1,322	2,214,982	1,144	1,736,778	178	506,514	3,008,378	20,121	0

19	My Tho	825	1,008,506	721	855,245	104	153,261	330,388	0	19,891
20	An Giang	1,252	1,710,208	1,187	1,606,918	65	103,290	1,984,152	24,360	0
21	Kien Giang	1,455	1,565,597	73	102,688	1,382	1,465,285	1,055,118	0	0
22	Dong Thap	398	570,603	99	168,646	299	401,957	1,142,558	15,508	8,409
23	Binh Thuan	136	363,086	86	19,070	42	358,946	239,190	0	0
24	Quang Nam	771	7,563,969	536	371,633	235	7,192,336	3,681,884	0	376
25	Ca Mau	842	1,070,508	808	863,936	34	206,572	748,213	17,358	0
Total		**52.077**	**448.980.371**	**30.012**	**84.931.664**	**21.727**	**354.554.029**	**230.042.522**	**6.563.319**	**509.068**

Source: VINAMARINE, 2017

Appendix 4 The details of the shipping activites throughout the Vietnamese seaport in 2014

No.	Port	Ship calls						Cargo		Passengers
		The total of ship calls	GT	Domestic ship		Foreign ship		Tons	TEUs	
				Ship calls	GT	Ship calls	GT			
I	**Group 1**	**24,761**	**176,918,708**	**14,159**	**41,184,404**	**10,602**	**135,734,304**	**120,357,755**	**3,460,083**	**130,883**
1	Quang Ninh	7,000	83,170,000	4,200	14,350,000	2,800	68,820,000	54,256,223	92,619	117,254
2	Hai Phong	17,653	93,611,708	9,851	26,697,404	7,802	66,914,304	65,803,032	3,367,464	13,629
3	Thai Binh	86	112,000	86	112,000	0	0	229,000	0	0
4	Nam Đinh	22	25,000	22	25,000	0	0	69,500	0	0
II	**Group 2**	**7,810**	**13,214,130**	**6,540**	**6,115,062**	**1,270**	**7,099,068**	**15,099,499**	**35,900**	**3,557**
5	Thanh Hoa	3,606	5,950,000	3,100	3,150,000	506	2,800,000	8,086,000	0	0
6	Nghe An	2,548	2,762,237	2,316	1,905,125	232	857,112	2,923,000	35,900	0
7	Ha Tinh	1,656	4,501,893	1,124	1,059,937	532	3,441,956	4,090,499	0	3,557
III	**Group 3**	**8,447**	**42,853,477**	**6,537**	**8,686,370**	**1,910**	**34,167,107**	**18,241,761**	**259,822**	**123,794**
8	Quang Binh	1,400	1,802,558	1,282	694,617	118	1,107,941	2,703,225	0	0
9	Quang Tri	847	436,479	847	436,479	0	0	319,868	0	1,282
10	TT. Hue	856	8,442,154	622	692,731	234	7,749,423	2,907,612	0	59,161
11	Da Nang	4,474	30,733,280	2,938	5,548,649	1,536	25,184,631	11,357,578	222,525	63,344
12	Quang Nam	870	1,439,006	848	1,313,894	22	125,112	953,478	37,297	7
IV	**Group 4**	**13,637**	**86,567,790**	**10,377**	**29,611,054**	**3,260**	**56,956,736**	**44,694,341**	**86,902**	**27,074**
13	Quang Ngai	3,078	28,958,949	2,470	15,571,956	608	13,386,993	17,468,031	0	0
14	Quy Nhon	4,655	25,049,973	3,381	4,300,499	1,274	20,749,474	11,639,635	85,911	74

15	Nha Trang	4,624	21,993,868	3,746	8,286,599	878	13,707,269	11,577,004	991	25,000
16	Binh Thuan	1,280	10,565,000	780	1,452,000	500	9,113,000	4,009,671	0	2,000
V	**Group 5**	**31,088**	**337,724,305**	**14,951**	**102,396,798**	**16,137**	**235,327,507**	**162,065,383**	**6,313,827**	**159,561**
17	TP. HCM	17,969	175,382,970	8,627	83,565,155	9,342	91,817,815	94,315,806	4,979,405	76,570
18	Dong Nai	3,693	11,367,569	2,503	4,141,315	1,190	7,226,254	8,375,565	180,226	
19	Vung Tau	9,426	150,973,766	3,821	14,690,328	5,605	136,283,438	59,374,012	1,154,196	82,991
VI	**Group 6**	**5,255**	**8,421,569**	**3,762**	**5,312,150**	**1,493**	**3,109,419**	**9,862,142**	**83,923**	**1,095,003**
20	Can Tho	1,634	2,713,202	1,418	2,162,720	216	550,482	4,220,410	46,288	0
21	My Tho	730	1,132,629	582	809,506	148	323,123	1,005,284	0	21,815
22	An Giang	1,500	2,160,214	1,417	2,037,284	83	122,930	2,444,541	14,844	0
23	Kien Giang	923	1,693,908	191	155,052	732	1,538,856	1,050,075	0	1,066,795
24	Dong Thap	450	472,076	154	147,588	296	324,488	915,491	22,791	6,393
25	Ca Mau	18	249,540	0	0	18	249,540	226,341	0	0

Source: VINAMARINE, 2017

Appendix 5 The details of the shipping activites throughout the Vietnamese seaport in 2015

No.	Port	Ship calls						Cargo		Passenger
		Ship calls	GT	Domestic ship		Foreign ship		Tons	Teus	
				Ship calls	GT	Ship calls	GT			
	Group 1	**26,810**	**204,439,833**	**15,168**	**49,091,002**	**11,642**	**155,348,831**	**133,224,479**	**3,812,992**	**83,386**
1	Quang Ninh	6,650	77,660,000	4,250	19,100,000	2,400	58,560,000	53,935,000	13,083	72,830
2	Hai Phong	19,614	126,150,831	10,430	29,572,000	9,184	96,578,831	78,812,551	3,799,909	10,556
3	Thai Binh	254	454,000	196	244,000	58	210,000	320,000	0	0
4	Nam Định	292	175,002	292	175,002	0	0	156,928	0	0
	Group 2	**8,965**	**16,540,293**	**7,426**	**7,520,748**	**1,539**	**9,019,545**	**19,143,778**	**47,139**	**0**
5	Thanh Hoa	5,138	7,786,758	4,370	3,532,482	768	4,254,276	9,508,361	0	0
6	Nghe An	2,505	3,236,000	2,216	2,376,978	289	859,022	3,205,913	47,000	0
7	Ha Tinh	1,322	5,517,535	840	1,611,288	482	3,906,247	6,429,504	139	0
	Group 3	**8,040**	**45,483,389**	**5,767**	**9,738,891**	**2,273**	**35,744,498**	**20,395,959**	**336,254**	**124,037**
8	Quang Binh	880	2,132,120	722	577,936	158	1,554,184	3,417,467	0	0
9	Quang Tri	656	349,700	635	304,849	21	44,851	367,669	0	2,204
10	TT. Hue	943	8,541,608	710	747,760	233	7,793,848	2,500,000	0	94,972
11	Da Nang	4,544	32,218,860	2,742	6,184,926	1,802	26,033,934	12,755,000	252,500	26,861
12	Quang Nam	1,017	2,241,101	958	1,923,420	59	317,681	1,355,823	83,754	0
	Group 4	**15,336**	**100,808,950**	**12,102**	**36,762,354**	**3,234**	**64,046,596**	**55,118,211**	**95,965**	**197,193**
13	Quang Ngai	3,346	30,020,443	2,919	20,311,984	427	9,708,459	17,095,856	0	0
14	Quy Nhon	4,684	29,039,911	3,107	4,167,016	1,577	24,872,895	16,550,040	95,543	1,304
15	Nha Trang	4,894	23,396,031	4,048	7,301,981	846	16,094,050	10,923,585	422	53,357
16	Binh Thuan	2,412	18,352,565	2,028	4,981,373	384	13,371,192	10,548,730	0	142,532
	Group 5	**40,227**	**409,568,686**	**20,720**	**38,767,543**	**19,507**	**370,801,143**	**199,507,748**	**7,711,161**	**1,672,388**
17	TP. HCM	19,603	196,610,700	8,908	8,732,803	10,695	187,877,897	111,452,560	5,996,052	53,236
18	Dong Nai	11,198	190,363,538	5,042	19,154,933	6,156	171,208,605	67,388,248	1,342,227	0

19	Vung Tau	3,800	12,318,106	2,666	4,589,222	1,134	7,728,884	8,510,604	301,520	0
20	**Group 6**	2,212	4,243,166	2,024	3,422,388	188	820,778	6,037,650	43,060	0
21	Can Tho	780	1,465,837	540	787,993	240	677,844	1,336,059	1,848	22,110
22	My Tho	1,400	1,810,000	1,301	1,692,000	99	118,000	2,434,730	18,000	0
23	An Giang	581	1,886,543	131	239,362	450	1,647,181	1,742,967	0	1,596,686
24	Kien Giang	643	629,548	106	148,776	537	480,772	478,524	8,454	356
25	Dong Thap	10	241,248	2	66	8	241,182	126,406	0	0
Total		Ca Mau	**776,841,151**	**61,183**	**141,880,538**	**38,195**	**634,960,613**	**427,390,175**	**12,003,511**	**2,077,004**

Source: VINAMARINE, 2017

Appendix 6 Details of the volume of goods and maritime transport activities in 2016

No.	Port	Ship calls						Cargo		Passenger
		Ship calls	GT	Domestic ship		Foreign ship		Tons	Teus	
				Ship calls	GT	Ship calls	GT			
1	Quang Ninh	11.695	89.443.607	4.213	23.104.106	7.481	11.695	59.227.065	13.921	95.071
2	Hai Phong	18.590	135.124.454	9.775	31.027.181	8.816	18.590	82.440.731	4.112.254	2.843
3	Thai Binh	316	1.484.073	264	434.400	52	316	963.491	0	0
4	Nam Dinh	153	190.911	153	153.231	0	153	147.482	0	0
5	Thanh Hoa	3.223	7.130.489	2.692	3.581.907	530	3.223	11.130.929	0	0
6	Nghe An	2.572	3.624.482	2.319	2.822.288	253	2.572	3.658.253	54.691	0
7	Hà Tinh	1.089	6.033.380	705	1.830.307	384	1.089	7.256.413	627	19
8	Quang Binh	753	2.454.575	585	760.754	168	753	3.845.114	0	0
9	Quang Tri	501	1.151.002	379	221.845	28	501	789.290	0	3.322
10	TT. Hue	646	9.318.118	449	533.025	196	646	2.698.381	0	115.067
11	Da Nang	4.486	40.556.801	2.756	6.576.253	1.730	4.486	14.078.865	310.145	155.037
12	Quang Ngai	3.317	29.853.953	2.823	17.773.300	494	3.317	17.832.826	0	0
13	Quy Nhon	5.122	31.322.468	3.743	5.464.186	1.379	5.122	14.931.590	96.958	236
14	Nha Trang	4.791	8.188.725	3.936	6.657.579	855	4.791	10.525.137	24	107.464
15	Vung Tau	12.624	253.206.293	4.934	17.891.125	7.690	12.624	67.628.363	2.014.165	285.734
16	TP. HCM	20.858	235.929.683	8.756	33.553.898	12.103	20.858	120.127.808	5.676.537	36.770
17	Dong Nai	3.657	10.861.320	2.413	3.688.941	1.244	3.657	14.619.273	365.018	0
18	Can Tho	2.480	4.628.908	2.281	3.733.510	199	2.480	8.338.457	42.922	0

19	My Tho	732	1.383.418	523	889.856	209	732	1.231.733	380	25.113
20	An Giang	1.354	1.976.990	1.203	1.665.320	151	1.354	2.559.019	14.182	0
21	Kien Giang	657	1.345.433	175	246.897	480	657	924.225	0	1.963.760
22	Dong Thap	344	203.456	67	274.305	4	344	432.188	7.735	304
23	Binh Thuan	2.042	9.342.983	1.537	7.594.589	505	2.042	9.118.955	0	106.131
24	Quang Nam	1.054	3.179.878	962	2.283.155	92	1.054	1.588.306	115.737	0
25	Ca Mau	56	282.964	24	8.258	32	56	238.316	0	776
Total		**52.077**	**448.980.371**	**30.012**	**84.931.664**	**21.727**	**354.554.029**	**230.042.522**	**6.563.319**	**509.068**

Source: VINAMARINE, 2017