



Review of Regulation and Management of Waste Treatment to Prevent Pollution of the Maritime Environment

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Abstract : Waste Management in ports is an important aspect in preserving marine ecosystems. Various regulations have been implemented both at the national and international levels to ensure that waste generated from port activities can be managed effectively and environmentally, from activities in ports and the Bira ships is important to do. The review aims to identify the extent to which waste management policies and practices have been implemented and to analyze their effectiveness in reducing marine pollution, so that other ports that have not undertaken waste management can follow suit.

Keywords: Prevention, Marine Pollution, Waste Management

1. INTRODUCTION

Waste Management in ports is an important aspect in preserving marine ecosystems [1][2]. Various regulations have been implemented both at national and international levels to ensure that waste generated from port activities can be managed effectively and environmentally [3][4]. However, the implementation of waste management at ports still faces various challenges, such as limited waste treatment facilities, the absence of waste management procedures, and the lack of supervision over waste disposal [5][6].

Previous research conducted in several ports such as Arar Sorong ferry port shows that there are 3 (Three) steps that can be done for waste management, namely habituation or accustoming the community to waste and waste management as dan daily habit and culture, applying zero waste technology and enforcing the law [7][8].

Therefore, a review of the regulation and application of waste management to prevent marine pollution both from activities in ports and the Bira ships is important to do [9][10][11]. The review aims to identify the extent to which waste management policies and practices have been implemented and to analyze their effectiveness in reducing marine pollution, so that other ports that have not undertaken waste management can follow suit.

2. Methodology

This type of research is descriptive qualitative by using case study method. This method aims to determine the types and sources of waste that commonly occur in ports, regulations, waste management methods and ways of handling waste that has been done in several ports in Indonesia.

Data collection technique is done by observing and interviewing in depth (in depth interview), while the secondary data obtained by conducting literature studies, both previous research and regulations related to marine pollution.

a. Observation

Observations were conducted to determine the source of waste and marine pollution conditions caused by activities in the port. The port that became the location of the study is the Bira ferry port in South Sulawesi.

b. In Depth Interview

Interviews were conducted to the port manager, PT. ASDP Indonesia Ferry (Persero) Selayar Branch and regulators, namely Balai Pengelola Transportasi Darat (BPTD) region of South Sulawesi - West Sulawesi, Harbormaster and Port Authority Office (KSOP) and the Department of transportation of South Sulawesi province.

The steps of data analysis using qualitative descriptive method conducted by the researcher are as follows :

a. Data Collection

This stage involves collecting data through various techniques such as interviews, observation, or documentation studies. The data collected is usually in the form of words, sentences, or narratives that are rich in meaning.

b. Data Reduction

At this stage, the data that has been collected is simplified, sorted, and focused on matters relevant to the research objectives. Data reduction helps eliminate yang unnecessary information.

c. Presentation Of Data

The data that has been reduced is then presented in the form of narratives, tables, or diagrams that help the researcher in understanding the general picture of the research findings. This presentation makes it easier for researchers to draw conclusions.

d. Conclusion and verification

The final stage is the drawing of conclusions from the data that have been analyzed. These inferences can be patterns, themes, or categories that emerge from the data. Verification is carried out to ensure that the conclusions are accurate and consistent with existing data.

3. DISCUSSION

Bira port is a ferry port in South Sulawesi that connects Bulukumba with Selayar Islands, Southeast Sulawesi and East Nusa Tenggara. The port is managed by the Technical Service Unit (UPT) ASDP Bira Department of transportation of South Sulawesi province. The ships that operate here are ferry ships operated by PT. ASDP Indonesia Ferry (Persero), with a fleet of KMP. Balibo, KMP. Kormomolin, KMP. Bontoharu, KMP. Sangke Palangga and KMP. Takabonerate, in addition, there are also fishing boats and cruise ships owned by individuals or

private companies that lean on the port of Bira, so it can cause great potential for pollution in the port environment.

a. Sources of waste in the port

Some activities in the port of Bira that can cause waste are as follows:

1. Ship operations

In addition to the ferry ships that operate in the port of Bira, there are also tourist ships and fishing boats that are aware of the waters around the port of Bira, so that it can be a factor in causing waste as in figure 1 and figure 2.

The waste generated can be:

- a. Solid waste such as plastic, bottles and styroform.
- b. Food waste.
- c. Human and animal waste.
- d. Oil and oil spills.
- e. Removal of residual oil.
- f. Ballast water.

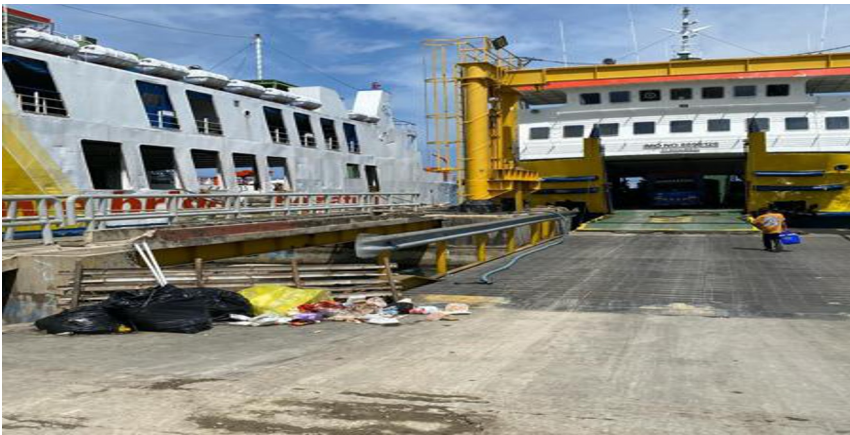


Figure 1. Garbage from Ships in The Port Area



Figure 2. Fishing Boats and Excursions in The Waters of The Port of Bira

2. Ship repair activities in the port area

Tourist and fishing vessels the waters of Bira port, in addition to berthing proses carry out the loading and unloading process but also carry out repairs or completion of ship construction. So that the waste caused in the form of oil spills, paint spills, remnants of wood, plastic and bottles, as in figure 3.



Figure 3. Ship Carrying Out Repairs in The Vicinity of The Port of Bira

3. Port service user activities

Ship passengers, deliverers and pick-ups as well as para traders in the Port become one of the causes of waste in the port of Bira, especially plastic waste and food or beverage packaging bottles.

4. Impact of tides and strong winds

Natural factors such as tides and strong winds affect the generation of waste in Bira waters. High tides and strong winds bring garbage into the waters of the port of Bira, while at low tide will be seen a lot of garbage in the waters of Bira.

b. Waste Management Regulation

Waste management is done by doing several ways to prevent pollution in the sea. The rules governing waste management and Pollution Prevention are as follows:

1. The Law Number 17 of 2008 on Maritime revised by Law Number 66 of 2024
Maritime environmental protection procedures and requirements must be met on activities:
 - a. Port
 - b. Ship operation
 - c. Transport of waste hazardous and toxic materials in waters
 - d. Waste disposal in waters
 - e. Shipwreck
2. The Government Regulation Number 21 of 2010 on Maritime Environmental Protection
 - a. Prevention and control of environmental pollution originating from the ship is the responsibility of each crew.
 - b. The obligations of the crew in accordance with his position in the certificate book on the ship are as follows:
 - 1) Ensure the availability of oil logbook in the engine room
 - 2) Ensure the availability of dirty oil storage tank well
 - 3) Ensure the availability of waste disposal management and garbage dumpster
 - 4) Ensure the availability of storage tanks or dirt crushers for ships with 15 (fifteen) sailors or more
 - 5) Ensure the availability of regular procedures for pollution control
 - 6) Ensure the availability of chemical decomposers and oil localizers.
 - 7) Localize the oil by using the oil localizer tool.
 - 8) Suck oil with an oil suction device.
 - 9) Absorb oil with absorbent material.
 - 10) Decompose oil by spraying environmentally friendly decomposing chemicals.
 - 11) Report to the nearest Harbourmaster and /or other government elements nearby.

Waste and other materials from the operation of ships are prohibited from being discharged into the waters. Waste from the operation of the ship can be dirty oil residues, garbage and human waste, while other materials include Ballast Water, hazardous and toxic chemicals and materials containing ozone-depleting substances. Pollution control requirements include: procedures, personnel, equipment and materials and exercises.

The equipment and materials that must be on board the ship consist of:

- 1) oil boom
- 2) Suction device (skimmer)
- 3) Temporary storage
- 4) Absorbent material (sorbent)

5) Decomposers (dispersants)

While oil pollution prevention equipment for ships with GT size of 100 or more and /or prime mover engine size of 200 HP or more, must have at least:

- 1) Water and oil separator (oily water separator)
- 2) Dirty oil storage tank (sludge tank)
- 3) Standard discharge connection

Vessels carrying more than 15 people must have dirt pollution prevention equipment which includes a dirt treatment device, a dirt crushing device and a standard dirt collection tank and discharge connection. Meanwhile, waste pollution prevention equipment consists of garbage collection bins and marking.

The exercise consists of:

- 1) communication and reporting exercises
- 2) table top exercise
- 3) deployment equipment exercise
- 4) combined and integrated exercises

Completeness and compliance with standards of pollution prevention equipment and equipment on the ship is evidenced by a certificate by the Minister.

3. Minister of Transportation regulation number PM. 24 of 2022 concerning amendments to the regulation of the Minister of Transportation number PM 29 of 2014 concerning the Prevention of Maritime Environmental Pollution
 - 1) Prevention of pollution from port activities is carried out by providing pollution prevention facilities at ports including special terminals.
 - 2) Ships are required to meet the construction and equipment requirements for the Prevention of waste pollution, namely : garbage shelters, Garbage record books (garbage record book), garbage disposal posters and waste handling patterns (garbage management plan) authorized by the competent authorities.
4. Based on the regulation of the Minister of Transportation number 39 of 2021 concerning amendments to the regulation of the Minister of Transportation number PM 58 of 2021 concerning Pollution Control in waters and ports.
Each port should have the following pollution prevention equipment and materials:
 - 1) Oil boom
 - 2) Suction device (skimmer)
 - 3) Temporary storage device
 - 4) Absorbent material (sorbent)
 - 5) Decomposers (dispersants)
5. Circular of the Directorate General of sea transportation number: am.003/23/14/DJPL.18 On Waste Handling in ship ports.
Every ship in the port environment must meet the following requirements for the Prevention of garbage pollution:
 - 1) Garbage disposal (garbage disposal)

- 2) Garbage record book (record book)
- 3) Garbage disposal Poster (garbage pleckerd)
- 4) Garbage handling pattern (garbage management plan) that has been approved by the competent authorities.

The ships operating in Bira port are ferry ships with an average size of 565 GT, a length of 43 meters, a passenger capacity of 260 people and kendaraan28 units of vehicles, as in table 1.

Table 1. Dimensions of Ships in the Port of Bira

THE	NAME OF THE SHIP (P.)	GRT	ENGINE POWER (HP)	LENGTH (METERS)	PASSENGER CAPACITY (PEOPLE)	VEHICLE CAPACITY (UNITS)
1.	Kormomolin	884	670	46,60	252	30
2.	Balibo	540	650	41,35	303	22
3.	Sangke Palangga	560	829	40,15	180	20
4.	Bontoharu	1.124	736	47,45	300	45
5.	Takabonerate	842	94	41.56	265	25
average		565		43	260	28

Source: UPT ASDP Department of transportation of South Sulawesi province, 2025

Based on the dimensions of the vessel in Table 2, the Prevention of pollution that must be done according to the rules are as follows:

Table 2.Prevention of Pollution on Crossing Ships

No	Aspect	Regulation	Implementation
1	certificate and monitoring of ship with GT ≥ 400 must have : • International Oil Pollution Prevention (IOPP) Certificate • International Sewage Pollution Prevention (ISPP) Certificate • Garbage Management Plan.	• Minister of Transportation regulation number PM. 24 of 2022 concerning amendments to the regulation of the Minister of Transportation number PM 29 of 2014 concerning the Prevention of Maritime Environmental Pollution • Law No. 17, 2008 artical 313–317	The related authorities (DJPL) issue certificates and conduct supervision

2	Fecal waste (Annex IV) Passenger ship > 100 passengers Must be equipped with Sewage Treatment Plant (STP) and storeroom	• MARPOL Annex IV • PP No. 21 Year 2010 Article 19-20 • Minister of Transportation regulation No. 29 year 2014 article 8	Ships must have a Holding Tank or Sewage Treatment Plant (STP)
3	waste (Annex V) It is forbidden to throw garbage in the sea. Ships must have Oil Filtering Equipment (OWS), keeping Oil Record Book, and distributing oil waste ke Reception Facility.	• MARPOL Annex V • Minister of Transportation regulation No. 29 Year 2014 article 10-11 • Law No. 17 year 2008 article 205	Ships must have an Oil Filtering Equipment (OWS)
	Ships must have a Garbage Management Plan and Garbage Record Book. Garbage is sorted, stored in a sealed containers, and disposed at port facilities.		The ship must have bins placed in an easily visible place on the ship
4	Air emissions (Annex VI) Ships are required to use low - sulfur fuel (α 0.5%), prohibit the use of hazardous refrigerants, and have an IAPP Certificate.	• MARPOL Annex VI • PP No. 21 Year 2010 Article 21-22 • Permenhub No. 29 year 2014 article 11	applies to new ships and ships with retrofit engines
5	ships must have the following pollution prevention equipment and materials : • localizers (oil boom) • skimmers • Temporary storages • Absorbent materials (sorbent) • Decomposing material (dispersant)	law No. 17 year 2008	Every ship must have pollution prevention equipment and materials

Source: processed by researchers, 2025

Furthermore, Pollution Prevention that must be done at the port for pollution control is as follows as in table 3:

Table 3. Pollution Prevention in Ports

No	Aspect	Basic	Application
1	Sewage facilities in the Port	• Annex I–V (Reception Facilities) • Law 17/2008 Article 208 • PP 21/2010 • Permenhub 29/2014	Reception Facility Terminal (RFT)
2	Prohibition of waste disposal	• Annex I–V • Law 32/2009 Article 69 • Permenhub 29/2014 Article 3	Prohibition of dumping waste in the sea, which is placed in a location that is easy to see
4	Supervision and sanctions	IMO Resolution MEPC.244(66)	Supervision is carried out by Harbourmaster the city and the Maritime Environment supervisor Maritim

Prevention of marine pollution in ports can be done by providing ship waste receiving facilities or Reception Facility Terminal (RFT), which is a pollution prevention system at the port to receive, collect and manage waste from ships before the waste is disposed of or further processed.

Some of the Reception Facility terminals (RFT) that have been implemented in several ports in Indonesia are as follows:

a. Reduce-Reuse-Recycle (TPS 3R)

This system is applied in the Port of Terminal Teluk Lamong Surabaya for solid waste from ports and ships. The facilities carried out are solid waste, measurement of waste generation and composition, and transportation of waste from temporary disposal sites to final disposal sites.

b. Oil Reception Facility

This facility is implemented at Tanjung Priok port to collect waste oil and garbage from ships. The port manages this facility by applying tariffs to the ships that use it.

c. Garbage Reception Facility

This facility is applied in the port of Banoa and Makassar to manage waste in the port. The method is to provide several bins according to their type, Solid Waste is collected and transported by truck to the port TPS, organic waste is processed into fertilizer while plastic waste is sold to collectors for recycling.

4. CONCLUSION

Some regulations governing the Prevention of pollution of the maritime environment are:

- The Law Number 17 of 2008 on Maritime, which was last revised with Law number 66 of 2024.
- Minister of Transportation regulation number PM. 24 of 2022 concerning amendments to the regulation of the Minister of Transportation number PM 29 of 2014 concerning the Prevention of Maritime Environmental Pollution.
- Government Regulation Number 21 of 2010 on Maritime Environmental Protection.

- d. Based on the regulation of the Minister of Transportation number 39 of 2021 concerning Amendments to the Regulation of the Minister of Transportation number PM. 58 of 2021 concerning Pollution Control in Waters and Ports.
- e. Circular of the Directorate General of Sea Transportation number: am.003/23/14/DJPL.18 On Waste Handling in Ship Ports.
- f. Marine Pollution (Marpol) Annex I to VI

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Acknowledgement

Waste Management in ports is an important aspect in preserving marine ecosystems. Various regulations have been implemented both at the national and international levels to ensure that waste generated from port activities can be managed effectively and environmentally.

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