Analysis of the Garbage Management Plan Implementation on KMP. Shita Giri Nusa to Prevent Pollution in the Lombok Strait

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Abstract.

Marine pollution from ship waste, regulated by MARPOL Annex V, threatens ecosystems like the Lombok Strait, where unmanaged garbage from vessels like ferries contributes significantly. This study aims to identify inhibiting factors in implementing the Garbage Management Plan (GMP) on KMP Shita Giri Nusa and evaluate the ship's operational company's supervisory role. Employing a qualitative descriptive approach, data were collected via observation, semi-structured interviews, and documentation during sea practice from July 2024 to July 2025. The population comprised all crew and company staff involved in GMP; purposive sample of 3 key informants such as Bosun, Crew, and Office Personnel. Instruments included observation guidelines, interview protocols, and document checklists; analysis applying Fishbone diagram with source triangulation. Results reveal adequate basic facilities and crew understanding but inconsistencies in waste sorting during peak workloads, limited labeled bins, occasional equipment damage, and suboptimal company training/monitoring. In conclusion, GMP implementation is moderately effective yet requires enhanced consistency, intensive socialization, and facility upgrades to prevent pollution effectively.

Keywords: *Fishbone Analysis, Garbage Management Plan, Lombok Strait, Marpol Annex V and Waste Pollution.*

I. INTRODUCTION

Ships as the main means of transportation for human mobility and large-scale distribution of goods at sea often contribute to environmental pollution through uncontrolled waste disposal, as regulated in Marine Pollution (MARPOL) 73/78 Annex V issued by the International Maritime Organization (IMO). This phenomenon is increasingly crucial considering that the ocean covers a large part of the earth's surface, functions as a habitat for marine biota, a source of energy, and supports maritime transportation, where ship waste such as plastic is difficult to decompose and disrupts the ecosystem. Data from the National Coordination Team for Marine Debris Management (TKNPSL) shows a decrease in sea-based marine debris from passenger ships, although plastic waste leakage increased significantly to 88,374.63 tons in 2022 compared to 2018, with a low peak in 2020[1].

Field observations in the Lombok Strait, a busy shipping lane near the busy shipping lane of the Lombok Strait, revealed the dominance of plastic waste from ships that threaten the ecosystem, as personally documented in 2024 and supported by a modeling study of the distribution of ship operational waste in the region. Real cases such as passengers of KM Sabuk Nusantara 106 who threw garbage in the Banda Sea due to accumulation on the ship[2] highlighted the indiscipline of the crew in waste management, The practice of throwing organic offerings directly into the sea on religious days on KMP Shita Giri Nusa was only done once. On this ship, the accumulation of garbage in the passenger area, used coffee cups on the side of the trash can, scattered peanut shells, and disposal in the anchor area after passengers disembarked worsened the situation, reflecting low awareness and inadequate facilities.

The crew's lack of knowledge, responsibility, and discipline regarding the Garbage Management Plan (GMP) led to violations of Annex V of MARPOL, such as negligent waste separation and improper disposal, which hampered pollution prevention in the Lombok Strait. The inhibiting factors for the implementation of the Garbage Management Plan on KMP. Shita Giri Nusa include increased passenger awareness through regular socialization and crew understanding of the SOP of the Garbage Management Plan. There are still few separate trash bins on board, and many trash bins are still without clear markings. Reporting regarding

cleaning equipment needs to be acted upon quickly to prevent delays in procurement. The limited level of awareness of the crew is also evident from the less intensive socialization and suboptimal training, even though regulations require GMP on ships >400 GT or with >15 passengers.[3].

Shipping companies often fail to fully support the Garbage Management Plan (GMP), particularly in operational oversight, infrastructure provision, and crew training. This has led to inconsistent implementation on the KMP Shita Giri Nusa, resulting in continued pollution despite a national reduction in marine debris. Therefore, strict sanctions and ongoing education are needed.[4].

This study aims to identify the inhibiting factors for GMP implementation on KMP Shita Giri Nusa and evaluate the operational-supervisory role of the shipping company in supporting it, in order to fulfill the requirements for graduation from the Applied Bachelor of Polytechnic of Shipping Surabaya. The urgency lies in the need to reduce pollution in the Lombok Strait, a strategic route with conservation areas, where effective GMP can support the national target of reducing plastic waste by 70% by 2025 according to the National Action Plan for Marine Safety (RAN PSL), while simultaneously improving compliance with international regulations for ship certification. The novelty of this study is the analysis of GMP specifically on KMP Shita Giri Nusa with direct observations in 2024 on the Padang Bai-Lembar Route, complementing previous, more general studies on other vessels such as Patrona 118 or Virgo 18, and integrating the latest TKNPSL data with local cases for practical recommendations for crews and companies.[5].

II. METHOD

Types and Methods of Research

This study uses a descriptive qualitative approach to explore the phenomenon of Garbage Management Plan (GMP) implementation on KMP. Shita Giri Nusa in depth through direct interaction with subjects in the ship's natural environment during the prala sea practice from July 24, 2024 to July 25, 2025. This approach allows the collection of primary data through observation, interviews, and documentation, as well as secondary data from MARPOL Annex V regulations, national laws, and related journals, in accordance with the characteristics of qualitative research that emphasizes the interpretation of complex phenomena [6]. This method was chosen because it is suitable for analyzing the inhibiting factors of GMP and the role of companies, as recommended for exploratory studies in the maritime sector [7].

Data Analysis Instruments and Techniques

The main instruments include observation guidelines for monitoring GMP processes, semi-structured interview guides with crew and officers, and documentation sheets for regulations such as the Garbage Record Book and MARPOL SOPs. The data analysis technique follows the model; the analysis applies a Fishbone diagram involving data reduction, presentation, and conclusion drawing, with source triangulation for validation through comparison of observations, interviews, and documents[8]. In addition, a Fishbone (Ishikawa) diagram is applied to identify root causes from the aspects of man, machine, method, and material, followed by the formulation of improvement solutions, which supports visual causality analysis in applied qualitative research[9].

Population and Sample

The research population includes all crew members and operational staff of PT. Samoedra Jaya Giri Nusa. With a total of approximately 28 personnel based on the ship's crew list and 1 Designated Person Ashore from the company. The sample was selected purposively with the criteria of key informants directly experienced in waste management, Bosun, sailors, and office staff, as many as 3 respondents for in-depth interviews, according to the non-probability sampling technique in qualitative that targets data saturation. This selection ensures representation from various ship departments, in line with the principle of sampling relevant informants for a single case study [7].

Research Procedures

The procedure began with a preliminary study through a MARPOL literature review and initial observations during sea practice, followed by parallel data collection via participant observation, face-to-face interviews, and document studies over 12 months on the Bali-Lombok Route. Data were processed iteratively with interview transcription, theme categorization, triangulation, and Fishbone visualization for

inhibiting factors and improvement efforts, ending with verification with informants[8]. The entire process complies with research ethics such as informed consent and confidentiality, ensuring reliability through an audit trail, as is the standard qualitative procedure[9].

III. RESULTS AND DISCUSSION

Based on the results of observations carried out by the author for 1 year and 1 day while carrying out Sea Practice (Prala), the author obtained various findings related to the condition of the marine environment on the Bali-Lombok crossing route.

Fig. 1. Finding Trash While Fishing in the Lombok Strait

Source: Researcher documentation (2025)

The author's observations found abundant trash in the Lombok Strait, mostly from various vessels (ferries, cargo, tankers, LNG, Pinisi, etc.). On the KMP Shita Giri Nusa during the prala sea practice, passengers of all ages dominated the indiscriminate dumping of trash into the sea, followed by the crew who dumped organic waste (sometimes non-organic by individuals, such as after sweeping). The availability of labeled trash bins is minimal, so the waste is mixed. The company rarely monitors waste management, although routine procurement of cleaning equipment is often late.

Tab. 1. Observation Results

Aspects Studied	Indicator	In accordance	It is not in accordance with	Information
Implementation of the Garbage Management Plan at KMP. Shita Giri Nusa	Crew's level of understanding	✓		It's enough, but there are some people who still throw rubbish into the sea.
	Consistency in implementing waste sorting during busy working conditions		✓	When the ship's crew is busy, they are often late in managing the waste, sometimes the waste is still full when they are sailing again.
	Crew awareness of marine cleanliness	✓		Even though they have sufficient awareness, some ship crew members still throw rubbish into the sea.
	Adequate number of crew in waste management	✓		It's sufficient enough
	Condition and completeness of the sorted waste bins		✓	Not yet optimal for the provision of separate waste bins
	Availability of trash bags and supporting equipment	✓		Availability of trash bags and supporting equipment is carried out routinely
	Clarity of waste type marking for crew and passengers		✓	Marking of types of waste is not yet optimal because there are many waste areas without markers.
	Clarity and understanding of the Garbage Management Plan SOP	✓		It is sufficient to understand the GMP SOP based on Marpol Annex V Rules.

	Frequency of socialization/briefing of the Garbage Management Plan		✓	There has been no special briefing regarding GMP to passengers or crew.
	Condition and suitability of waste management equipment		✓	The suitability of the equipment is quite good, but sometimes there are some equipment that is damaged but has not been replaced.
The Role of the Company in Supporting the Garbage Management Plan at KMP.Shita Giri Nusa	Form and implementation of Garbage Management Plan training by companies		✓	There is no special training from the company
	Routine company evaluation of the implementation of the Garbage Management Plan	✓		Routine evaluations have been conducted regarding the implementation of the Garbage Management Plan.
	Company attention to crew performance		✓	The company's attention to the performance of the ship's crew is not yet optimal.
	Company support in providing separate waste bins	✓		For maximum company support
	Routine procurement of trash bags and equipment	✓		It's quite routine but sometimes there are delays
	Condition of the company's waste management facilities	✓		It's good enough
	Company policy regarding ship waste management	✓		The policies issued by the company are very helpful in waste management.
	Direct company monitoring of ships	✓		Monitoring has been done quite well
	Company support in providing cleaning equipment	✓		Very supportive despite the delays
	Routine maintenance of waste management equipment by the company	✓		Damaged equipment is reported to the company and replaced immediately.

Source: Researcher Data (2025)

Based on Table 1, the implementation of GMP on KMP. Shita Giri Nusa is generally quite good, especially regarding basic facilities and the crew's initial understanding of waste management, with adequate crew availability (see Appendix 1 Crew List and Appendix 2 Garbage Record Book). However, during busy work hours, the consistency of waste sorting decreases due to delays in handling and full trash bins (a rare occurrence), crew members still dumping trash into the sea, limited segregation areas, inadequate GMP socialization to crew and passengers, and damaged facilities not being replaced (Figure 4.5). Procurement of daily equipment such as trash bags is routine verbally, while non-routine items (numbers 39-43 of Appendix 3) are submitted at the same time as docking. The company's role in GMP supervision and specific training has not been maximized, resulting in less consistent and disciplined implementation; properly labeled facilities are provided. Increased company attention is needed to balance policy-facility with implementation.

Source: Personal Documentation (2024)

Fig 2. Organic, Inorganic, and Recycling Trash Bins

Fig. 3. Condition of the Trash Can

Source: Personal Documentation (2024)

However, in Figure 3, you can see the condition of the trash cans, which are broken, and two of them are missing lids, which creates an unpleasant odor around them. You can also see the faded and dirty color of the trash cans, indicating that they haven't been replaced in a long time.

Fig. 4. Garbage Collection After Unloading

Source: Personal Documentation (2024)

And in picture 4 the ship's crew is collecting the garbage that has been collected in the garbage bins provided in all corners of the ship, this garbage collection is carried out after loading and unloading is complete, and the garbage that has been collected will be placed in one corner of the ship to make it easier to dispose of the garbage when it is docked at the port.

As can be seen in Figure 5, the condition of the cleaning equipment is quite good, there is minimal damage, and the number is sufficient to carry out waste management.

In Figure 6, some trash bins lack clear markings, such as waste type markers and different color markers. The image shows that the trash bins are still mixed with different types of waste.

Fig. 5. Cleaning Tools

Source: Personal Documentation (2024)

Fig 6. Trash Can Does Not Have a Type Marker Trash and Color

Source: Personal Documentation (2024)

Interview Results

The data collected by the author is the result of interviews conducted with several crew members on board the ship, where the author selected three informants. The first informant, Bosun, was the primary informant because he was responsible for the implementation of the ship.*Garbage Management Plan (GMP)*and the sailor as the second source because they are the implementers in the implementation of the Garbage Management Plan (GMP) and the office as the supervisor and as the party that provides facilities so that the Garbage Management Plan (GMP) can run well and according to the rules. The author chose these three sources because 2 of them are ship crews who are directly involved in the storage, processing and disposal of waste on board and the office as the supervisor for all ship activities. The following are some of the results of the description of the interviews conducted by the researcher as follows:

Interview results

Time : 24 July 2024 – 25 July 2025

Interview Location : At KMP. Shita Giri Nusa

Purpose of Interview : To know how GMP is implemented on ships and to know the role of the company in supporting GMP

Respondents : Bosun and Crew of KMP. Shita Giri Nusa and DPA (*Designated Person Ashore*) as a representative of the PT. Samoedra Jaya Giri Nusa office

Tab. 2. Interview Results

No	Question	Respondents' Answers		
		Boss	**Sailor**	**Office**
1	How is the crew's understanding of waste management procedures on board ships?	It is quite good and clear, which is always explained by the captain and the company's operations periodically.	The crew's understanding of waste management procedures is quite good.	Most of the crew members usually already understand the waste management procedures on board. ship, because the office always conducts familiarization regarding the procedures before the crew gets on board and works.
2	In busy working conditions, how consistent is the crew in implementing waste sorting?	Create a cleaning planning schedule on the ship	Even though the work is busy, sorting waste on the ship can be done quite easily and quickly because there is a trash bag in each trash can so you just have to take it.	For this sorting, it's clearly decreasing, yes. It's decreasing. But we remain focused and Direct the sorting of waste so that it does not pollute the environment.
3	Is the crew's awareness of marine cleanliness optimal or can it still be improved?	Very Optimal	It was quite optimal because before the ship departed, a briefing was given to the crew and passengers.	If it's not optimal, it's said to be optimal, it's optimal. But We still have to monitor it there, because we have to maintain our consistency. Maintaining our working environment in this ocean. There's still room for improvement.
4	Is the current crew size sufficient to handle waste management on board?	It is sufficient to handle waste management on ships.	It is sufficient because the crew on duty has been given their own schedule for waste management.	under certain conditions, especially when there are a lot of passengers, waste management becomes It's not optimal, right, because of limited time and energy. But we are trying to fulfill all of that, so that it remains optimal.
5	What is the condition and completeness of the sorted waste bins on the ship currently?	Quite good and clean	The condition is very well organized and has been running very smoothly.	For separate waste bins, it is in accordance with MARPOL Annex V regulations, and also waste bins are placed where there are many passengers.
6	Have there ever been a shortage of	There is never a shortage of trash	Once, like trash bags, we received them from	There has never been a shortage because there is always overstocking of garbage

	trash bags or other supporting equipment?	bags and other supporting equipment because the company always routinely checks for shortages of trash bags and other supporting equipment.	the office and sometimes there were delays in sending the trash bags, but now there is a lot of stock so there are no more delays for the trash bags.	bags, considering that they are not used. n lots of space and important for passenger ships.
7	Is the marking of waste types clear enough for passengers and crew?	It was quite clear to both passengers and crew.	It is very clear because there is a description for each trash can.	It should be clear enough because we use markings too, we also have different colors according to the type of waste.
8	How clear is the Garbage Management Plan SOP implemented on the ship?	It's quite clear because there are always briefings by the captain and the company.	It has been implemented and informed to all crew to implement waste sorting, for waste disposal, and an explanation has been given to passengers.	On the ship, for SOP, we use SOP based on Marpol Annex V Regulations, and it has been running quite optimally.
9	How often is socialization or briefing regarding the Garbage Management Plan carried out?	Every 2 weeks during safety meetings to discuss the socialization of briefings regarding GMP on ships	Every time before departure for passengers and for crew it is twice a month	Before the ship sails the crew gathers for a briefing and we explain the GMP SOPs again.
10	What is the condition and suitability of the equipment used for waste management on ships?	Quite good	For the tools and conditions, they are very suitable, if they are not suitable, we will immediately confirm this with the office.	The waste management tools are suitable for use, but some are starting to experience a decline in function so that... You are maintained and re-optimized by fulfilling the required stock.
11	What form of training does the company provide regarding ship waste management?	Monitor directly when the ship is docked regarding cleanliness and sorting plastic waste, glass waste and other hazardous waste.	Informed to work head 1 to inform all crew members	Through briefings and short directions
12	Does the company conduct regular evaluations of the implementation of the Garbage Management Plan by the ship's crew?	Every 2 weeks	Routine evaluations have been carried out, whether offline or online.	The company always carries out routine monitoring and evaluation of waste problems, records them, and revises them. iew, and re-socialize the evaluation results.
13	How does the company pay attention to the crew's performance in maintaining the cleanliness of the ship?	Quite regularly by monitoring any shortage of plastic trash bags and other equipment	Quite routine in monitoring the cleanliness of the ship	It's still not a top priority, but we continue to prioritize and monitor the performance of the ship's crew.
14	How does the company support	Quite good and regularly	The provision of facilities is very	The company regularly monitors the sorting facilities, ensuring their

	the provision of sorted waste bin facilities on ships?		adequate	completeness and suitability. before the ship sails to prevent damage or pollution during the voyage.
15	Is the company providing trash bags and other equipment regularly?	Once every 2 weeks according to requests from the ship's crew regarding shortages of existing equipment	Trash bags and other equipment are routinely provided by the office.	Procurement of trash bags and other equipment is carried out routinely with direct monitoring and backup. ung if there is a shortage, even overstocking, because garbage is constantly present on passenger ships.
16	What is the condition of the waste management facilities provided by the company?	It is quite good and orderly, regular checks are always carried out every month.	Very adequate and neatly arranged and information is provided in each trash can for dry trash, wet trash and non-biodegradable trash.	The waste management facilities are still functioning but are not yet fully optimal, so they require improvement. continuous quality improvement through review and search for solutions.
17	What is the company's policy regarding ship waste management?	By providing plastic bags and trash bins according to Marpol Annex V	It is emphasized to the crew to maintain the cleanliness of the ship and the cleanliness of the sea, and efforts are made to inform passengers to maintain cleanliness both inside the ship and in the sea area, it is prohibited to throw rubbish carelessly.	Company policy refers to Marpol regulations, which are then implemented and adapted to s specific situations and conditions on board to continuously improve management.
18	Does the company conduct direct monitoring of ships regarding the implementation of the Garbage Management Plan?	Every 2 weeks	For monitoring, sometimes twice a month, sometimes once, which is carried out by office management.	Always monitor directly, whether the implementation is in accordance with SOP or not
19	How does the company support the provision of waste management equipment on ships?	Very supportive and direct monitoring when the ship is docked	It is very good because it keeps the ship clean and the sea unpolluted.	It's optimal, we always coordinate with the ship. When the ship reports damage, the company immediately fulfills the report.
20	Does the company carry out routine maintenance on the waste management equipment?	Periodically, both those that are still good and those that are damaged	For equipment, maintenance is carried out every time cleaning is carried out on the ship, such as washing the trash bins so that they do not cause odors due to remaining trash that may be stuck to them.	Maintenance of waste management equipment is carried out by the ship's crew after use, and if there is damage or s If it runs out, land management will immediately provide backup.

Source: Researcher Data (2025)

Based on Table 2, the implementation of the Garbage Management Plan (GMP) on the ship has basically been running quite well because the crew understands the waste management procedures through regular captain briefings and company socialization, and is supported by the availability of sorted waste bins, waste bags, and other equipment that generally comply with Marpol Annex V provisions. However, in busy working conditions and busy passengers, the consistency of waste sorting decreases due to limited time and energy, some equipment begins to decline in function, and continuous monitoring of crew awareness is still needed, as well as maintenance and improvement of the quality of facilities.

The company has demonstrated its support through the provision of facilities, on-board monitoring, regular evaluations, and a waste management policy that adheres to regulations, including a system of stockpiling trash bags to ensure shortages are rare. Overall, waste management on board is quite good, supported by adequate policies and facilities. However, increased consistency of implementation during times of high workload and ongoing equipment maintenance are needed to optimize GMP implementation.

Data analysis

In addition to collecting data through direct observation on board the ship, the author also obtained information from interviews with the ship's crew and office staff and reviewed various relevant references regarding the garbage management plan. The collected data were then analyzed using a triangulation method to compare and verify the suitability of information from various sources, thereby obtaining an accurate picture of the implementation of waste management on board the ship. This analysis focused on identifying obstacles faced in implementing the garbage management plan and assessing the extent of the company's role in supporting its implementation, such as through the provision of facilities, policies, and supervision. The purpose of this analysis is to formulate appropriate steps so that the waste management system can run effectively, in accordance with applicable regulations, and sustainably. The following table presents the results of the data triangulation.

Table 3. Data Triangulation Table

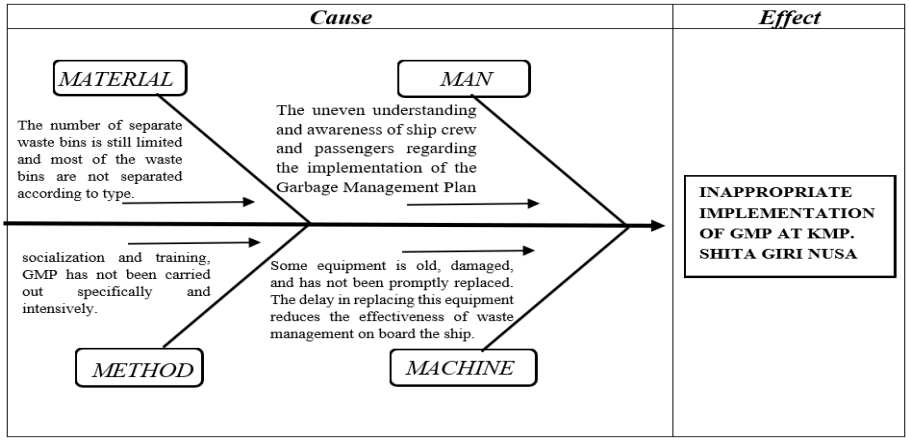
No	Indicator	Observation	Interview	Documentation
1	Crew's level of understanding	The crew's understanding of GMP is not yet optimal.	The crew's understanding of waste management procedures is quite good, due to regular briefings from the captain and outreach from the company before and while the crew is working.	No documentation in the form of photos or visual notes was obtained to support this indicator.
2	Consistency in implementing waste sorting during busy working conditions	When work is busy, only a few crew members collect garbage, so it is not optimal.	Under normal working conditions, waste sorting can be carried out effectively. However, when the workload increases, waste sorting consistency tends to decrease, although efforts are still made to prevent marine pollution.	Supported by documentation Figure 4 Collection of Waste After Loading and Unloading is Complete
3	Crew awareness of marine cleanliness	Still not enough because several times I saw the ship's crew throwing rubbish into the sea, especially in the anchorage area.	The crew's awareness of marine cleanliness is considered optimal, but still requires monitoring and supervision to maintain consistency.	No documentation in the form of photos or visual notes was obtained to support this indicator.
4	Adequate number of crew in waste management	It's enough if there is no other work that gets in the way.	The number of crew is generally sufficient to handle waste management, but in certain conditions, such as when there are many passengers, management becomes less than optimal due to limited time and manpower.	Supported by Appendix 1 Crew List
5	Condition and completeness of the sorted waste bins	There are only a few separate trash bins available and most of the trash bins are mixed.	The sorted waste bins on the ship are in good condition, clean and well-organized, and have been placed in strategic areas.	Supported by documentation Figure 4.4 Organic, Inorganic, and Recycling Waste Bins
6	Availability of trash bags and supporting equipment	The availability of trash bags is sufficient but there is a situation where the ship is short of trash bags.	In general, there is no shortage of trash bags due to routine checks and a reserve stock system, although there have been delays in procurement at certain times.	No documentation in the form of photos or visual notes was obtained to support this indicator.
7	Clarity of waste type marking for crew and passengers	It's quite clear, but there are still trash cans that don't have any markings, the colors	The marking of waste types is considered quite clear for the crew and passengers because there is different writing, color and marking on each trash	Supported by documentation of Figure 2 Organic, Inorganic, and

		are not different.	can.	Recycling Trash Bins and documentation of Figure 6 Trash Bins that do not have Trash Type Markers and Color
8	Clarity and understanding of the Garbage Management Plan SOP	There are no internal SOPs specifically for the KMP Shita Giri Nusa. The SOPs used on board are based on MARPOL Annex V regulations, which are quite optimal but need improvement.	The Garbage Management Plan SOP is considered clear and has been implemented, and socialized to the crew and passengers through briefings and instructions.	Supported by Appendix 2 Garbage Record Book
9	Frequency of socialization/briefing of the Garbage Management Plan	There has been no socialization or direction	GMP socialization and briefings are carried out routinely, both through safety meetings, briefings before sailing, and briefings to passengers.	No documentation in the form of photos or visual notes was obtained to support this indicator.
10	Condition and suitability of waste management equipment	It is quite adequate but there are some waste management tools that are damaged and take a long time to be replaced.	The tool is still usable, although some of it needs updating.	Supported by documentation Figure 3 Condition of Trash Can
11	Form and implementation of GMP training by companies	There hasn't been any during my sea practice	Training is provided in the form of briefings, direct instruction, and field monitoring, including the division of types of waste that must be sorted.	No documentation in the form of photos or visual notes was obtained to support this indicator.
12	Routine company evaluation of GMP implementation	Have conducted evaluations from company to ship but not specifically regarding GMP implementation	The company conducts regular evaluations, both directly and indirectly, to review the implementation of waste management on ships.	No documentation in the form of photos or visual notes was obtained to support this indicator.
13	Company attention to crew performance	In particular, performance in waste management has not received sufficient attention.	The company's attention to crew performance is considered quite routine, although it has not yet become a top priority, but monitoring is still carried out.	No documentation in the form of photos or visual notes was obtained to support this indicator.
14	Company support in providing separate waste bins	There are only a few separate trash bins available.	The company provides good and adequate support in providing sorted waste bin facilities and ensuring their suitability before the ship sails.	No documentation in the form of photos or visual notes was obtained to support this indicator.
15	Routine procurement of trash bags and equipment	It is quite routine for the procurement of garbage bags but for other equipment, there are still delays.	Procurement of trash bags and supporting equipment is carried out routinely with a monitoring system and stock reserves.	Supported by Appendix 3 of the Ship's Goods Requisition List
16	Condition of the company's waste management facilities	Actually the condition is good but if there is equipment that is damaged it will take a long time to replace it.	Waste management facilities are considered quite good and functional, but are not yet fully optimal and therefore still require quality improvement.	Supported by documentation Figure 3 Condition of Trash Can
17	Company policy regarding ship waste management	The company's policy for waste management is that the company collaborates with the	The company's policy refers to Marpol Annex V regulations and is applied according to the operational conditions of the vessel to improve waste	No documentation in the form of photos or visual notes was obtained to support

		port to provide waste bins at the port.	management.	this indicator.
18	Direct company monitoring of ships	During my sea practice there was no GMP monitoring on the ship	The company conducts regular direct monitoring to ensure that GMP implementation complies with applicable SOPs.	No documentation in the form of photos or visual notes was obtained to support this indicator.
19	Company support in providing cleaning equipment	It's good enough for providing cleaning tools	The company's support for the provision of waste management equipment is considered very good, with a quick response in the event of damage or shortages.	Supported by documentation Figure 5 Cleaning Tools
20	Routine maintenance of waste management equipment by the company	Not routine enough because damaged cleaning equipment is not quickly replaced	Maintenance of waste management equipment is carried out periodically by the crew, with company support in providing replacements or repairs if necessary.	Supported by documentation Figure 3 Condition of Trash Can

Based on data triangulation in Table 3, GMP implementation on board has been implemented but is not optimal and consistent. Crew understanding is quite good through routine briefings, but consistency in waste sorting decreases during busy work hours, awareness of marine cleanliness remains low with the practice of throwing waste into the sea, and waste management facilities are adequate despite the limited number of sorting bins and slow equipment replacement. Company support is available through policies and facilities, but there is a lack of written documentation and direct supervision during sea practices. Therefore, increased consistency, supervision, and documentation are needed for more optimal and sustainable waste management, with classification of problem causes using a Fishbone Diagram.

Fig. 7. Fishbone Diagram of Inhibiting Factor Analysis



Source: Researcher Data (2025)

In this study, researchers also used the fishbone analysis technique, identifying several factors that contributed to the inadequacy of the Garbage Management Plan implementation at KMP Shita Giri Nusa.

1. ***Man*(Ship's crew)**

Passengers play a role in hindering the implementation of GMP because they do not yet fully have awareness and understanding of the impact of marine pollution and based on the results of data triangulation, the inhibiting factor from the Man aspect is seen in the unequal understanding of the crew and passengers regarding the implementation of the Garbage Management Plan. Although interviews indicate that crew members generally understand waste management procedures, observations still found the practice of dumping waste into the sea. In addition, under busy work conditions, crew involvement in waste management tends to decrease because the main focus is shifted to service and ship operations. This indicates that the understanding has not been fully translated into consistent work behavior.

2. ***Machine*(Cleaning tool)**

The inhibiting factor in the Machine aspect relates to the condition and suitability of waste management equipment. Observations and interviews indicate that waste management equipment is generally still suitable

for use, but some equipment is old, damaged, and has not been promptly replaced. Delays in replacing these equipment have the potential to reduce the effectiveness of waste management on board ships. Although documentation supports the existence of these equipment, the equipment's suboptimal condition is one of the obstacles to GMP implementation.

3. ***Method*(Work Systems and Procedures)**

From a method perspective, the Garbage Management Plan SOP is in place and refers to MARPOL Annex V and has been disseminated through briefings and training. However, the implementation of this method is not yet fully consistent in the field, especially during busy working conditions. The company stated that socialization, training, monitoring, and evaluation have been carried out, but these are not always directly felt during offshore practices, so the implementation of GMP has not been optimal and sustainable.

4. ***Material*(Supporting Equipment)**

From a materials perspective, inhibiting factors include the limited and inadequate distribution of supporting equipment, particularly segregated waste bins and trash bags. Observations indicate that the number of segregated waste bins is still limited, and most trash bins are not separated by type. Furthermore, although trash bag procurement is considered fairly routine, shortages have occurred due to delays in supply. This indicates that the availability of GMP supporting materials is not yet fully stable and optimal.

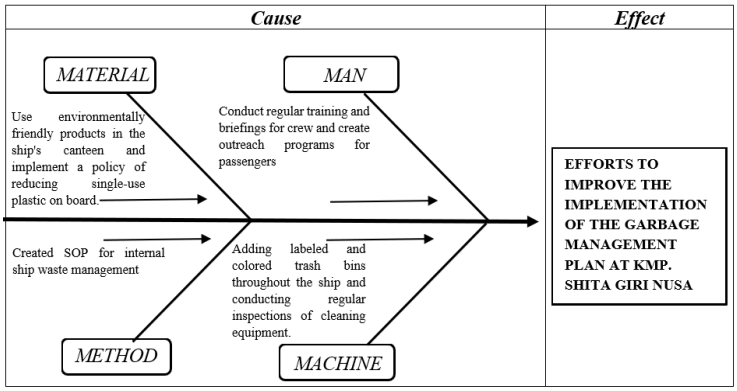


Fig 8. Fishbone Diagram of Efforts to Improve GMP Implementation

Source: Researcher Data (2025)

Based on the problems identified previously, several relevant solutions can be formulated. These problems also have several impacts, including the following:

1. ***Man*(Ship's crew)**

Crew and passenger awareness needs to be increased through regular training, interactive outreach, and the implementation of a reward and penalty system. Regular evaluations are also crucial to maintain discipline in waste management.

2. ***Machine*(Cleaning tool)**

Highlighting the need for additional labeled trash bins, expanding temporary storage areas, and procuring portable incinerators or trash compactors. Regular inspections of sanitation facilities are essential to ensure optimal equipment function.

3. ***Method*(Work Systems and Procedures)**

Establishing Standard Operating Procedures (SOPs) within the ship's internal operations, regular internal audits, and scheduled training are necessary to ensure consistent GMP implementation. Daily checklists can also help crew ensure each step is being implemented.

4. ***Material*(Supporting Equipment)**

Focusing on reducing single-use plastics and increasing the use of environmentally friendly materials. Providing recycling containers and educating logistics suppliers is crucial to reducing the volume of non-recyclable waste.

IV. DISCUSSION

*Garbage Management Plan*is a complete guideline that includes written steps for collecting, storing,

processing and disposing of waste generated on board ships in accordance with the regulations as stated in Annex V of MARPOL. Based on Annex V of Presidential Regulation of the Republic of Indonesia No. 29 of 2012, specifically Regulation 9 number (2), it is stated that every ship with a gross tonnage of 400 or more, and every ship certified to carry 15 or more persons, must carry a waste management plan that must be adhered to by the crew. This plan must provide written procedures for the collection, storage and disposal of waste, including the use of equipment on board. It must also apply to the people tasked with implementing the plan. The plan must be in accordance with the Organization's guidelines and written in the working language of the crew.

Factors Inhibiting Implementation*Garbage Management Plan*

Based on the results of observations, interviews, data triangulation, and fishbone analysis presented in the previous section, several key factors hindered the implementation of the Garbage Management Plan (GMP) at KMP Shita Giri Nusa. These obstacles stemmed from the elements of Man, Machine, Method, and Material.

1. Man Factor (Crew)

Based on the results of data triangulation, human resource factors are one of the main obstacles in the implementation of the Garbage Management Plan on ships. Although the results of interviews indicate that crew members generally understand waste management procedures, observation findings show that this understanding has not been consistently implemented in the field. And passengers also play a role in hindering the implementation of GMP because they do not fully have awareness and understanding of the impact of marine pollution. This is evident from the behavior of passengers still throwing garbage into the sea and the less than optimal implementation of SOPs from Marpol Annex V by all crew members. In addition, during busy work conditions, crew involvement in waste management tends to decrease because the focus of work is directed more towards other operational tasks. This condition indicates a gap between understanding and practice, which has an impact on the less than optimal implementation of GMP.

2. Machine Factor (Cleaning Equipment)

The inhibiting factor in terms of facilities and equipment is evident in the suboptimal condition of waste management equipment. Based on observations and interviews, waste management equipment is generally still suitable for use, but some equipment is old, damaged, and has not been promptly replaced. Delays in replacing these equipment have the potential to reduce the effectiveness of waste management on board ships. Although documentation indicates the presence of waste management equipment, the equipment's suboptimal condition is one of the obstacles to maximizing GMP implementation.

3. Method Factor (Work Systems and Procedures)

From a methodological perspective, obstacles to GMP implementation are related to the suboptimal implementation of SOPs and supporting waste management activities. Data triangulation indicates that GMP SOPs are available and generally understood, but their implementation in the field has not been optimal. This is reinforced by the finding that GMP socialization and guidance have not been carried out specifically and intensively, and tend to be combined with briefings or general operational activities. Furthermore, GMP training, evaluation, and monitoring by companies have not been carried out in a focused manner, resulting in less effective oversight of GMP implementation on ships. This condition results in waste management methods not being sufficiently strengthened to ensure consistent implementation.

4. Material Factors (Supporting Equipment)

From a material perspective, obstacles to GMP implementation relate to the limited and unstable availability of supporting equipment. Data triangulation results indicate that the number of segregated waste bins on board ships is still limited, resulting in most available bins not being fully segregated by type. Furthermore, although waste bags are routinely procured, shortages have occurred due to delays in supply. This situation indicates that the availability of supporting materials for waste management is not yet fully consistent, impacting the effectiveness of waste sorting and management on board ships.

The Role of Companies in Supporting the Implementation of the Garbage Management Plan

Based on the results of triangulation of data obtained through observation, interviews and documentation, the role of the company in implementing...*Garbage Management Plan*While the waste

management system on board is already visible, it has not yet been implemented optimally. The company has provided support by providing waste management facilities, cleaning equipment, and regular trash bags. Furthermore, the company's waste management policies are also considered to support the implementation of GMP on board, as evidenced by field documentation on several indicators.

However, observations and interviews indicate that the company's role still has several limitations. GMP-related socialization, training, evaluation, and monitoring have not been carried out specifically and continuously, but ratheris still integrated with general operational activities. This situation results in a lack of direct supervision of GMP implementation in the field. Furthermore, the limited number of sorted waste bins and the delay in replacing damaged equipment indicate that company support is not yet fully consistent. Thus, although the company has played a role in supporting waste management on board ships, data triangulation results indicate that this role still needs to be strengthened, particularly in the aspects of monitoring and following up on the implementation of the Garbage Management Plan.

V. ICONCLUSION

This study found that the implementation of the Garbage Management Plan (GMP) on KMP. Shita Giri Nusa has generally been quite good, supported by the crew's understanding of Marpol Annex V procedures, the availability of basic facilities such as segregated waste bins and cleaning equipment, and the company's role in procuring equipment and routine monitoring. However, the main inhibiting factors from the human aspect (uneven awareness among crew and passengers), machine (broken equipment and delays in replacement), method (inadequate socialization and GMP training), and material (limited number of segregated waste bins) resulted in low consistency during busy working conditions, potentially increasing waste pollution in the Lombok Strait. Research limitations include a descriptive qualitative approach with a purposive sample limited to one vessel and a sea practice period, making the results difficult to generalize to other vessels or external conditions such as port regulations.

For further research, it is recommended to adopt a multi-vessel comparative quantitative design with broader triangulation including long-term Garbage Record Book data, to measure the effectiveness of GMP interventions. Practically, the implications of this research encourage companies to develop specific internal SOPs, conduct routine Fishbone-based training, add labeled facilities, and implement sanctions and rewards for crew and intensive socialization to passengers, thereby supporting the sustainability of the maritime environment in accordance with Marpol and significantly reducing marine debris.

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