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## Study of Waste Management Strategy at the Mayangan Coastal Fisheries Port UPT Case Study of MYG+ Innovation (Mayangan Waste Management)

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### Abstract

Indonesia's oceans as the heart of the Coral Triangle face a serious threat from anthropogenic pressure in the form of plastic waste pollution in coastal areas. The Mayangan Coastal Fisheries Port (PPP) is one of the epicenters of complex waste flows from land and sea activities. As a solution, MYG+ innovation, a community-based holistic upstream waste management model and circular economy is implemented. This study aims to analyze the reduction in the volume of waste around the Mayangan PPP after the implementation of MYG+, examine the response of fishermen, and evaluate the success rate and recommendations for improvement. The research method uses a qualitative and quantitative descriptive approach (mixed-methods) through the principle of holistic management. Waste volume data was analyzed comparatively before and after the program, while fishermen's response and success rate were evaluated through field surveys. The results show that MYG+ innovation significantly reduces the volume of waste in port areas through efficiency of prevention upstream and strict sorting downstream (composting and recycling). This reduction in pollution burden directly contributes to improving water quality, restoring ecosystems (coral reefs and seagrasses), and increasing fish populations. Socially, this program received a positive response and encouraged a change in less-waste behavior from the fishing community. This study concludes that the MYG+ model is effective as a best practice for integrated coastal area management. The implications of this study provide an empirical contribution to the community-based waste management literature as well as a guide for policymakers to replicate similar models in other fishing ports in Indonesia.

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### 1. Introduction

The ocean is the lifblood of planet earth. Since ancient times, human civilization has grown and developed around coastal areas, taking advantage of all the riches and conveniences provided by marine ecosystems. The Indonesian ocean as the heart of the Coral Triangle and the owner of the highest marine biodiversity in the world, is a national and global strategic asset (Hutagaol, 2025) <sup>[1]</sup>. Coastal ecosystems such as mangroves, coral reefs, and seagrass meadows act as life supports, fisheries supports, carbon sequesters (blue carbon), and natural protectors from abrasion. Nowadays the waves of modernization and the economy have changed the face of the coast. Industrialization, urbanization, and rapid population growth in coastal areas have resulted in an enormous pollution burden. In recent decades the symbiotic relationship of mutualism between humans and the sea has begun to falter. The anthropogenic pressures of man-made activities have carried a very heavy burden of pollution, especially plastic waste has become a real global enemy. According to Fabianto and Berhita (2014) <sup>[2]</sup>, this activity not only focuses on the use of

fish resources but also includes the protection of coastal ecosystems. Waste management is an inseparable part because it is directly related to the health of the aquatic environment.

According to the MYG+ Monitoring and Evaluation Report (2024), innovation (MYG+) places waste management as an entry point in building a more comprehensive coastal resource management system. MYG+ innovation applies a waste management approach from upstream to downstream. At the upstream stage, prevention efforts are carried out by reducing waste generation from the source. The public is invited to use reusable containers and reduce single-use packaging. At the downstream stage, the collected waste is processed through strict sorting. Organic waste is processed into compost while inorganic waste is recycled into new products. The positive impact of the implementation of MYG+ innovation can be seen in improving the quality of the coastal water environment, namely water quality shows a decrease in pollution levels around the port area, marine ecosystems such as coral reefs and seagrass beds show better

conditions, and fish populations around port waters have also experienced a significant increase. This indicates that. Good waste management contributes directly to the restoration of coastal ecosystems. MYG+ innovation in this study is expected to be more than just an ordinary hygiene program. This innovation is expected to be able to become an integrated model designed to handle waste from upstream to downstream in a participatory manner. The name "MYG+" itself may be an acronym that reflects the local identity of Mayangan (MYG) with added value that signifies a more comprehensive, innovative, and value-added approach. The Technical Implementation Unit of the Mayangan Coastal Fisheries Port (UPT PPP), which is strategically located on Jl. Peportuhan Perikanan No. 1 Mayangan, Probolinggo City, East Java, plays a central role as the largest fishing port in the Madura Strait area. Standing about 2 km from the center of trade, services, and offices in Probolinggo City, this port is an important node in the distribution chain of marine products and a provider of various fisheries-related services.



Fig 1: Mayangan Port

UPT PPP Mayangan has an ambitious vision: "Towards a fishing port with an orientation of investment services and educational tourism". This vision shows that UPT PPP Mayangan not only functions as a fisheries economic center, but also seeks to develop its potential as a maritime investment and education destination. Various work units in it, such as the Governance and Business Services Section and the Port Technical Services Section, support a variety of operational activities, ranging from ship licensing services, ship administrative and physical inspections, to handling superior catch products such as premium red snapper and valuable seats. The daily activities at these ports, including fish landings, moorings and fish marketing, naturally produce significant volumes of solid and liquid waste.

According to (Mayor of Probolinggo, 2017)<sup>[3]</sup>, the Mayangan Coastal Fisheries Port (PPP) has an area of 41.63 Ha and the main facilities consist of: a pier with a length of 1,720 m, a mooring length of 729 m and a port pond area of 20.05 Ha. Mayangan Port is directly adjacent to PT. Kutai Timber Indonesia in the west, BeeJay Bakau Resort in the south and Java Sea in the north. Referring to (Governor of East Java, 2018)<sup>[4]</sup>, UPT PPP Mayangan is a port under the direct auspices of the East Java Provincial Marine and Fisheries Service which has the main task and function of carrying out

some of the technical tasks of the office by extension to the field of coastal fishing port technical services, business governance and services, as well as administration and community services.

The number of ships at the Mayangan PPP UPT has increased in 2022 by approximately 1200 with the number of fishermen and workers around 4500 (Prasetyowati *et al.*, 2017)<sup>[5]</sup> with the number of fishermen on ships carrying out unloading activities of 500 people. According to Polin *et al.* (2025)<sup>[6]</sup>, the types of fish landed at Mayangan Port include Manyung Jahan (*Netuma thalassinus*), Layur (*Trichiurus lepturus*), Red Snapper (*Lutjanus sp.*), Kwe (*Caranx ignobilis*), and Anggoli (*Pristipomoides multidens*).

In environmental pollution, especially for soil pollution, plastic materials are organic materials that cannot be decomposed by bacteria (Rohana Nasution *et al.*, 2018)<sup>[7]</sup>. The plastic waste can be reused by recycling and being used as a new product. Many efforts to manage plastic waste recycling have been carried out by the government, such as by providing garbage cans that have been broken down into several categories of waste (wet waste and dry waste). However, this strategy still does not provide significant results in reducing the amount of plastic waste. In other words, the current management is not fully effective. There

are still many people who throw waste not based on the category of waste.

(El Haq *et al.*, 2024) <sup>[8]</sup> describes that there are 9 types of waste including plastic waste, plastic foam, fabric, glass, metal, paper, rubber, wood, and other materials. Generally, waste at the Port is like waste that comes from anthropogenic activities on land or carried by rivers to the sea which is then washed back to the mainland. Furthermore, waste can come from tourism activities, fishing activities, or garbage from the sea stranded by waves (Zahra *et al.*, 2024) <sup>[9]</sup>. It is estimated that waste production at PPP Mayangan can reach at least 2 pick-up car transportation. The amount of garbage that accumulates in the port can result in several negative impacts including port pollution that has an impact on the environment marked by a pungent smell due to the existence of stagnant waste, piles of garbage in the port environment which result in a reduction in the aesthetics of the port environment, and have the potential to disrupt ship traffic. Waste management policies have also been regulated in the Law of the Republic of Indonesia in 2018 concerning Waste Management. In the law, it is said that managers of public facilities are obliged to provide waste sorting facilities. The port only has a Temporary Waste Disposal Site and does not have a sorting facility. In accordance with Law No. 8 of 2008, waste management includes waste reduction and handling. For waste handling activities, the Port must carry out a

cleanliness program but has not implemented waste reduction efforts through 3R (Reduce, Reuse and Recycle) activities (Rijulvita *et al.*, 2023) <sup>[10]</sup>.

The idea of the MYG+ Innovation started from the anxiety about waste that accumulates and is neglected, the idea of processing waste into objects with selling value emerged. This innovation is proposed from the end of 2023 and will begin to be implemented in 2024. The dissemination of information about this innovation has been carried out periodically from 2024 to service users/agencies/ship owners (Waluyo, 2025) <sup>[11]</sup>. Mayangan Innovation Waste Management (MYG+) is one of the innovations of the Mayangan PPP UPT and will be the 25 regional innovations of the East Java Provincial Marine and Fisheries Service in 2024. MYG+ focuses on three main pillars: Reduce, Reuse, and Recycle. The three pillars are in line with the affairs of the government under its authority, especially in terms of:

1. The implementation of cleanliness and waste management where this innovation helps reduce the volume of waste and improve sustainable waste management.
2. Helping to maintain public health by reducing environmental pollution due to waste.
3. Help preserve the environment by reducing waste and encouraging recycling.



Fig 2: MYG+ Innovation Poster

MYG+ is an example of regional innovation that is in accordance with government affairs under its authority, namely environmental management. This innovation is also an example of public service innovation that improves the quality of services to the community, especially fishermen, traders, and the community around the port. Good local governance is also seen in the implementation of MYG+,

where various parties are involved and work together to achieve the same goals.

## 2. Research Method

Waste management has evolved from a conventional model that focuses only on transport and disposal, to a more integrated and sustainable approach. The integrated approach

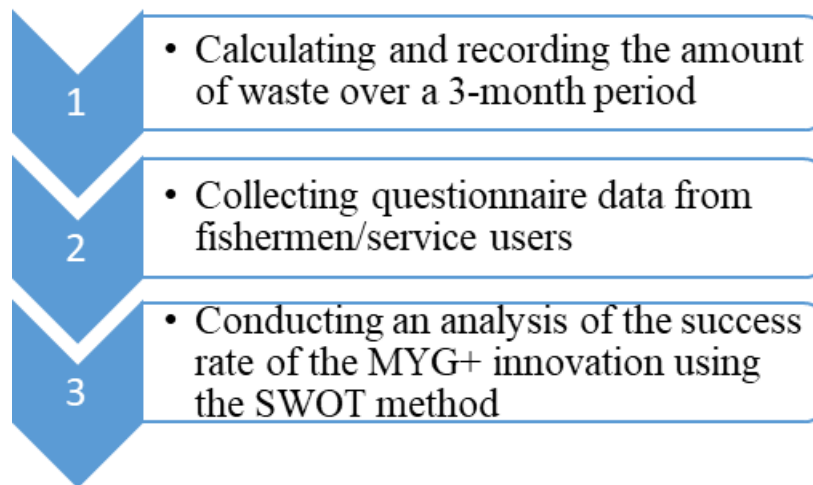
emphasizes the importance of integrating four key pillars, namely: strengthening institutional and policy frameworks, adequate infrastructure development, increased active participation of all stakeholders, and consistent law enforcement. The theoretical foundation of this approach is the 3R (Reduce, Reuse, Recycle) principle. This principle emphasizes that waste reduction, reuse, and recycling are effective steps in addressing the waste problem.

Another study (Sutisna *et al.*, 2025)<sup>[12]</sup> at the Karangantu VAT focused on a review of waste management policies and their implications for ports. This study uses a qualitative approach with descriptive analysis methods and field observations. The main finding is that the Karangantu VAT does not yet have specific regulations governing waste management. As a result, waste management is still carried out conventionally due to limited resources and low community participation. The high volume of waste from the activities of fishermen, traders, and service users demands sustainable partnership-based solutions. This condition shows the failure of the approach The Sajameh Waste Bank initiative at the Bungus Fisheries Port offers concrete examples of collaboration-based solutions (Yuwono, 2025)<sup>[13]</sup>. Based on the available reports, this Waste Bank has succeeded in reducing the flow of waste into the sea through management at the port. This model includes education on the impact of waste and the separation of economically valuable waste. Although details of specific mechanisms and outcomes are not available in the

existing materials, the success of this initiative shows that community-based approaches and circular economies can be effective models. The existence of this initiative provides an initial empirical basis for validating the partnership-based approach recommended in the research in Karangantu and the nationally proposed integrated model.

Collectively, previous studies have succeeded in mapping the landscape of waste management problems in fishing ports. The study in Karangantu successfully diagnosed institutional and policy problems, the study in Muara Angke managed to measure the volume of waste and identify the paradox between knowledge and practice, while the initiative in Bungus demonstrated the potential for community-based solutions. However, there is one fundamental gap that has not been filled: there has been no research that has specifically evaluated an integrated strategy that has been systematically implemented. Most studies are diagnostic-descriptive or report on initiatives anecdotally, without in-depth analysis of their implementation.

This research is uniquely positioned because it focuses on the case study of a concrete solution: MYG+ innovation. This shifts the focus of research from identifying problems to analyzing how an innovative solution works in the field. Thus, this research will not only contribute to the understanding of the problem, but also to the evaluation of implementation, which is crucial for more effective policy formulation and replication elsewhere.



**Fig 3:** Research Flow

This research was carried out at PPP Mayangan, Probolinggo City in June – June 2025 and was carried out in the area of the Technical Implementation Unit of the Mayangan Coastal Fisheries Port (UPT PPP), which is located in Probolinggo City, East Java Province. The selection of this location is purposive, considering that UPT PPP Mayangan is a node of dense fishery activities on the north coast of East Java and has implemented MYG+ innovation as the main case study. The implementation of the research was carried out during June 2025, this period was strategically selected with several methodological considerations. The month of June is generally in the period of the relatively high fish landing

season at the Mayangan PPP UPT, so that port activities and waste generation can be observed under normal and representative operational conditions.

This study uses the SWOT method to analyze the success of MYG+ innovations. One of the approaches that can be used as an instrument in the selection of basic strategies is through SWOT analysis. SWOT analysis is the systematic identification of various factors to formulate an organizational strategy. This analysis is based on a logic that can maximize strengths and opportunities, but at the same time can minimize weaknesses and threats (Wiswasta *et al.*, 2018)<sup>[14]</sup>. SWOT Matrix (Sulianta, 2024)<sup>[15]</sup> in Figure 4.



Fig 4: SWOT Chart

The selection of SWOT analysis as the core method in this study is not a coincidence or simply a popular choice of instrument, but is based on epistemological suitability and deep strategic needs. This research focuses on the evaluation of an innovation program that has been implemented (MYG+), so it requires an approach that is not only able to describe the conditions but especially analyze the strategic position of the program in its internal and external contexts. The SWOT analysis was chosen because of its unique ability to provide a systematic and holistic framework to achieve those goals. In contrast to pure statistical analysis methods that may only answer "what" and "how much", SWOT is designed to answer the "why" a condition occurs and "how" to design the next step based on that overarching understanding.

Methodologically, SWOT analysis serves as a very powerful data synthesis and integration tool. This research collected diverse data, ranging from quantitative data on waste volume and questionnaire scores to qualitative data from in-depth interviews. The SWOT analysis becomes a frame where all the fragmented findings are put together, classified, and given strategic meaning. Strengths and Weaknesses are the result of an in-depth diagnosis of the program's internal conditions, such as operational effectiveness, user satisfaction, and

resource quality. Meanwhile, Opportunities and Threats are obtained from an analysis of external factors, such as the social dynamics of the fishing community, broader policy support, environmental pressures, and potential partnerships. This classification enables researchers to see not only the symptoms, but the root causes and constellations of factors that influence the success of MYG+.

3. Results and Discussion

3.1. Total Daily Volume of Waste at Mayangan Port Landfill

The measurement of the total waste volume is carried out at the Mayangan Beach Port Landfill every day from Monday to Friday from 10.00 to 11.00 after the waste is collected. The following waste volume measured from June 2, 2025 to August 29, 2025 is presented in the form of a graph. The MYG+ innovation is a new innovation at the Mayangan PPP UPT (there has been no data on the weight of waste before), so it is hoped that this innovation will help overcome the waste problem at the Mayangan Beach Fisheries Port. From the graph in Figure 5, it is known that the trend of the amount of waste has increased on weekends. It is shown by the weight of the scales that increases significantly every Monday.

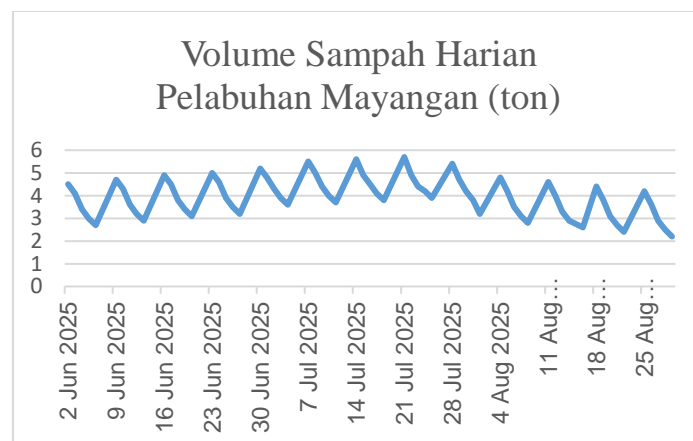


Figure 5. Daily Waste Volume per Ton

The data collection is based on the assumption that the scales in the landfill receive and record all waste produced from the port area, including land waste (offices, markets) and marine debris brought by fishermen. Consistency of measurement times (Monday-Friday 10:00-11:00) is a good step to minimize variation, but it needs to be acknowledged that waste transported outside of those hours is not recorded in the data. Second, the statement that MYG+ is a new innovation so that "there has been no data on the weight of waste before" actually leaves a major methodological challenge. The absence of valid baseline or comparative data from the period before the program (pre-implementation) makes the causality claim "MYG+ helps solve the waste problem" very difficult to measure scientifically. Without comparative data, the decrease or increase in the volume of waste cannot be expressly attributed to the program; Fluctuations can be caused by seasonal factors, changes in economic activity, or consumption patterns.

Third, the observation of the trend of increasing the weight of waste every Monday associated with the weekend is an interesting preliminary finding and deserves further study. This pattern most likely reflects the accumulation of activity over two days (Saturday and Sunday) in which port operations, especially fish unloading activities and worker attendance, may still be running but with different intensity

of hygiene management. This significant increase every Monday indicates two things: (1) Garbage continues to be generated significantly over the weekend, and (2) The final collection or stockpiling mechanism during the weekend may not operate optimally, leading to a new accumulation recorded on Monday. The findings of this weekly cycle pattern, while preliminary, have provided valuable insights. This pattern has the potential to be a proxy or indirect indicator for estimating the relative contribution of waste from land-based activities (which may decrease drastically on weekends) versus waste from marine activities carried by ships (which may remain constant if fishers remain at sea). A more in-depth analysis of the composition of waste on Mondays than on other days of the week can test this hypothesis and provide a clearer picture of the main sources of port waste.

**3.2. Analysis of the success and recommendations for improvement of MYG+ innovation**

The MYG+ program shows significant internal strength, especially in building social legitimacy and positive perceptions among the respondents, who are essentially fishermen as the main actors. The first strength lies in universal (100%) support for the sustainability of Innovation.

**Table 1:** Diagram SWOT Inovasi MYG+

<p><b>Strengths</b></p> <ol style="list-style-type: none"> <li>1. Full program continuation support (Q8 and Q9)</li> <li>2. Recognized ecological benefits (Q6 and Q7)</li> <li>3. Rules considered easy (Q10)</li> <li>4. Real cleanliness impact (Q5)</li> </ol>	<p><b>Weaknesses</b></p> <ol style="list-style-type: none"> <li>1. Low awareness (Q1)</li> <li>2. Minimal goal understanding (Q2)</li> <li>3. Limited mechanism knowledge (Q4)</li> </ol>
<p><b>Opportunities</b></p> <ol style="list-style-type: none"> <li>1. High personal responsibility (Q9)</li> <li>2. Effective socialization (Q15)</li> <li>3. Adequate facilities (Q16)</li> <li>1. Incentives are quite motivating (Q14)</li> </ol>	<p><b>Threats (External Threats)</b></p> <ol style="list-style-type: none"> <li>1. Low active participation (Q11 and Q12)</li> <li>2. Program misinterpretation (Q3)</li> <li>2. Reliance on incentives (Q4)</li> </ol>

In the context of public policy, especially waste management involving community participation, this kind of full support is a very valuable social capital and is often a determining factor for the long-term success of a participatory program (Sitoresmi & Karmilah, 2025) [16]. The second strength is the recognition of ecological benefits that also reach 100%. Respondents unanimously realized that these innovations were beneficial to the preservation of the marine ecosystems where they made a living. This awareness transforms the program from a mere external obligation to a collective investment in maintaining their productive resources, thereby increasing intrinsic motivation. Third, the ease of the rules felt (100%) is a critical factor. In the implementation of programs in the field, procedural complexity is often a major obstacle. The fact that all respondents rated the MYG+ rules as easy to follow shows that the program design has taken into account the capacity and operational context of the user, namely fishermen. Finally, a positive perception of the impact of cleanliness (97% agree the port is becoming cleaner) provides real performance validation. These tangible results strengthened respondents' confidence in the effectiveness of the program and built a success narrative that could encourage wider participation.

Behind the power of perception, the MYG+ program faces fundamental weaknesses that have the potential to undermine its sustainability if not addressed. The most fundamental

weakness is the very low level of awareness, where only 24.2% of respondents have heard of the program before. This condition reflects the possibility of failure or limitations in the initial socialization stage, so that the program operates in publication conditions that are not optimal. This phenomenon is in line with the challenges that community-based environmental initiatives often face, where suboptimal dissemination of information can limit the reach and impact of programs in the first place. This weakness is exacerbated by a minimal understanding of the purpose (19.4%) and limited knowledge of the mechanism (30.6%). This low understanding indicates that the information circulating may not have touched the essence or how the program works, thus creating a deep knowledge gap between the manager and the target participant. This gap can be a critical barrier, as the literature on community empowerment emphasizes that the success of collaborative programs is highly dependent on the mutual understanding and ownership of the affected parties, in this case the fishing community. The direct consequences of this weakness manifest in the low level of active participation. Of the 31% who routinely bring waste ashore to be handed over, only about 24% increasingly emphasized that fishermen lack active participation in terms of waste management. This disparity between awareness, understanding, and real action corroborates the findings of a variety of similar programs, where active and sustained

participation is often the toughest challenge (Riyanto & Kovalenko, 2023)<sup>[17]</sup>, although certain incentives have been provided. These challenges are exacerbated by the complexity of Indonesia's coastal ecosystem with thousands of islands and ports, which requires a highly decentralized and contextual approach to socialization and mobilization.

The MYG+ program has some great opportunities to grow by leveraging positive external assets and conditions. The first is a high sense of personal responsibility (100%) to maintain the cleanliness of the sea. This intrinsic value is a very strong capital that can be explored more, by juxtaposing the MYG+ program as a concrete solution to realize this responsibility. The second opportunity is the effectiveness of socialization which is recognized by 83.4% of respondents who are aware of the program. This indicates that the method or channel used has been shown to work well for affordable segments. This opportunity can be exploited by scaling and replicating the socialization model to reach the 75.8% of the untouched population, while deepening the material to improve understanding. Third, the availability of facilities that are considered adequate by 77.6% of respondents is an operational opportunity. Good facilities reduce the technical barriers to participating. Trust in these facilities can be used to encourage increased frequency of use, for example by linking it to the ease of waste handover. Finally, incentives that are considered quite motivating by 61.2% of respondents open up opportunities to design a more differentiated reward system. Incentives are not only material but can be developed into a form of non-material recognition (such as certificates or awards) that are in line with efforts to build a positive image of the fishing profession, which is also recognized by 100% of respondents as a benefit of the program.

Several serious threats lurk and can hinder the achievement of the objectives of the MYG+ program. The most crucial threat is the program's scope which is still very limited due to low awareness. The result is that MYG+ Innovation is only run by a handful of fishermen who are aware of the importance of protecting the environment, so that they are not able to create systemic and normative changes at the community level. The implementation gap between waste sorting and delivery is a direct operational threat. If left untreated, this can lead to an accumulation of sorted waste on ships that may eventually be dumped back into the sea due to the lack of a practical disposal mechanism, making the program worse. The third threat is the misinterpretation of the program, where 43.6% of respondents do not see the link between MYG+ and the management of marine and port debris. This misperception can lead to passive rejection or indifference, as people don't see the relevance of the program to their context. Finally, there is the threat of dependence on incentives. Although it is currently considered sufficient, focusing on material incentives risks shifting participation motivation from intrinsic value (protecting the environment) to extrinsic (getting rewards). If at any point incentives are reduced or stopped, participation can plummet drastically, threatening the sustainability of the program. An ideal waste management program involves the participation of all parties (government, business actors, and communities) in a sustainable ecosystem, not just relying on one driving factor.

## 5. Conclusion

MYG+ innovation has succeeded in building a system for recording the volume of daily waste that did not exist before. The data shows a consistent pattern of fluctuations, with the

peak of garbage generation occurring every Monday indicating an accumulation of activity over the weekend. Although the decline claims have not been statistically proven due to the absence of baseline data prior to the program, the existence of this routine data itself is a fundamental achievement. The data proves that MYG+ has initiated measurable waste management at the port, where previously waste only accumulated without being managed. Forming and training "MYG+ Ambassadors" from fishermen who have been active and influential to conduct peer-to-peer education so that the message is more contextual and trusted. Simplifying the flow of participation into very practical steps, supported by visual guides (pictograms) installed on docks and ships.

Upgrade and redistribute waste collection points to make them more accessible from fishing and mooring areas, and provide temporary storage containers on board that are waterproof and practical.

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