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ESTIMATION OF WASTE AND ITS MANAGEMENT STRATEGIES IN THE MODERN FISH MARKET OF MUARA BARU JAKARTA

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ABSTRACT

Modern Fish Market is one of the main fish marketing and culinary tourism centers located in Muara Baru, Jakarta, specifically within the Nizam Zachman Ocean Fishing Port area. The market faces environmental challenges related to solid waste, particularly the mismanagement of inorganic waste. This study aims to estimate the amount and economic value of waste produced, compare existing waste management practices with SNI-19-2454-2002, and formulate appropriate waste management strategies for Modern Fish Market. The research was conducted using a case study approach, and respondents were selected through accidental sampling and purposive sampling techniques. Data were analyzed using descriptive analysis, gap analysis, and SWOT analysis. The results showed that waste generated from fish marketing activities at PIM consisted of 3.95% organic waste and 96.05% inorganic waste, with the economic value of inorganic waste reaching Rp1,559,000 per day. In terms of waste management, two aspects were found to be inconsistent with SNI-19-2454-2002. Six strategies were recommended to improve waste management at Modern Fish Market, with priority actions including the preparation of technical guidelines aligned with SNI-19-2454-2002 and expanding cooperation with recycling industries.

Keywords: *recycling, organic waste, inorganic waste, SNI-19-2454-2002, Nizam Zachman*

INTRODUCTION

The Modern Fish Market (Pasar Ikan Modern – PIM) is a center for fish marketing and culinary tourism located in Muara Baru, Jakarta, specifically within the area of the Nizam Zachman Oceanic Fishing Port (Pelabuhan Perikanan Samudera Nizam Zachman). PIM is managed by PT Perikanan Indonesia (PERINDO), Jakarta branch, and has significant revenue potential, estimated at around IDR 5 billion per year (Solihin *et al*. 2020). The primary goals of establishing PIM are to increase fish consumption among the residents of Jakarta and its surroundings, to provide a comfortable and clean marketplace that meets sanitation and hygiene standards, and to ensure the availability of high-quality, safe-to-consume, continuous, diverse, and affordable fish. Furthermore, PIM aims to develop a hub for fisheries business and its supporting industries, to serve as a promotional and educational venue for the marine and fisheries sector, and to become a tourism destination for the marine and fisheries industry (Hidayanto 2019).

Given the substantial business potential in the fisheries sector, it is essential to support it with the implementation of proper sanitation and hygiene standards to maintain the quality of marketed fish. However, PIM currently faces sanitation issues, such as scattered waste around vendor stalls and fish waste—like guts, skins, and scales—being improperly discarded within the market environment. These conditions contribute to an unsightly and unsanitary atmosphere, contradicting the original objectives of PIM's establishment.

Unmanaged garbage piles serve as excellent breeding grounds for infectious disease vectors, such as rats and insects. These piles can also pose a fire hazard, in addition to being an eyesore and emitting unpleasant odors (Oluwole *et al*. 2017). Moreover, if plastic waste is not managed properly, it can significantly impact marine life and ecosystems, as well as public health, by increasing the risk of flooding—due to blocked drainage systems—or contributing to air pollution from the burning of waste.

Based on the aforementioned issues, it is important to conduct a study to formulate an appropriate waste management strategy at PIM by estimating the volume and composition of waste generated. In analyzing waste composition, sample collection must at least identify the percentage of organic and inorganic waste such as plastic, paper, metal, glass, and other residual waste. Additionally, an evaluation of the waste management efforts undertaken by PIM's management should be carried out in accordance with prevailing standards. This study aims to estimate the quantity and production value of waste, compare the existing waste management practices with the Indonesian National Standard SNI-19-2454-2002 on operational waste management techniques, and formulate an appropriate waste management strategy for PIM.

METHODS

Data collection was conducted from March to April 2022 at the Modern Fish Market (Pasar Ikan Modern) in Muara Baru, Jakarta (location map shown in Figure 1). This study employed a case study approach, with the unit of analysis being the waste management system at the Modern Fish Market in Jakarta.

Primary data collection in this study was conducted through waste weighing, interviews, and field observations. The primary data collected included the types and volumes of waste at the Modern Fish Market (PIM), the prices and volumes of recyclable inorganic waste, data and information related to the current waste management conditions at PIM, as well as data on strengths, weaknesses, opportunities, and threats (SWOT) from the perspective of PIM in terms of solid waste management. The waste weighing and composition assessment in this study were carried out at the market location, as unmanaged waste issues were only identified at trader stalls located on the first floor (see Figure 2). Specifically, observations and waste weighing were conducted at 18 stall blocks in PIM, from Block A to Block R, all located on the first floor. According to information provided by the PIM management, the number of traders operating in these stalls is 420. Therefore, the sample or respondents for this study consisted of 24 traders. The number of respondents was determined based on 5% of the population. following Gay *et al*., (2012), who stated that survey research typically uses at least 5-10% of the population as a sample.

The selection of 24 traders as respondents in this study was conducted using the accidental sampling method. In addition to the traders, the study also involved three PIM management personnel as respondents, selected using the purposive sampling method.

Meanwhile, secondary data were collected through a review of literature, regulations, and policies related to waste management, such as the SNI-19-2454-2002 standard on operational techniques for waste management. Primary data included the number of traders at PIM and the block layout of trader stalls within PIM, as obtained through interviews.

Estimation of Waste Volume and Inorganic Waste Production Value

The method used to estimate the quantity and composition of waste at the Modern Fish Market (PIM) refers to SNI 19-3964-1994 concerning sampling and measurement methods for urban waste generation and composition. Waste sampling was conducted using an estimation approach, based on the waste accumulated daily at PIM. The observation area consisted of 18 blocks, from Block A to Block R. The waste from each block was weighed and categorized by type and quantity.

Waste sample determination was conducted across all blocks using a census approach, meaning that all waste collection points from every block were measured—effectively treating the number of blocks in PIM as the population.

The procedural stages for the collection and measurement of waste generation and composition samples are illustrated in Figure 3. Waste measurements were conducted over a period of (8) days, in accordance with the standart SNI 19-3964-1994.

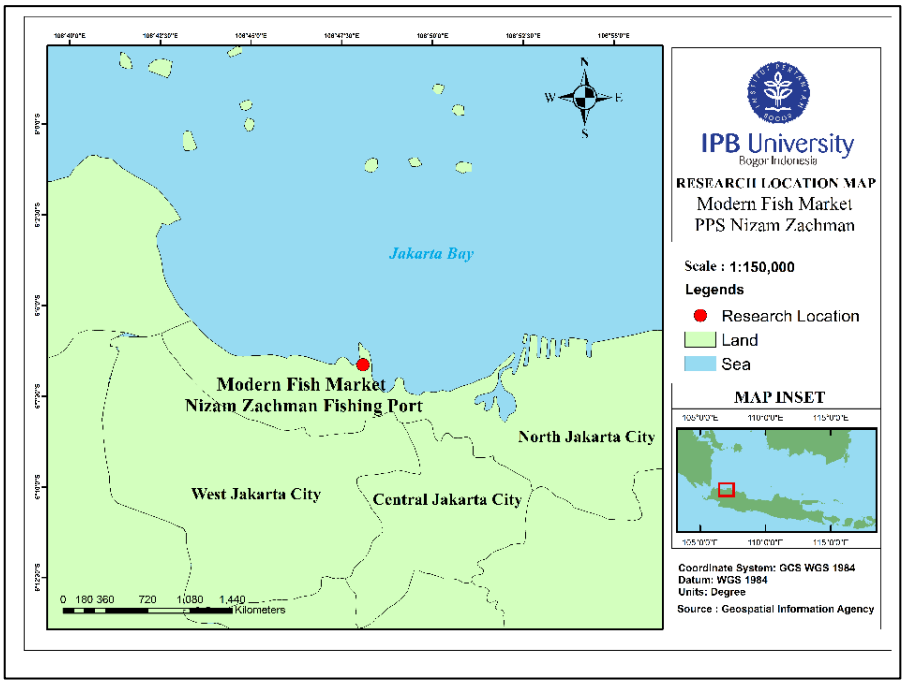

Figure 1 Research Location Map

Figure 2 Trader Stalls at the Modern Fish Market

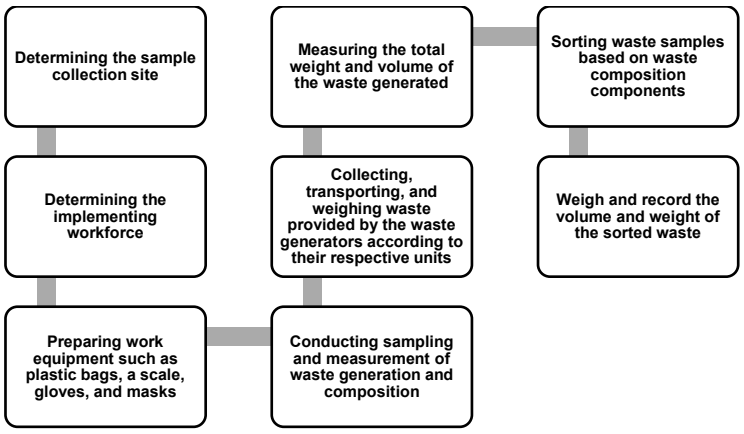

Figure 3 Method for Sampling and Measuring Waste Generation and Composition According to SNI 19-3964-1994

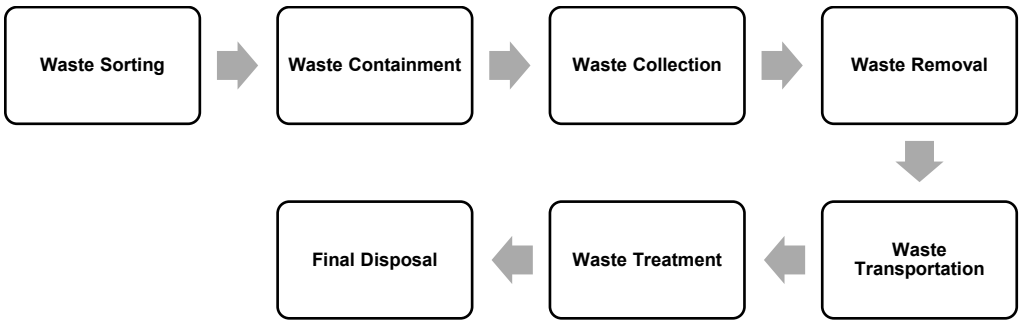

Figure 4 Waste Management Operational Techniques Based on SNI-19-2454-2002

The method for analyzing the production value of waste is by multiplying the weight of each waste type by its price per kilogram using the formula (1):

$$N(Si) = QSi \times PSi \quad \ldots\ldots (1)$$

With:

N(Si) = Production value of waste type i (Rupiah/kg)

QSi = Weight of waste type i (kg)

PSi = Price of waste type i (Rupiah)

Waste Management Analysis at PIM Based on SNI-19-2454-2002

The method used to analyze waste management at PIM is gap analysis, which compares actual performance with expected performance (as per applicable regulations or standards). The gap analysis aims to describe whether the waste management flow at PIM aligns with the existing standard, namely SNI-19-2454-2002 on operational techniques for waste management.

The stages of waste management according to SNI-19-2454-2002 include segregation, containment, collection, transfer, transportation, processing, and final disposal, as shown in Figure 4.

Formulation of Solid Waste Management Strategy at PIM

The method used to formulate the solid waste management strategy at PIM is the SWOT Analysis approach. The resulting strategy will be recommended to the PIM management authority, PT Perindo. To construct the SWOT matrix, data is required on internal factors (strengths and weaknesses) and external factors (opportunities and threats) (Rangkuti 2018). Internal and external factors are compiled based on field conditions and information obtained through interviews with respondents. The SWOT formulation is based on a logical framework that maximizes strengths and opportunities while addressing the balance between weaknesses and threats.

The tool used to map and arrange strategic factors in addressing waste pollution is the SWOT matrix (Table 4). The IFE and EFE matrices are used to evaluate internal and external factors, while the IE matrix is used to determine the company's position in its business development strategy (Hayyina & Puspitasari 2024).

RESULTS

Modern Fish Market (PIM) Muara Baru, located at PPS Nizam Zachman, is the result of the relocation from the Fish Marketing Center at the Ocean Fishing Port of Nizam Zachman. The Modern Fish Market was first built in the Muara Baru area, Penjaringan District, North Jakarta, and was officially inaugurated by the President of the Republic of Indonesia on March 13, 2019.

The facilities of the Modern Fish Market are generally divided into six working areas, including offices, packaging area, loading and unloading area, temporary waste storage area, the market, and a food court. The market building consists of two floors, with the market area located on the first floor and the food court on the second floor.

Estimated Amount and Composition of Waste at PIM

In its operations, PIM Jakarta generates various types of waste. Generally, the waste produced at PIM is categorized into two main types: Organic waste (consisting of fish cutting residues) and Inorganic waste (including plastic waste, cardboard, sacks, styrofoam, raffia string, and adhesive tape). The results of the waste quantity and composition estimation (Figure 5) show that the dominant waste type is inorganic waste, amounting to 96.05% (4,883.1 kg). This figure is significantly higher than the organic waste, which is only 3.95% (192.7 kg). The detailed estimation results are presented in Table 1.

Based on Table 1 and Figure 5, it is evident that plastic waste dominates the composition of waste identified at PIM, accounting for 60%. Plastic waste is the most prevalent type of waste at PIM because plastic packaging is highly favored by traders due to its low cost, durability, lightweight nature, chemical inertness, resistance to rust, thermoplastic properties (heat sealable), and ability to be colored (Nasution 2015). It is not surprising that plastic is the largest contributor to waste, posing a significant threat to environmental pollution on both land and in aquatic ecosystems (Asia and Arifin 2017).

The smallest portion of the waste composition is organic waste, accounting for only 3.95% (Figure 5), which primarily consists of fish waste (fish body parts, intestines, and others). This condition occurs because most of this waste is not simply discarded by the traders, but is instead sold to fish waste processing industries. Fishery waste is processed into fish meal, organic fertilizer, and food mixture ingredients such as *siomay*, *pempek*, crackers, and others. Waste management has a positive impact on the environment by fostering a clean and healthy environment, eliminating unpleasant odors from waste, and reducing the accumulation of waste in residential areas and temporary waste storage facilities. Furthermore, composted waste provides benefits to plants and soil, enhancing their fertility (Fera *et al.* 2025). Waste management provides health benefits by preventing the risk of disease transmission due to waste accumulation, as well as economic benefits through the utilization of both organic and inorganic waste (Sari *et al*. 2024).

Table 1 Estimated Quantity and Composition of Waste at the Modern Fish Market

No.	Type of Waste	Waste weight (kgHari)								Total (kg)
		1	2	3	4	5	6	7	8	
1	Cardboard	127.2	125	137.9	128.5	130.8	160.4	135	111.8	1,056.6
2	Sack	59.3	64.2	64.3	75.1	58.1	73.1	56.2	74.2	524.5
3	Fish waste	22.9	22.2	26.3	26.5	20.3	30.0	19.1	25.4	192.7
4	**Plastic**	**335.2**	**340.3**	**358.8**	**358.5**	**348.6**	**392.2**	**358.9**	**332.6**	**2,825.1**
5	Styrofoam	17.9	19.8	17.9	20.5	16.2	20.1	16.8	19.4	148.6
6	Rafia rope and Adhesive	16,3	18.1	16.1	19.7	14.6	19.7	12.3	18.8	135.6
				Total waste (kg)						4,883.1
				Average per day (kg)						610.4

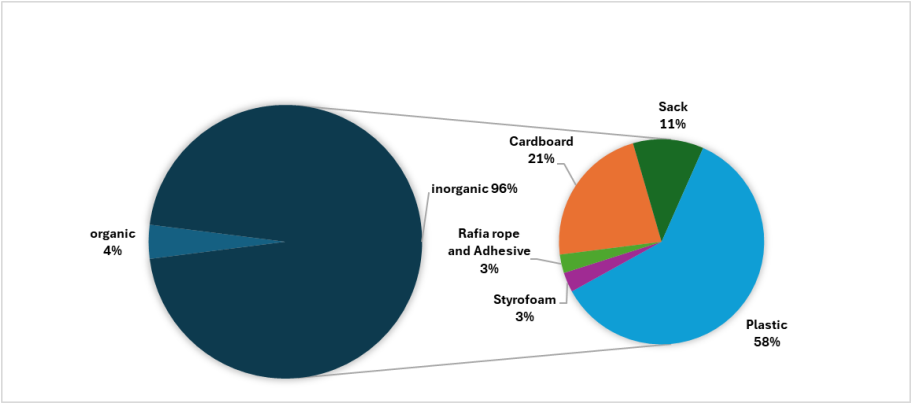

Figure 5 Waste Percentage at the Modern Fish Market

Value of Inorganic Waste Production

Based on interview results, several traders at the Modern Fish Market (PIM) have identified a business opportunity in the accumulation of inorganic waste in the market area. They sell inorganic waste such as plastic, sacks, cardboard, and styrofoam to waste collectors and recycling industries. Before being sold, the waste is first washed with soap and dried. The selling value of this waste is quite high, as shown in Table 2.

Existing Waste Management at PIM

The analysis of existing waste management was conducted based on SNI-19-2454-2002, which consists of seven processes: sorting, storage, collection, transportation, and final disposal. The analysis results indicate that in the current waste management at PIM, there are still several stages that do not comply with SNI-19-2454-2002, specifically the waste storage and waste treatment stages. The results of the gap analysis between existing waste management practices at PIM and the standards outlined in SNI-19-2454-2002 are presented in Table 3.

(a) Waste Sorting

Waste sorting is the process of separating waste based on its type. Sorting aims to facilitate the processes of storage and treatment. Based on field observations, traders at PIM have already sorted waste by type—organic and inorganic. Waste sorting is a crucial component of the waste management process aimed at reducing costs. Waste management costs have become a significant issue in several countries, as they have legislative implications related to circular economy action plans (Cialani and Mortazav 2020).

(b) Waste Storage

Waste storage is the activity of temporarily storing waste in individual or communal containers at the waste source location before it is moved to a temporary disposal site (TPS) or final disposal site (TPA). Interviews with management revealed that at the inception of PIM, the management provided 300 containers or waste bins distributed throughout the market to facilitate traders in disposing of unused waste. The management hoped that these bins would be used appropriately. However, after three years of operation (from 2019 to 2022), waste was no longer placed in these bins and was left scattered in corners of the market because traders repurposed the bins to store fish.

(c) Waste Collection

Waste collection is not only about collecting waste from individual or communal containers but also transporting it to TPS or TPA. Waste collection at PIM is carried out daily by the PIM cleanliness unit. The collection period is between 05:00 – 09:00 AM, during which the cleanliness unit cleans the vendor areas.

(d) Waste Transfer

Waste transfer is the process of moving collected waste into transport equipment to be taken to a temporary or final disposal site. Field observations showed that the transfer process follows a stall-to-stall system. During this process, the cleanliness unit is divided into two teams: the first collects waste from vendor stalls, while the second transfers the waste from the market area to the TPS using carts.

(e) Waste Transportation

Waste transportation involves carrying waste from the transfer point or directly from the source to the final disposal site (TPA). At PIM, waste is not transported directly to the TPA but is first collected at the TPS facility of PPS Nizam Zachman. The transfer from PIM's TPS to the PPS Nizam Zachman TPS is done by the UPT port sanitation unit using 2.5-ton trucks.

(f) Waste Treatment

Waste treatment is the process of reducing waste volume or converting waste into more useful forms through methods such as incineration, composting, compacting, shredding, drying, or recycling. According to interviews with management, the PIM management does not carry out waste treatment processes from trader stalls to final disposal.

(g) Final Disposal

Final waste disposal involves isolating waste to ensure environmental safety. Interviews with management indicated that the transportation of waste from the Port TPS to the final disposal site (TPA) is handled by a third party, not by the PIM market's sanitation unit or the UPT. Port management collaborates with the Integrated Waste Management Unit of the DKI Jakarta Environmental Office.

PIM Waste Management Strategy based on SWOT Analysis

Based on the results of the estimation of the amount and composition of waste in the PIM area and the analysis of waste management

that has been carried out by PIM compared to SNI-19-2454-2002, the internal and external factors of PIM are compiled to formulate an appropriate waste management strategy as shown in Table 4.

Table 2 Inorganic Waste Production Value at PIM

No.	Type of Waste	Average Waste/day/kg	Waste Production Value (Rp/kg)	Total (Rp)
1	Plastic	353	3,000	1,059,000
2	Cardbard	132	2,500	330,000
3	Sack	66	2,000	132,000
4	*Styrofoam*	19	2,000	38,000
Total Production Value (Rp/day)				**1,559,000**

Table 3 Results of Gap Analysis of PIM Waste Management with SNI-19-2454-2002

No.	Activity stages	SNI-19-2454-2002	Existing condtion at PIM
1	Waste Sorting	The activity of separating each type of waste from the location of the waste source	Already in accordance with SNI-19-2454-2002
2	Waste Containment	The activity of temporarily accommodating waste in a container at the source of waste	There are no containers or waste bins available in the market area, only collected in the corner of the stall.
3	Waste Collection	Collecting waste in a certain place (temporarily)	Already In accordance with SNI-19-2454-2002
4	Waste Removal	Moving the collected waste into the transportation equipment	Already In accordance with SNI-19-2454-2002
5	Waste Transportation	Moving waste from the transfer location to the final disposal site	Already In accordance with SNI-19-2454-2002
6	Waste Processing	The process of reducing the volume of waste, among others through: burning, composting, compaction, crushing, drying, recycling	Not carried out by the management, some traders sell inorganic waste to collectors or recycling industries.
7	Final Disposal	The activity of isolating waste so that it is safe for the environment	Already In accordance with SNI-19-2454-2002, carried out by a third party.

Table 4 Internal, External Factors and Strategies for Fish Market Waste Management

	Strength (S)	Weakness (W)
IFA/EFA	1. Merchants utilize the waste in PIM by selling it to the recycling industry. 2. The management has provided facilities for temporary disposal sites (TPS) 3. There are already efforts to sort, collect, transfer and transport waste	1. Traders do not properly use the waste bin facilities provided by the manager 2. The manager has not carried out the process of storing and processing waste according to the standard
Opportunity (O)	Strategis (S-O)	Strategis (W-O)
1. Existence of legislation to regulations related to waste management 2. Paradigm shift in waste management to make it economically valuable 3. The development of the circular economy is characterized by the emergence of the recycling industry	1. Develop technical guidelines related to PIM waste management based on SNI-19-2454-2002 (S3, O1) 2. Conduct broader cooperation with the recycling industry (S1, S2, O2, O3))	1. Educate traders about the waste disposal system (W2, W3, O1) 2. Rewarding traders for implementing waste management rules (W1, O1)
Threat (T)	Strategis (S-T)	Strategis (W-T)
1. Environmental pollution when waste is not managed properly, especially plastic waste 2. Decrease in fish quality due to bacterial contamination from unmanaged waste	1. Provide technical guidance to traders on the negative impact of waste on the quality of marketed fish (S2, T2)	1. Making efforts to process waste, especially plastic waste (W1, T1, T2)

DISCUSSION

The results of the waste production value analysis show that there is already awareness of traders in PIM Muara Baru to collect inorganic waste and sell it. This proves that waste has economic value if it is reused and recycled. Economic activities utilizing waste are in line with government policy in implementing a circular economy in the management of waste, waste, and hazardous and toxic materials (B3). One of the implementations is to encourage waste and B3 waste to be recycled or utilized as resources for the production process, either raw materials or energy. Efforts to utilize waste can adopt a circular economy model that prioritizes waste reduction, re-use, and re-cycle, and explores alternative materials such as bioplastics (Elgarahy *et al.* 2023).

The circular economy system is seen as more sustainable because it can reduce environmental burdens and improve the quality of the environment. In addition to being more environmentally friendly, the circular economy is also able to provide added economic value, provide employment,

contribute to development, as well as efforts to address climate change. Converting waste to energy (WTE) can be one of the keys to a circular economy that allows increasing the value of products, materials, and resources in the market, as well as minimizing the use of waste and resources (Malinauskaite *et al*. 2017). The circular economy creates a “zero waste” environment by minimizing or even eliminating waste in final disposal.

The results of the gap analysis between the existing conditions of waste management and SNI-19-2454-2002 show that PIM traders and users have not carried out the waste disposal stage in accordance with SNI-19-2454-2002. This happens because of the lack of awareness of the importance of protecting the environment. The main priority in overcoming environmental problems is to change the behavior and mindset of traders towards the condition of the surrounding environment (Rini *et al*. 2017).

Likewise, the aspect of waste management has not been implemented by PIM so that it does not comply with existing SNI regulations. Solid waste management strategies to recycle waste products are promising practices that have a positive impact on sustainable goals. The DKI Jakarta Provincial Government has started to carry out waste processing by building modern and sustainable waste processing facilities through Landfill Mining with Refuse-Derived Fuel (RDF) Plant technology that is able to convert waste into energy. Currently, RDF is only implemented in Bantar Gebang Landfill and with this technology it is expected to reduce the pile of municipal waste that has not been managed properly, including waste from PIM and its surroundings. Some developed countries have excellent solid waste management strategies to recycle waste products such as Sweden with incinerator technology is able to process up to 90% of its citizens' waste into electrical energy (Waste to Energy/WTE policy). On the other hand, developing countries face many challenges, such as the sorting and handling of municipal solid waste due to high population density and economic instability (Khan *et al*. 2022).

In addition to Sweden, other countries such as Egypt, South Korea, China, and Nepal have successfully managed waste into economically valuable products. Egypt has demonstrated success by developing an innovative approach to municipal solid waste characterization for waste-to-energy processes, particularly in urban and industrial contexts (Emara *et al*. 2024). South Korea, known for its "Pay-As-You-Throw" system, has significantly reduced food waste and adopted biodigesters to convert waste into energy. China has initiated the “Zero Waste City” concept in cities like Shenzhen and Hangzhou, where they are advancing recycling industries and industrial waste-to-energy technologies (Huang *et al*. 2025). In Nepal, sustainable approaches have improved waste management practices and enhanced recycling opportunities, contributing to increased household incomes (Bhandari *et al*. 2025).

In Indonesia, open dumping is the dominant method of waste disposal, resulting in slum scenery and inviting disease vectors (such as flies, rats and cockroaches) as well as bacteria, unpleasant odors and poor aesthetics. Municipal solid waste disposal through landfilling has become an important environmental problem worldwide resulting in environmental pollution and contamination. Microbes present in the soil act on the disposed materials and decompose the organic content present. The final disposal should use a sanitary landfill system, which dumps waste in a large area away from settlements, so that it does not cause odors (Nanda and Berruti 2021; Mor and Ravindra 2023). In addition, research by Yaashikaa *et al*. (2022) recommended engineering landfill design to produce gas from landfill discharges that replace fossil fuels as compressed natural gas or liquefied natural gas.

The sanitary landfill method of final disposal is in accordance with the criteria set out in the Minister of Public Works Regulation No. 3/2013 on the Implementation of Solid Waste Infrastructure and Facilities in Handling Household Waste and Waste Similar to Household Waste. In addition to sanitary landfill, the thermal method can be used by considering that the waste produced in the processing process will not harm the surrounding environment (Chaerul and Zatadini 2020). Although sanitary landfills already exist in several cities in Indonesia, Jambi, Malang, Sidoarjo and Jombang, the number is still inadequate with the volume of existing waste, so the government should start prioritizing more cities that process waste with sanitary landfill technology.

The results of the SWOT analysis in Table 5 shows that there are six recommended strategies for waste management in the Modern Fish Market. The SO strategy produced in this study is to develop technical guidelines related to PIM waste management based on SNI-19-2454-

2002; conduct wider cooperation with the recycling industry. This is done to improve the waste management that has been carried out, because when compared with SNI-19-2454-2002 regarding waste management techniques, there are still aspects that are not yet in accordance, namely aspects of waste containerization and waste processing. This strategy also opens up opportunities for more traders to participate in the inorganic waste collection business, which is quite promising. With the existence of laws and regulations related to waste management as well as a paradigm shift in waste management, it has economic value, characterized by the development of a circular economy and the emergence of a recycling industry that will have significant potential for the environment and economy. In addition, awareness, collaboration, and partnership between the Government, stakeholders, policy makers, and competent authorities are also important to enable a circular economy in an ecosystem (Mukherjee *et al*. 2023).

The resulting WO strategy is to provide education to traders regarding the waste container system, rewarding traders in implementing waste management rules. This strategy is intended so that PIM policies related to waste management can be understood and implemented by all stakeholders, especially traders. Regarding waste disposal, if the management provides waste bin facilities in the market area, it is hoped that traders will have the awareness to maintain these facilities and use them for their intended purpose.

The resulting ST strategy is to provide technical guidance to traders on the negative impact of litter on the quality of fish being marketed). This is so that traders understand the link between a clean market area and the quality of fish sold. Although the presence of waste does not directly reduce the quality of fish, the presence of unmanaged waste becomes a source of bacteria and disease. In Indonesia, the application of the waste management system still refers to the conventional way with the habit of picking up and transporting waste and burdening the burden of waste management at the final stage with a reactive approach, so it can be said that the application of the municipal waste management system of waste management is still low. This condition requires an increase in environmental awareness by emphasizing socialization and education to the community in seeing the waste itself so as to form behaviors and patterns that support the reduction and processing of municipal waste (Rahmawati *et al*. 2021).

The WT strategy is to make efforts to process waste, especially plastic waste.i This is because plastic waste is an environmental problem that arises due to the extensive use of plastics and the ability of plastics to survive in the environment. This condition has implications for marine life, maritime industry, tourism, and human health (Gall and Thompson 2015; Napper and Thompson 2019). Pollutants or wastes present in waters can absorb other pollutants, such as organic matter, toxic heavy metal ions, and pathogens from the environment and transfer them to living organisms (Pourebrahimi and Pirooz 2023). Another study reported the possibility of microplastic particle contaminants in the air and can cause toxicity to the human respiratory tract (Jahandari 2023).

Efforts to reduce waste while simultaneously enhancing the economic potential of waste at the Modern Fish Market (PIM) can be pursued through the initiation of an integrated recycling system for both organic and inorganic waste. This initiative should involve key stakeholders, including traders, waste collectors, and recycling industries. Currently, the utilization of inorganic waste by traders remains unorganized, highlighting the need for active involvement of PIM management and the Technical Implementation Unit (UPT) of PPS Nizam Zachman. These stakeholders must collaboratively develop a comprehensive circular economy model through coordinated stakeholder engagement at the port level. A notable example is the waste management model implemented at the Port of Szczecin, Poland, where the integration of information systems and the expansion of waste processing facilities are directed toward realizing circular economy principles and supporting the green port concept (Deja *et al*. 2023).

Waste and its management is something that has become interrelated and a problem that must be resolved properly, because if not handled properly it will result in unexpected changes in environmental balance so that it can pollute the environment, both to soil, water and air. This is in line with the study of mesoplastics and microplastics in landfills which concluded that plastic pollutants from landfills enter rivers and seas so that the solution is that open waste disposal must be replaced with more controlled landfills or sanitary landfills (Nurhasanah *et al*. 2021).

CONCLUSION

The estimated amount of waste in the PIM area is 488.1 kg/day which consists of 96.05% inorganic waste and 3.95% organic waste. The production value of inorganic waste reaches Rp 1,559,000/day. Waste management in PIM has been carried out in accordance with SNI-19-2454-2002 at the sorting, collection, transfer, transportation and final processing stages, but for the containerization and processing stages it has not been carried out in accordance with SNI-19-2454-2002. There are 6 (six) strategies to improve waste management in PIM, namely (1) compiling technical guidelines related to PIM waste management based on SNI-19-2454-2002; (2) conducting broader cooperation with the recycling industry; (3) providing education to traders regarding the waste containerization system; (4) rewarding traders in implementing waste management rules; (5) providing technical guidance to traders about the negative impact of waste on the quality of fish marketed; (6) making efforts to process waste, especially plastic waste.

RECOMMENDATION

The suggestion from this research is that the management of PIM Muara Baru Jakarta needs to implement the recommended strategies to improve waste management in the PIM area.

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