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Coastal Waste Identification as Part of Waste Management Efforts in Dusit Area, Balikpapan, East Kalimantan

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ABSTRACT

Coastal waste pollution remains a critical environmental issue that poses substantial risks to marine ecosystems and nearby communities. This study aims to identify the composition and volume of coastal waste found in the Dusit Beach area and to evaluate potential management strategies that support environmental sustainability and community empowerment. Using a field-based research approach, systematic waste collection was conducted on 18 May 2024, resulting in 27 sacks of waste that were subsequently sorted and analyzed. Plastic waste was identified as the most dominant category by volume, accounting for 48 percent of the total. The 13 sacks of plastic waste collected weighed 129.7 kg. These results indicate inadequate waste management practices and limited public awareness regarding proper waste disposal and segregation. Further analysis reveals that the significant amount of plastic waste presents opportunities to apply the 3R waste management concept (Reduce, Reuse, Recycle). Examples include eco-brick production, craft development, simple construction materials, and community-based waste bank initiatives to generate raw materials for recycling. Community involvement and empowerment in waste management are essential strategies to enhance public participation and generate additional economic value. Overall, the findings emphasize the need for an integrated and community-driven waste management system to reduce coastal pollution and promote sustainable development.

Keyword: waste, community-based waste bank, sustainable waste management, 3R waste management concept

1. INTRODUCTION

The issue of waste management in Indonesia remains inadequately addressed to this day. The country even ranks as the second-largest waste producer in the world. According to estimates from the Ministry of Environment and Forestry (KLHK) in 2019, the total waste generated reached approximately 175,000 tons per day, or about 64 million tons annually, with each resident contributing an average of 0.7 kilograms of waste per day (Tangio et al., 2023). The waste generated from human activities is predominantly organic, accounting for around 60–70%, while the remaining 30–40% consists of non-organic waste. Among the non-organic fraction, plastic is the second most prevalent type, comprising about 14% (Purwaningrum, 2016). This situation is concerning because plastic requires an extremely long time to degrade naturally. Ratnawati (2020) states that the decomposition process of plastic can take nearly a century. Furthermore, Nurhadi (2021) reports that plastic bottles may require up to 450 years to fully decompose.

The increasing accumulation of plastic waste in the environment can lead to various detrimental impacts, including contamination of soil, groundwater, and wildlife (Muhammad et al., 2024). The chemical components of plastics can be toxic to soil-dwelling organisms that play an essential role in maintaining soil fertility. In addition, plastic waste can obstruct soil aeration, thereby reducing soil quality and productivity (Purwaningrum, 2016). Coastal areas are also particularly vulnerable to waste-related issues, especially plastic pollution (Yona et al., 2020; Jayantri & Ridlo, 2021; Ilyas & Hartini, 2022). Such pollution threatens marine ecosystems, as the presence of waste in the ocean can damage critical habitats such as coral reefs, mangrove forests, and other marine environments. Moreover, waste pollution degrades seawater quality and disrupts the survival of marine organisms. Many species, including dolphins, sea turtles, seals, and other marine fauna, often mistake plastic for food. As a result, they may suffer poisoning, which can ultimately lead to death. Plastic waste is highly resistant to degradation; even after these animals die, the plastic they ingested remains intact. Consequently, the undecomposed plastic can continue to pose risks to other living organisms (Kahfi, 2017; Azharil & Paskah, 2023).

Therefore, appropriate waste management practices are essential. Waste processing serves as a key effort to mitigate various problems caused by waste. The management process includes collection, transportation, and treatment, while non-recyclable waste—such as diapers and sanitary pads—is destroyed. Organic waste can be transformed into various useful products, including biogas, compost, and maggots. These processing efforts also reflect the application of the 3R principles (Reduce, Reuse, Recycle), which can be implemented across multiple waste categories. With proper waste treatment, valuable end-products can be created and utilized by communities. These products not only support daily human activities but also hold potential economic benefits (Sulistriyani, 2015).

Communities can manage plastic waste—which constitutes the largest contributor to pollution—by converting it into handicrafts that can be sold. Plastic waste can also be used as eco-friendly building materials and furniture through ecobrick initiatives (Nirmalasari et al., 2021). Additionally, establishing waste banks can serve as an effective strategy to address waste-related issues. Waste banks provide opportunities for communities to deposit recyclable waste with economic value in exchange for money (Fadzoli & Waluyo, 2023; Kusumaningsih & Rianawati, 2023). It is expected that waste management practices applying the 3R principles can improve community livelihoods. Therefore, this study aims to identify appropriate waste-processing methods in the Dusit Beach area that can benefit the surrounding community.

2. RESEARCH METHOD

This research was conducted in the Dusit Beach area of Balikpapan City. The activity took place on Saturday, 18 May 2024. The study site was selected based on the availability of samples suitable for research purposes. In addition, the location is a tourism destination, and it is expected that the outcomes of this study will provide benefits to the local community. The research area is shown in Figure 1.

Figure 1. Research Area Location (Dusit Beach Area)

Meanwhile, the research date of 18 May 2024 was selected because, according to information from the Tides application, the seawater level on that day was relatively stable. The difference between high and low tide from morning to afternoon was not significant—approximately 60 cm, as shown in Figure 2. Under these calm-water conditions, it is expected that the waste observed originates from community activities rather than debris carried by ocean currents during high tide.

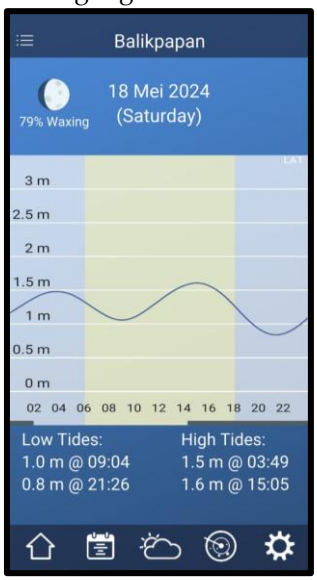

Figure 2. Research Area Location (Dusit Beach Area)

This study falls under the category of field research, which involves direct and in-depth investigation at a specific location to observe actual conditions and the patterns of interaction occurring within a particular social environment (Irgil et al., 2021). The research consisted of waste collection activities around the Dusit Beach area, involving a total of 75 participants. Prior to the activity, several preparations were carried out, including a site survey and the preparation of tools and materials used for waste collection, such as coconut-leaf brooms, waste sacks, metal rakes, scoops, gloves, buckets, hand soap, a pickup truck for transporting materials, and a weighing scale. The activity also included collaboration with a partner institution, PALDAM (Peralatan Angkatan Darat Kodam).

3. RESULTS AND ANALYSIS

The Dusit Beach area is facing significant environmental challenges related to waste accumulation. Observational data indicate that the waste problem in this location is predominantly caused by household waste, which substantially contributes to pollution and generates adverse impacts on the surrounding community. Consequently, this study was conducted to help mitigate pollution and address the ongoing waste-related issues. The collected data confirm that the area is polluted by various types of waste. Field data collection was carried out through group-based waste gathering on Saturday, 18 May 2024, in the Dusit Beach area, yielding a total of 27 sacks of waste. These sacks were subsequently classified into several categories based on waste type, as presented in Table 1.

Table 1. Classification of Collected Waste

Type of Waste	Quantity (Sacks)
Plastic	13
Wood, branches, and leaves	3
Used clothing and fabric	3
Glass (bottles & fragments)	1
Styrofoam	2
Cans and metal	2
Diapers and miscellaneous	3
Total	27

Based on the waste collection results, plastic waste was identified as the most dominant category, accounting for 48% of the total. This was followed by wood, branches, and leaves; used clothing and fabric; and diapers and miscellaneous waste, each contributing 11%. Cans and metal, along with Styrofoam, represented 8%, while the remaining 3% consisted of glass waste in the form of bottles and fragments. These proportions are presented in Figure 3.

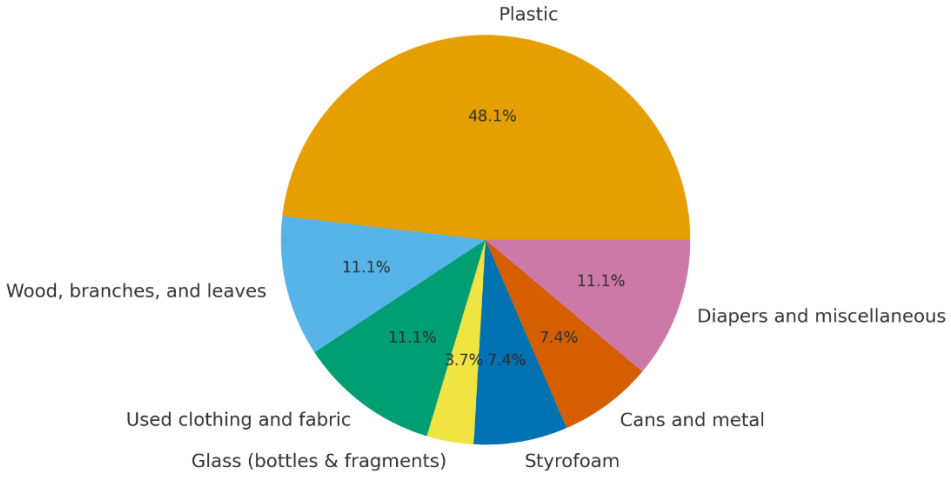

Figure 3. Pie Chart of Waste Classification Percentages

Based on the data collection results, the most abundant type of waste found was plastic waste. The plastic waste was then weighed using a scale, resulting in a total mass of 129.7 kg. A more detailed breakdown of the plastic waste composition is presented as shown in Table 2.

Table 2. Plastic Waste Mass

Plastic Waste in Sacks	Mass (kg)
Sack 1	21
Sack 2	18
Sack 3	7
Sack 4	5
Sack 5	5
Sack 6	5
Sack 7	13
Sack 8	23
Sack 9	8
Sack 10	6
Sack 11	12
Sack 12	4.5
Sack 13	2.2
Total Mass	129.7

Waste in the Dusit Beach coastal area is estimated to originate from multiple sources, including materials transported by ocean currents and waves, river-borne waste from inland areas, and improper disposal practices by local communities. Waste management at the site remains suboptimal, particularly for plastic waste due to its resistance to decomposition. The absence of recycling facilities further contributes to low environmental awareness, as indicated by the persistent presence of litter. Adopting the Reduce, Reuse, and Recycle (3R) approach can help mitigate the accumulation of non-degradable plastics (Eprianti, N. 2021). Moreover, environmental activists are increasingly engaged in converting plastic waste into valuable products to support environmental sustainability.

The waste will be processed into products with economic value. This approach is expected to serve as a solution to reduce environmental pollution and enhance community livelihoods. Waste materials that can be utilized include wood, plastic waste, food residues, and others. Figures 4a and b illustrate examples of products derived from the collected waste.

(a)

(b)

(c)

Figure 4. (a) Plastic waste is utilized to make mats. (b) Plastic waste is used to create lamp decorations. (c) Ecobrick products

In addition to being processed into various marketable products, plastic waste can also be used as construction or furniture materials, such as chairs and tables, through the ecobrick technique. Ecobrick represents an application of the Recycle principle, involving the process of compacting plastic bottles by filling them with inorganic materials until they become hard and solid. The production of ecobricks utilizes used plastic bottles filled with small pieces of plastic waste (Masluha, S. 2023). The Ecobrick products can be seen in Figure 4c.

Waste bank management is also a form of sustainable inorganic waste management (Revani et al., 2016), as shown in Table 3. Waste banks receive inorganic waste collected from the community and provide compensation according to an agreed arrangement. Plastic waste is further processed—classified, cleaned, and shredded—before being packaged and sent to recycling factories. Meanwhile, other inorganic waste (such as metal and glass) is sent to local collectors. The following are some types of waste accepted by the waste bank.

Table 3. Prices of Inorganic Waste at the Waste Bank According to Revani et al. (2016)

Types of Waste	Price (Rp/kg)
Plastic	800 - 3.500
Metal	1.300 - 6.000
Glass	500

The presence of a waste bank is expected to encourage the community to avoid littering and to separate their waste before submitting it to the waste bank. In addition, the collected waste will be processed into marketable products. This approach not only helps reduce waste problems but also improves the local community's economy. By converting waste into products with economic value, it is anticipated that new business opportunities can emerge for the community in the study area.

4. CONCLUSION

Based on the results of this study, the Dusit Beach area faces significant waste management challenges, with plastic waste dominating at 48%, equivalent to 13 sacks out of a total of 27 sacks collected, or 129.7 kg. These findings indicate that waste management in the area is still suboptimal and that community awareness regarding proper waste sorting and disposal remains low. The high proportion of plastic waste suggests that applying the 3R (Reduce, Reuse, Recycle) concept could be an effective solution for reducing coastal waste.

Waste collected from the community through the waste bank program can be further processed into economically valuable products, such as ecobricks, handicrafts, construction materials, or recycled plastic raw materials. Recycling initiatives provide environmental benefits while offering opportunities to increase local community income. Furthermore, this study confirms that waste banks serve as a supporting strategy for effective waste management. They function not only as a collection point for marketable inorganic waste but also as a tool to raise public awareness of the importance of sustainable waste management.

Therefore, this study recommends enhancing environmental education, providing adequate waste management facilities, and establishing waste banks in the Dusit Beach area. Guidance on waste management and collaboration with recycling factories should also be implemented to ensure the effective and optimal operation of waste banks. These efforts are expected to reduce environmental pollution, improve coastal ecosystem quality, and provide economic benefits to the local community.

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