Waste Generation and Community Behavior in Waste Management in Banjarbaru City in 2024

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ABSTRACT

Waste management has become a pressing environmental issue in Banjarbaru City, with increased waste generation due to population growth and economic activities. This study aims to provide a comprehensive picture of waste generation, composition, and community behavior in waste management. The research method was quantitative, with sampling based on the SNI 19-3964-1994 standard. Primary data was collected through a survey of 112 households and questionnaire-based interviews. Analysis was conducted using the chi-square test to identify the relationship between behavioral variables and waste generation. The results showed that the average daily waste generation reached 4.91 kg for wet and 2.80 kg for dry waste. Wet waste is dominated by organic waste, while dry waste comprises plastic and paper. An analysis of community behavior shows that only 20% of respondents actively separate organic and inorganic waste. Implementing programs such as waste banks helps reduce the burden on landfills, but infrastructure and community awareness challenges remain. Statistically, no significant relationship was found between community behavior in waste handling/management at the household level and the amount of waste generated, with p-values ranging from 0.099 to 1.000 (=5%). The conclusion of this study highlights the importance of collaboration between government, community, and technology to create effective and sustainable waste management.

Keywords: Waste Generation, Waste Composition, Community Behavior, Banjarbaru City

INTRODUCTION

Waste management has become a pressing global issue along with rapid population growth and urbanization. Around the world, waste production has increased dramatically due to changes in lifestyles, consumption patterns, and economic activities. If not handled properly, waste can cause various negative impacts, ranging from environmental pollution to public health problems (Imelda et al., 2024). Banjarbaru City, one of Indonesia's growing urban areas, is not immune to this problem. With the increasing population and urban activities, managing waste effectively is becoming more complex.

Waste generated by urban communities generally consists of two main categories: organic waste and inorganic waste. Organic waste, such as food and garden waste, often dominates household waste generation (Chen, 2018). On the other hand, inorganic waste, such as plastic and paper, has economic value that can be utilized through the recycling process. However, the lack of public awareness and limited waste management infrastructure often hinder the implementation of the reduce, reuse, and recycle (3R) principles. As a result, most waste simply ends up in landfills, which ultimately contributes to environmental issues such as greenhouse gas emissions, groundwater pollution, and limited landfill space.

Various studies have shown that people's behavior strongly influences the success of waste management. Lack of education on the importance of waste management, coupled with the habit of littering, exacerbates this condition (Yusuf & Fajri, 2022). In Banjarbaru City, the government has initiated several programs to address this issue, including the waste bank. This program aims to raise public awareness about the importance of waste segregation while providing economic incentives for those who actively participate. However, the effectiveness of such a program still requires further study, especially in measuring its impact on reducing waste generation and changing people's behavior (Mizwar & Kartini, 2016).

In addition, national standards such as SNI 19-3964-1994 provide technical guidance in measuring waste generation and composition. This standard is an important reference in

research related to waste management to ensure that the data generated is valid and comparable (Wiratama & WijaYes, 2024). On the other hand, waste management is not only the government's responsibility but also requires active involvement from the community, private sector, and educational institutions. Effective collaboration among these parties is expected to create a sustainable waste management system (Mustapa, 2024).

However, implementing a sustainable management system in Banjarbaru City still presents many challenges. One of the main obstacles is inadequate infrastructure, such as the lack of waste sorting and processing facilities. On the other hand, local government policies also need strengthening in implementation and supervision (Mizwar & Kartini, 2016). Without substantial policy support and maximum community participation, efforts to reduce the negative impacts of waste will be difficult to realize.

Therefore, an in-depth study is needed to identify waste generation patterns, waste composition, and community behavior in its management. This study aims to provide a comprehensive picture of the condition of waste management at the household level in Banjarbaru City and analyze the relationship between this management behavior and the amount of waste generated.

METHOD

This study used a quantitative approach to analyze waste generation, composition, and community behavior in Banjarbaru City. Primary data was collected through direct surveys and interviews with respondents, while secondary data was obtained from reports of related agencies and other official documents. This research was conducted over three months in two villages and two sub-districts in Banjarbaru City, namely Komet Village, North Banjarbaru Sub-district, and Sungai Besar Village, South Banjarbaru Sub-district. Quantitative analysis was conducted in categories tested partially using the chi-square test with a 95% confidence level.

RESULT AND DISCUSSION

Result

Waste Generation

Waste generation per day is calculated from the weight of waste generated by all houses sampled. The calculation of waste generation is divided into two categories: wet waste and dry waste. Wet waste comes from organic waste derived from the remains of living things that are easily decomposed naturally without human intervention. In contrast, dry waste is not easily decomposed and usually cannot be biodegraded. The observation results of waste generation can be seen in Table 1.

Table 1. Waste Generation in Banjarbaru City Based on Type

Day	Wet Waste		Dry Waste	
	Total (Kg)	Mean (Kg/day)	Total (Kg)	Mean (Kg/day)
Day I	150,95	1,35	61,00	0,54
Day II	85,86	0,77	44,27	0,40
Day III	57,73	0,52	39,29	0,35
Day IV	59,17	0,53	42,20	0,38
Day V	62,33	0,56	44,90	0,40
Day VI	67,65	0,60	38,73	0,35
Day VII	66,50	0,59	43,59	0,39
Jumlah	550,19	4,91	313,98	2,80

Sources: Primary Data, 2024

Dry waste comprises paper, plastic, wood, metal, glass, and medical waste. Figure 1 shows the weight and type composition of dry waste.

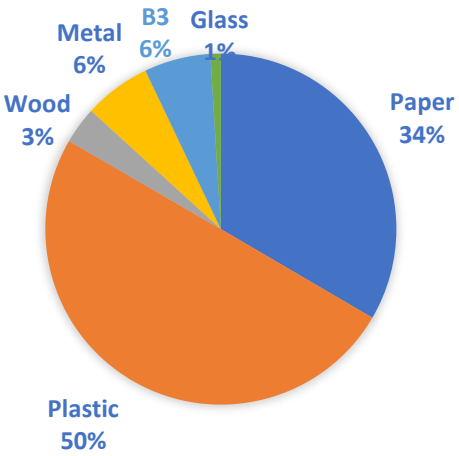

Figure 1. Composition of Dry Waste from Waste Generation in Banjarbaru City

Per capita waste generation is a measure used to quantify the amount of waste each individual generates in one day. It can be expressed gravimetrically in kilograms per person per day (kg/person/day) or volumetrically in liters per person per day (liters/person/day) (Adeniyi & Afon, 2022). Waste generation in kg/person/day measures the weight of waste each individual generates in one day. Waste generation in liters/person/day measures the volume of waste each individual generates in one day. For example, in a study in an informal settlement, the average waste generation was 1.33 liters/person/day. The gravimetric and volumetric waste generation of the 112 houses sampled can be seen in Table 2.

Table 2. Waste Generation Per Person PerDay in Banjarbaru City

Day	Waste Generation (Gravimetrik)			Waste Generation (Volumetrik)			
	Weight (Kg)	Mean (Kg/Day)	Leads (Kg/person/ Day)	Volume (m3)	Mean (m3/Day)	Leads (m3/person/ Day)	Leads (Liter/person /Day)
Day I	211,95	1,89	0,0049	0,89	0,13	0,0003	0,33
Day II	130,13	1,16	0,0030	1,45	0,21	0,0005	0,54
Day III	97,02	0,87	0,0023	1,42	0,20	0,0005	0,53
Day IV	101,37	0,91	0,0024	1,45	0,21	0,0005	0,54
Day V	107,23	0,96	0,0025	0,82	0,12	0,0003	0,31
Day VI	106,38	0,95	0,0025	1,66	0,24	0,0006	0,62
Day VII	110,09	0,98	0,0026	1,15	0,16	0,0004	0,43
Total	864,17	7,72	0,0201	8,84	1,26	0,0033	3,30

Sources: Primary Data, 2024

Community Behavior in Waste Management

Community behavior in waste management is how individuals and groups in society manage, dispose, and recycle the waste they produce (Kaplan Mintz et al., 2019). There are several main aspects of community behavior in waste management, namely awareness and knowledge (the level of awareness and knowledge of the community about the importance of good waste management, including the negative impact of waste on the environment and health), waste reduction (Reduce), which is an effort to reduce the amount of waste generated by choosing products that are more environmentally friendly and avoiding the use of disposable items, reuse (Reuse), which is the practice of reusing items that are still suitable for use to minimize the waste generated, recycling (Recycle), which is the activity of collecting, sorting, and recycling items that can be reprocessed into new products, such as plastic, paper, and metal. Composting is processing organic waste, such as food waste and leaves, into compost that can be used as fertilizer; proper disposal is disposing of waste in a place that

has been provided according to its type, such as organic and inorganic waste bins and participation in waste management programs, namely the level of community participation in waste management programs organized by the government or community, such as waste bank programs or cooperation to clean the environment. (Swami et al., 2011).

As shown in Table 3, 112 respondents in Banjarbaru City were interviewed to gather information on community behavior related to waste generation and management.

Table 3. Community Behavior Related to Waste Generation and Management

Community Behavior	Total	Percentage
Estimated waste generation per day		
• <= 2 Kg	94	83.9
• 3-10 Kg	18	16.1
Household waste disposal location		
• Final Disposal Site	2	1.8
• Temporary Disposal Site	26	23.2
• Taken by Waste Officer	84	75.0
Frequency of waste transportation from home to the nearest TPS		
• Everyday	68	60.7
• Every Two Days	43	38.4
• Once a week	1	0.9
Waste sorting process		
• Available	14	12.5
• Rare	57	50.9
• Unavailable	41	36.6
Media/waste collection points		
• Put in plastic bag	110	98.2
• Buried in drums	1	0.9
• Directly to landfills	1	0.9
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• Put in plastic bag	110	98.2
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• Directly to landfills	1	0.9
Recycling of wet/dry waste		
• Yes	1	0.9
• Sometimes	15	13.4
• No	96	85.7
Behavior of throwing garbage to the place provided		
• Yes	105	93.8
• Sometimes	7	6.3
Dispose of organic/non-organic waste separately		
• Yes	24	21.4
• No	46	41.1
• Sometimes	42	37.5
Processing of organic waste into compost		
• Yes	2	1.8
• No	108	96.4
• Sometimes	2	1.8
Burying used cans/bottles		
• Yes	2	1.8
• No	105	93.8
• Sometimes	5	4.5
Waste picking behavior found in TTU		
• Yes	7	6.3
• No	27	24.1
• Sometimes	78	69.6
Burning waste		
• Yes	21	18.8

• No	23	20.5
• Sometimes	68	60.7
Respondents Utilizing inorganic waste		
• Yes	4	3.6
• No	75	67.0
• Sometimes	33	29.5
Respondents' participation in waste reduction in the neighborhood		
• Yes	66	58.9
• No	8	7.1
• Sometimes	38	33.9
Respondents' opinion that waste is a big problem		
• Yes	86	76.8
• No	20	17.9
• Sometimes	6	5.4

Sources: Primary Data, 2024

Relationship Between Community Behavior and Waste Generation

Waste management behavior at the household level can positively impact reducing the amount of waste generated. Some behaviors that can be applied include reusing inorganic waste according to its original function or for other purposes, utilizing organic waste as fertilizer, compost, or animal feed, and sorting dry waste to be sold to collectors or waste banks. Furthermore, the relationship between behavioral factors and the per capita waste generation rate was tested using the chi-square test. Behavior obtained from the interview results was categorized into “doing” and “not doing.” In contrast, waste generation was categorized as low if it was less than 3 kg/day and high if it exceeded this value. The results of the chi-square test are presented in Table 4.

Table 4. Results of Analysis of Behavioral Relationship with Waste Generation using Chi Square Test

No.	Behavioral Variables	Sig. (p)	Conclusion
1.	Doing waste segregation	0,099	Meaningless
2.	Recycling waste	0,132	Meaningless
3.	Disposing of garbage in its place	1,000	Meaningless
4.	Disposing of waste separately	0,641	Meaningless
5.	Processing waste into compost	0,509	Meaningless
6.	Burying inorganic waste	0,313	Meaningless
7.	Burning dry waste	1,000	Meaningless
8.	Utilizing inorganic waste	0,162	Meaningless
9.	Participate in reducing waste	0,351	Meaningless

Sources: Primary Data, 2024

Discussion

Waste Generation

Waste generation is one of the most pressing environmental problems in many major cities in Indonesia, including Banjarbaru City. The increasing population and economic activities in these cities directly contribute to the increasing volume of waste generated (BPS, 2020). Waste is discarded or deemed useless material, which often burdens the environment when not managed properly. Untreated waste generation can cause various problems, ranging from air, soil, and water pollution, as well as being a potential source of disease (Al-Hamdani, 2021). The increase in waste volume in urban areas is caused by several factors, including changes in people's consumption patterns, urbanization, and rapid industrialization (Wu, Zhu, and Zhai, 2022). Waste that is not managed correctly will end up in landfills, which often cause environmental pollution. The increasing waste generation requires the government and society to find more effective solutions for its management (Çavuşa, Bayhan, and Ismail, 2022).

Waste can be classified into various categories based on its composition and nature. Waste is generally divided into two main categories: wet and dry (Bamatov et al., 2019). Wet waste consists of biodegradable organic materials, such as food scraps, vegetables, fruits,

and kitchen waste. This type of waste is the most significant component of total household waste generation, especially in urban areas (Wu, Zhu, and Zhai, 2022).

Dry waste includes materials that are not easily decomposed naturally, such as paper, plastic, wood, metal, Glass, and hazardous or toxic materials (B3). Paper waste is the type of waste most often found in urban environments. Paper waste comes from various sources, such as packaging, newspapers, and office documents (Bamatov et al., 2019). Although paper waste can be recycled, the recycling rate in Indonesia is still relatively low. Paper recycling can reduce the need for tree felling and reduce carbon emissions (Lorang et al., 2023). Plastic waste is the type of waste that is most difficult to decompose in the environment. Plastic can take up to hundreds of years to degrade naturally (Çavuşa, Bayhan, and Ismail, 2022). Plastic waste that is not managed correctly often ends up in the sea, causing marine pollution and hurting the ecosystem (Oláh et al., 2022). Efforts to reduce plastic waste include recycling, reducing the use of single-use plastics, and educating the public about the dangers of plastic. Wood waste mainly comes from the construction and home renovation industries. Wood waste management can be done through reuse or recycling into other products, such as particle board or biomass fuel. Metal is a material that can be recycled without losing its quality. Metal recycling helps reduce the need for mining and saves the energy needed for production. However, suboptimal sorting of metal waste is still a challenge in Indonesia (Çavuşa, Bayhan, and Ismail, 2022). Glass is a material that can be recycled repeatedly without reducing its quality. However, due to improper sorting processes, much glass waste ends up in landfills, increasing the environmental burden. Medical waste, or B3, requires special handling because of its hazardous nature to health and the environment. This waste includes used syringes, expired medicines, and laboratory waste. Improper handling of medical waste can lead to the spread of infectious diseases and contamination of hazardous chemicals (Janil-Karpinska et al., 2023).

The problem of waste generation in urban areas has become one of the main issues in environmental management in various countries, including Indonesia. Waste generation per person per day is one of the important indicators used to measure the level of waste production in an area. Information on waste generation is crucial because it can help the government and the community design more effective and efficient waste management policies (Lagman-Bautista, 2020).

Waste generation per person per day is often expressed in volume units (m^3/person/day) and capacity (liters/person/day). This measurement method is important for assessing the efficiency of the waste management system in an area. Based on the Indonesian national standard (SNI 19-3964-1994), the waste measurement method involves taking samples at a specific location and measuring the weight or volume of waste produced over a certain period. Measurement in cubic meters (m^3) is often used in infrastructure management, such as the capacity of landfills (Final Disposal Sites) and waste transportation systems. In Banjarbaru City, research shows that the average daily waste generation per person ranges from 0.002 to 0.005 m^3/person/day. This figure shows an increase along with the increasing population and changes in people's consumption patterns (Mizwar & Kartini, 2016).

In addition to measurements in m^3, liters (L) are also commonly used to measure household waste generation. This makes it easier to understand the capacity of the community's garbage bags or collection containers. In the research area, waste generation per person per day reached an average of 2 to 5 liters, depending on consumption habits and community awareness of the importance of waste sorting (Kaseva, Wernstedt, Kihila, 2019). Household waste usually consists of organic and inorganic waste. Organic waste, such as food scraps, tends to have a larger volume but is lighter, while inorganic waste, such as plastic and glass, has a higher density but a smaller volume (Lorang et al., 2023).

The amount of waste generated per person is influenced by internal and external factors (Çavuşa, Bayhan, and Ismail, 2022). Some main factors influence income level, consumption patterns, waste management habits, and environmental awareness. High-income people consume more packaging products and disposable goods, producing more waste.

In Banjarbaru City, research shows that the volume of waste per person per day is higher compared to the surrounding rural areas (Çavuşa, Bayhan, and Ismail, 2022). This difference

is due to the high level of urbanization and changes in people's lifestyles, which makes them more likely to use disposable packaging products (Lorang et al., 2023). The amount of waste generated per person per day significantly impacts waste management strategies. With the increasing amount of waste, the capacity of landfills is increasingly limited, resulting in waste accumulation and environmental pollution. In addition, the cost of transporting and processing waste also increases along with the increasing volume of waste..

Ineffective waste management can cause various negative impacts, such as groundwater pollution due to seepage from landfills, increased greenhouse gas emissions from the decomposition of organic waste, and health risks for the surrounding community (Lorang et al., 2023). Therefore, more intensive efforts are needed to reduce waste generation per person through a more sustainable approach.

Overcoming waste problems can be done with various strategies, for example, education and public awareness by 1) increasing public awareness of the importance of waste reduction through environmental education programs and campaigns; 2) recycling and composting, namely by encouraging people to separate organic and inorganic waste and utilize organic waste for composting; 3) implementing stricter policies in waste management, such as implementing waste taxes and incentives for recycling; and 4) providing waste management infrastructure, namely by developing adequate infrastructure, including environmentally friendly landfills and recycling facilities, is critical to deal with the increase in waste generation.

Community Behavior in Waste Management

Community behavior in waste management plays a vital role in supporting efforts to reduce waste generation in various large cities, including in Indonesia. Active community participation in sorting, recycling, and reducing waste from its source dramatically determines the effectiveness of the government's waste management strategy. In the context of Banjarbaru City, community behavior in waste management is one of the key factors that influences the success of the waste reduction program.

Community awareness and participation regarding waste management varies depending on social, economic, and cultural backgrounds (Çavuşa, Bayhan, and Ismail, 2022). Therefore, understanding community behavior is an important first step in designing appropriate education and intervention programs to optimize waste management.

Most respondents in Banjarbaru City produce 2 to 5 liters of waste per person daily. This volume of waste tends to increase on weekends and holidays, when household activities are more intensive, such as cooking and social activities (Lorang et al., 2023). In addition, waste generation is also influenced by seasonal factors; for example, during the month of Ramadan and holidays, there is a significant increase in waste volume. Studies conducted in various cities in Indonesia show that people tend to throw away waste excessively during specific periods, especially during big celebrations or family events. This behavior shows a drastic increase in consumption patterns, which ultimately increases the amount of household waste.

Most respondents in Banjarbaru dispose of waste in the local government's temporary disposal sites (TPS). However, several people still throw waste in empty land or open areas that are not monitored. This shows that, despite the government's efforts to provide adequate TPS, there are still obstacles in ensuring that waste is disposed of in the right place. The high number of illegal waste disposal is caused by the lack of public awareness and the long distance to the TPS for some residents (Çavuşa, Bayhan, and Ismail, 2022). Therefore, a more intensive approach is needed to educate the public on the importance of disposing waste in designated locations to prevent adverse environmental impacts.

The frequency of waste transportation from households to TPS varies between two to three times per week, depending on the capacity of the TPS and the cleaning service's waste transportation schedule (Lorang et al., 2023). In some areas, especially with high population density, transportation can be more frequent to prevent the accumulation of waste that can cause unpleasant odors and attract rodents. However, waste transportation is often irregular in more remote areas due to limited transportation fleets and inadequate infrastructure (Al-

Hamdani, et al, 2021). This increases the risk of environmental pollution, mainly if the waste is not transported long.

Waste sorting at the household level is still a significant challenge in Banjarbaru City. Only around 20% of respondents actively sort waste into organic and inorganic waste before throwing it into the TPS (Lorang et al., 2023). Proper waste sorting can help reduce the waste that must be disposed of in landfills and increase the efficiency of recycling programs (Çavuşa, Bayhan, and Ismail, 2022). Factors influencing low participation in waste sorting include a lack of education and supporting facilities such as separate garbage bags. The local government has carried out several campaign programs but has not reached all levels of society evenly..

Media or waste collection sites, such as closed trash bins, are still limited in some areas (Lorang et al., 2023). Most households still use plastic bags to dispose of waste, which are left on the roadside to be collected by cleaners. This risks causing waste leakage and pollutes the environment, especially when it rains. Efforts to provide more environmentally friendly and organized trash bins still need to be improved, especially in densely populated areas (Çavuşa, Bayhan, and Ismail, 2022). Facilities such as waste banks have been established in several areas, but community participation still needs to be increased through more intensive education programs.

Recycling wet and dry waste is one effective way to reduce the volume of waste entering the landfill. However, research shows that only a few households are involved in recycling activities, especially wet waste that can be processed into compost (Lorang et al., 2023). Most people still dispose of wet and dry waste without a prior sorting process. The local government has taken various initiatives to encourage recycling programs, including composting and plastic recycling training (Çavuşa, Bayhan, and Ismail, 2022). However, the main challenges faced are the lack of public awareness about the benefits of recycling and the lack of supporting infrastructure.

Only about 30% of respondents reported that they regularly separate organic and inorganic waste. Awareness of the importance of sorting organic and inorganic waste is essential to supporting recycling and composting programs (Lorang et al., 2023). Processing organic waste into compost is still rarely done at the household level. Composting is one of the most effective ways to reduce the volume of organic waste disposed of in landfills.

Research shows that people's behavior in dealing with waste varies, including the habit of burning, burying, and utilizing inorganic waste for specific needs. Local governments have taken various initiatives to increase public awareness and participation in managing waste more responsibly.

CONCLUSION

This study successfully identified household waste generation and composition patterns in Banjarbaru City and community behavior in managing them. The results of the analysis indicate an opportunity to improve waste management through strengthening programs such as waste banks, which can be integrated with digital platforms to facilitate community participation. In addition, collaboration between the government, community, and private sector is a key element in creating a sustainable waste management system. As a further step, this study recommends the development of more in-depth studies related to the socio-economic impacts of waste management programs, as well as implementing new technologies to support the efficiency of the management system. With this approach, it is hoped that a waste management model can be created that is effective and replicated in other areas with similar characteristics. For further research, it is recommended that the study area be expanded.

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