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Sustainability Strategy for Makassar City Central Waste Bank

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Abstract

Waste banks solve the waste problem by involving the community in waste sorting and processing, which contributes to improving the local economy. This research aims to explore the implementation of the performance of waste banks from economic, social, and environmental aspects, as well as the sustainability strategy of waste banks in Makassar City. This research uses qualitative descriptive analysis. The results showed that waste banks in Makassar City have fulfilled two pillars of sustainability: economic and environmental. This is evident from the increased income of the community, especially the low-income ones, and the effectiveness of waste management that supports waste reduction. However, these waste banks still face social challenges, mainly related to the community's low participation and the manager's non-optimal role. To improve sustainability, this study proposes several strategies, such as increasing community participation through socialisation and social media to educate the importance of waste management, affirming waste sorting regulations, strengthening the role of waste bank managers, and improving facilities and infrastructure that support waste bank operations. Implementing these strategies is expected to ensure that waste banks in Makassar City operate sustainably.

1. INTRODUCTION

Makassar is one of the largest cities in Indonesia. Solid waste is a major problem in this city, where the volume of waste in Makassar City reaches 1,048 tons/day (Dinas Lingkungan Hidup Kota Makassar, 2024). The challenges faced in waste management in Makassar City are the lack of awareness and behaviour of residents, as well as attention from the government (Susan et al., 2023), inadequate infrastructure (Rumata et al., 2025), and the need for a waste sorting approach to reduce the overcapacity of Makassar City Landfill (Rusni, 2024). There is a new paradigm in waste management, as stated in Law Number 18 of 2008, which introduces waste management with two approaches, namely waste reduction and handling through 3R or reduce, reuse, and recycle (Kementerian Lingkungan Hidup dan Kehutanan, 2021). To support these efforts and to overcome the challenges of waste management in Makassar City, the government encourages its citizens to care for, sort, and voluntarily carry their waste by setting up a waste bank, where certain waste is traded for money. This system not only incentivises waste sorting but also involves the community and the local government. The operation of these waste banks hinges on the active participation of the public, which plays a vital role in gathering and sorting waste before it is exchanged at the banks. This communal participation also stimulates local economic activities, as residents earn income from selling waste collected at the banks.

However, despite its positive impact, the waste bank has not alleviated the problem of poverty, but it still has an impact on the community, both for itself and the surrounding environment (Wulandari et al., 2017). The research (Masruroh et al., 2022), shows that a waste bank can significantly impact the socio-economy of the community. In Banten, it amounts to 41.5%, where the savings from the waste bank can help buy daily necessities. Research by (Fatmawati et al., 2024) also shows that the role of waste banks consistently improves economic outcomes, which is inseparable from community participation, and improves government performance in waste management. Furthermore, the implementation of waste banks itself is related to the concept of a circular economy, where the main objective of this concept is to reduce waste and maximise existing resources (Nur, 2021; Satori et al., 2020). The circular economy promotes sustainable production

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practices by extending the value of waste into raw materials that can be recycled into new products (Fatmawati et al., 2024).

The concept of sustainable development is deeply integrated into Indonesia's growth policies, focusing on the development aspects (Setyarini et al., 2020). While driving economic progress, population growth also impacts the environment, particularly regarding waste production. Effective waste management is, therefore, essential in achieving sustainable development targets, as it has significant implications for society and the economy (Aminah & Muliawati, 2021). The Sustainable Development Goals (SDGs) most relevant to waste management are Goal 3, which focuses on ensuring healthy living, and Goal 8, which promotes economic growth, full employment, and decent work for all (Saleh et al., 2020; Schroeder et al., 2019). Sustainability indicators can be used to assess waste management performance from economic, environmental, and social perspectives (Khair, 2019; Setyarini et al., 2020).

Considering the increasingly complex waste management problems and their impact on the environment and community welfare, this study is expected to provide a more in-depth understanding of the role of waste banks in overcoming these challenges. With the existence of waste banks, it is hoped that the community will be more aware of the importance of sorting waste and more active in recycling activities, which in turn supports the achievement of sustainable development goals, especially in environmental and economic aspects (Khair, 2019; Saleh et al., 2020). Therefore, this study aims to explore the implementation of the performance of waste banks from economic, social, and environmental aspects, as well as the sustainability strategy of waste banks in Makassar City.

2. METHODS

The case study location is in Makassar City, South Sulawesi, more precisely at the Makassar City Central Waste Bank. The population of Makassar City is 1,477,861 inhabitants (Badan Pusat Statistik Kota Makassar, 2025). Makassar City Central Waste Bank was chosen as the case study location due to its strategic role and prominence in the city's waste management system. As the central hub for waste banking in Makassar, it serves as a key model for other waste banks in the town. It provides a comprehensive data source on the waste bank's operations, management, and community involvement. The central waste bank serves multiple sub-districts within the city and handles a significant volume of waste. This makes it an ideal site for examining how waste banks function at scale and contribute to the city's overall waste management efforts.

The data used in this study includes both secondary and primary data. Secondary data was collected through literature studies and documents from the Central Waste Bank, which provided information on the number of waste bank units in each sub-district, waste sales rates, and waste generation data. Primary data was gathered through observations and interviews with waste bank managers. One limitation of this research is that interviews were not conducted with the users of the waste banks. The data collected was then analysed using qualitative descriptive analysis.

3. RESULT AND DISCUSSION

Waste banks in Makassar City were formed due to the Makassar Green and Clean (MGC) movement and ministerial regulation no. 13 of 2012 to implement the 3Rs through waste banks (Hermansyah, 2021). The Makassar City Waste Bank was introduced and started operating in 2015. Initially, 188 unit waste banks were established and spread across 14 sub-districts. Waste banks accept plastic, paper, metal, and glass types of waste.

People who want to sort and sell their waste must register as members. Generally, the types of waste banks in Makassar City consist of unit, school, sectoral, and waste banks of Regional Work Units/government institutions. These waste banks will later bring the waste collected to the central level, namely the Makassar City Central Waste Bank, for resale. The difference between the unit waste bank and the sectoral waste bank

is that the unit waste bank is a waste bank that serves the urban village and neighbourhood level. This waste bank also accepts individual members (Chanigo, 2023; Yustiani & Abror, 2019). While the sectoral waste bank is a sub-district level service, it can also assist the unit waste bank in sales (Ashariani, 2021), but this waste bank also accepts individual customers. Recorded in 2024, the number of waste banks in Makassar City amounted to 1,212 units, but not all are active. The number of active waste banks each year can be seen in the following table.

Table 1. Number of active waste banks in Makassar City

Year	Number of active waste banks (unit)				Total bank active waste
	Unit Waste Bank	School Waste Bank	Sectoral Waste Bank	Government Institutions	
2015	187	0	1	0	188
2016	243	5	3	2	253
2017	136	155	5	20	316
2018	49	16	0	3	68
2019	27	22	0	10	23
2020	64	27	0	0	91
2021	64	27	0	0	91
2022	64	27	0	0	91
2023	247	39	0	30	316
2024	266	43	0	39	348

(Source: UPT. Bank Sampah Pusat Kota Makassar, 2024)

The data above shows the activeness of waste banks in Makassar City in the last 10 years. The activeness of waste banks in Makassar City experienced a fluctuating trend, 2017 and 2024 showed the highest numbers with 316 and 348 units, respectively, while from 2020 to 2022, the data was stagnant, and there was no increase in the number of active waste banks as a result of the Covid-19 pandemic. Research by (Latanna, 2019) also shows that the impact of the pandemic has reduced activity at Makassar City's waste bank. Besides that, many waste bank units have moved to app-based waste trades, such as MallSampah, and stand independently because it is more efficient during the pandemic and has many advantages. However, in recent years, there has been a significant increase in the activeness of waste banks, especially in the types of unit waste banks and government institutions waste banks.

In buying and selling waste at the central waste bank, each waste bank manager brings their waste to the central waste bank for resale. The waste is then exchanged for money, and the price is based on the weight of the waste. For example, unit waste banks usually collect waste in one month. After collecting a large amount of waste, the unit waste bank manager will contact the central waste bank to pick it up and sell it back to the central waste bank. Trucks or three-wheeled motorised carts will transport the waste to the central waste bank and place it in the dropping area to be sorted and cleaned again. A clearer scheme of the waste buying and selling process at the Central Waste Bank can be seen in the following figure.

Figure 1. The process of buying and selling waste at the Makassar City Center Waste Bank

All waste collected by the Central Waste Bank will be resold to vendors. The central waste bank in Makassar City works with 11 vendors to resell and recycle waste. The vendors are UD. Dua Jaya, UD. Sumber Box, UD. Celebes Agung Niaga, MFC. Mitra Fajar Cemerlang, Hamparan Plastik Gowa, Botol Vendor, Olymplast, Anugrah Vendor, Hadado Go Green, MEP, and Myra Rahma. These vendors will take the waste to Surabaya, Jakarta, and China for recycling. Therefore, the central waste bank in Makassar City only plays a major role in the waste sorting component; it is left to the vendors who have collaborated for other processing. This is a limitation, as the waste bank does not engage in direct recycling processes at the unit or central levels. This lack of direct involvement in recycling means that the waste bank's contribution to the recycling chain is limited to sorting, and it relies on external vendors for the next crucial step in waste management.

The purchase price of inorganic waste by the Makassar City Central Waste Bank is differentiated from the type of waste based on its material. Inorganic waste is categorised into several main groups: plastic, metal, paper, glass bottles, and waste cooking oil. Each of these categories has a varying price depending on the characteristics and reuse value of the material. Plastic waste is classified based on the type and condition of the packaging, such as clear glass, bottles, plastics, and jars, and it has a purchase price range of Rp. 1,000 - Rp. 6,000 per kg, with the highest price for clean, unlabeled clear glass at Rp. 6,000 per kg, and the lowest price for dirty plastic is Rp. 1,000 per kg. Metal materials include iron, aluminium, copper, brass, and bronze. Metal prices are much higher than plastic, with copper from cables having the highest value of Rp. 80,000 per kg, and zinc-iron has the lowest price of Rp. 1,500 per kg. The paper waste category includes white paper, mixed paper, cardboard, newspapers, and cones, with a price range of Rp. 400 – Rp. 1,600 per kg. Glass waste is classified based on the type of beverage previously packaged (glass bottles). The price per bottle ranges from Rp. 250 - Rp1,000 per bottle. Waste cooking oil has a high price, which is Rp. 3,600 per kg. The unit-scale waste bank manager can earn around Rp 1,000,000 - Rp. 2,000,000 per month from the waste sold to the central waste bank. The results of waste purchases by the central waste bank over the past 9 years can be seen in the following figure.

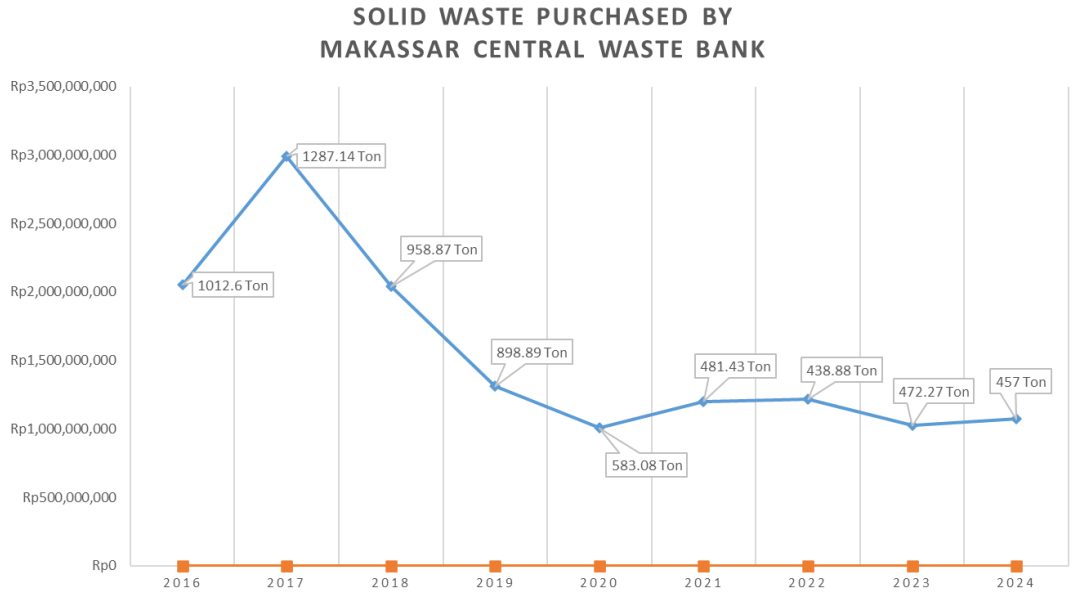

Figure 2. Waste purchased by Makassar City Central Waste Bank in 2016-2024

The data above shows the trend of waste purchase by Makassar Central Waste Bank from 2016 to 2024, which shows a fluctuating pattern with three phases: a significant increase in 2016-2017, a sharp decline in 2018-2020, and stagnation in 2021-2024. At the beginning of the period, the amount of waste purchased experienced a high increase, with the amount of waste collected in 2016 amounting to 1,012.6 tons and in 2018 reaching a peak of 1,287 tons; this was due to increased community participation with the new waste sorting policy supported by an incentive system. However, from 2018 to 2020, there was a decrease in waste purchases due to reduced unit waste bank activities. In addition, research by (Kubota et al., 2020) found that waste collection decreased in 2018 because this was the year of the new mayoral election. This led to differences in political party preferences, with waste bank leaders expressing support for certain candidates while waste bank unit collectors had other preferred candidates. These differences affected the motivation to participate in the waste bank program.

The years 2020-2024 showed a pattern that tended to stagnate. Although there were slight fluctuations, in general, the amount of waste purchased did not experience a significant increase. This is supported by Hermansyah's research, 2021, which concluded that community participation in processing waste in 2021 was around 27.33%, which is classified as low (Hermansyah, 2021). This condition shows that challenges have not been resolved in increasing the waste collected.

3.1 Evaluation of Makassar City Waste Bank Management

The evaluation of waste bank management in Makassar City uses the standard components of waste bank management from the Ministry of Environment Regulation No. 13 of 2012, which consists of assessing the components of members, waste bank organisers, waste collectors/buyers/recycling industries, management in waste banks, and the role of waste bank managers (Kementerian Lingkungan Hidup, 2012). The evaluation results are displayed in table form and explained as follows.

Table 2. Evaluation of Makassar City Waste Bank management

Component	Sub-component	Existing condition
Members	Waste bank counseling is conducted at least 1 (one) time in 3 (three) months	X
	Each member is given 3 three sorting waste packages	X

Component	Sub-component	Existing condition
	Members get an account book and garbage savings account number	✓
	Have done waste sorting	✓
	Have made efforts to reduce waste	✓
Waste bank organiser	Use Personal Protective Equipment (PPE) while serving members	X
	Wash hands with soap before and after serving waste savers	X
	Have participated in waste bank training	✓
	Number of daily managers at least five employees	X
	Managers get a salary/intensive every month	✓
Waste collector/buyer/recycling industry	No burning of waste	✓
	Has a cooperation/MoU with a waste bank as a partner in waste management	✓
	Able to maintain environmental cleanliness, such as the absence of mosquito larvae in can/bottle bins	✓
	Have a business license	✓
Waste management in a waste bank	Waste can be picked up by collectors at least once a month	✓
	Waste bank-assisted craftsmen recycle waste worthy of creation	X
	Compostable waste suitable for neighbourhood and/or communal scale management	X
	The number of members increases by an average of 5-10 members every month	X
The role of waste bank managers	As a facilitator in the development and implementation of waste banks	✓
	Provide waste collector/buyer data for waste banks	✓
	Provide recycling industry data	✓
	Reward waste banks	✓

The evaluation results show that several sub-components in the standard are still not implemented. One is the members component, which does not conduct counselling for members regularly, at least once every 3 months. There is no provision for three waste packages for each member, where members pack their waste using plastic bags or rice sacks. The waste bank organiser component, which is based on direct observation, does not wash their hands before and after serving members and does not use PPE. In addition, the average manager is only 2-3 people at the unit-level waste bank.

In the waste management component of the waste bank, the unit, and central-level waste banks, there are no waste recycling activities by craftsmen. Waste management activities only reached the sorting stage; previously, the central waste bank provided composting facilities in each waste bank unit, but unit-level managers did not use this facility due to a lack of knowledge of how to process organic waste into compost properly. The number of additional members also does not increase by 5-10 every month; the increase fluctuates and is erratic.

Based on the results of the above evaluation and observations, as well as interviews in the field, several issues of waste bank management were formulated it is 1) lack of community participation, 2) the non-optimal role of the manager, and 3) inadequate facilities in waste bank management.

The first issue is the lack of community participation due to the lack of knowledge about waste management, awareness, and motivation. Generally, the main reason why people become waste bank members is because they only want to get economic benefits. Most people interested in becoming waste bank members come from the middle to lower economic levels, while the upper middle economic level is still relatively low.

Hence, the importance of socialisation from the waste bank. In addition, since members must bring their waste to the waste bank to be sold, this may not be easy for some people because they have to take their time. Currently, many online waste trader applications have a similar concept to waste banks in Makassar City, one of which is MallSampah. However, from the waste bank itself, both at the central and unit levels, there is no online service to pick up or receive waste. Based on interviews with the waste bank units, some customers are no longer active because they prefer to use online waste trader applications where the buying and selling process is easier and more efficient.

The second issue is that the manager's role is not optimal because the average number of workers in the waste bank unit is only 2-3 people. According to the written standards, waste banks should employ five people. In addition, the obstacle that prevents the waste bank from running well is the lack of supervision and socialisation of the program from the central waste bank. For example, the central waste bank has facilitated unit waste banks with composters to process organic waste on a neighbourhood scale. However, the unit waste bank does not use this facility because of the lack of knowledge on how to process organic waste into compost, such as in the Ujung Tanah sub-district. Several studies (Haerul et al., 2016; Latanna, 2019) show that the waste bank program is considered non-optimal due to a lack of socialization in the community, especially regarding the concept of reuse, reduce, and recycle (3R). As a result, the community does not fully understand the applicable regulations and is not yet strongly committed to changing attitudes towards environmental cleanliness. The lack of adequate education also leads to low active community participation in the waste bank program, which results in a lack of positive impact on sustainable waste management. Based on interviews with the central waste bank, socialisation is not carried out regularly because there is no budget for socialisation.

Figure 3. Composter at the unit waste bank

The third issue is the inadequate waste bank management facilities, especially in waste storage containers. Currently, there are still many waste bank units that do not have adequate storage facilities, so all the waste that has been collected is mixed in one place. As a result, the sorting process must be repeated before the waste is distributed to the central waste bank, which can slow down waste management efficiency. In addition, due to the absence of storage facilities, some waste bank units also put the collected waste on vacant land, which reduces the aesthetics of the environment and has the potential to cause environmental impacts.

Figure 4. Waste collection in the waste bank unit

Limited waste storage facilities occur not only at the unit level but also at the central level. Although the central waste bank has provided a dropping area designed to separate waste by type, the area's capacity is still insufficient to accommodate the entire volume of incoming waste. Managers are forced to place waste in empty areas around the facility.

Figure 5. Dropping area at the central waste bank

In addition, based on the standard, each member is supposed to receive three types of waste packaging to sort waste from the source. However, members have not received such packaging and are forced to provide their own packaging for the waste they intend to sell. Generally, members use plastic bags and rice sacks, which is against the basic principle of waste banks in reducing plastic waste. In addition, waste bank units in the islands of Makassar City face an additional challenge in transporting their waste to the central waste bank because they have to provide their own boats. Without adequate transportation facilities, such as specialised motorboats, the operations of unit waste banks in small islands become even more difficult. This lack of standardised facilities has resulted in the waste sorting process not running optimally.

3.2 Strategies for a Sustainable Waste Bank

Developing an effective waste bank management strategy is important for sustainable waste management. These strategies arise from issues such as community participation in waste management, the unoptimised role of waste bank managers, and inadequate facilities in supporting waste bank operations. Therefore, this section will discuss some strategies that can be implemented to ensure that the Makassar City Central Waste Bank can operate effectively and sustainably.

The first strategy is that public participation must be strongly encouraged. Public participation can be increased by counselling or socialising about the importance of managing waste, processing, types of waste, and information about waste banks. This socialisation does not have to be done directly. However, it can be done through posts and social media, such as the one done by Bersinar Waste Bank, Bandung City. The operations of Bersinar Waste Bank were effective (Kusumawati et al., 2019). Bersinar Waste Bank has a website that contains information related to waste banks. In addition to the website, Bersinar Waste Bank has

an Instagram social media page containing forms for customer registration, waste pickup, and waste sorting guidelines. Previously, the Makassar City Central Waste Bank already had an Instagram social media account. However, the account was not actively used, so it is hoped that the account will be activated. It will post much information to the public about how to become a member of the waste bank and education related to waste management. In addition, counselling or socialisation can also be done by holding online seminars. Bersinar Waste Bank often holds online seminars on waste management and introductions related to waste banks. In addition, waste banks can also work with institutions to provide information about waste management and empower young people to carry out environmental care movements through waste banks.

Education is pivotal in fostering creativity and innovation within the community, especially in transforming waste into valuable products with economic benefits. This approach can significantly optimise waste management practices and create a sustainable city (Fatmawati et al., 2022). Aside from the success of Bersinar Waste Bank, the tangible benefits of waste management education are evident in Kamikatsu City, Japan. Since 2002, Kamikatsu has implemented a zero-waste management system, where waste is sorted centrally and 100% composted at the household level (Jarman-Walsh, 2019). The city has successfully applied the 5R principles: refuse, reduce, reuse, recycle, and recover, with everyone, from young to old, having been educated on the importance of living waste-free. As a result, residents understand the severe environmental impact of pollution and have embraced the zero-waste lifestyle in their daily routines (Sidjabat & Ilmi, 2020).

The second strategy is the reaffirmation of waste sorting regulations. Waste sorting is a critical initial step in waste management, as outlined in the Makassar City Regional Regulation No. 4/2011 on Waste Management. This regulation mandates waste sorting as an obligation for all community members. To strengthen compliance and ensure effective waste management, a policy requires the community to sort waste through the waste bank system. Reaffirming this regulation will encourage consistent waste sorting among individuals and institutions, making waste management more organized and effective.

The third strategy is to improve the performance and role of waste bank managers. One of the important factors in the success of waste banks is their professional and efficient management. Therefore, the standard operating procedures for waste bank management must be updated and reaffirmed to ensure optimal implementation. Building close partnerships between waste banks and other stakeholders, as well as providing ongoing training and coaching to waste bank management staff, is essential to improve the ability of managers to manage waste properly. In addition, it is important to regularly monitor and evaluate all programs run by the waste bank. All activities must be recorded properly as a basis for assessing the success of the waste bank. As a form of appreciation for successful waste banks, appropriate awards should be given to encourage motivation to improve their performance. Waste banks also need to support the development of waste recycling craftsmen to increase the economic value of the processed waste. In addition, waste banks should introduce digital platforms to facilitate online transactions and collection services so that people can still participate in waste management programs even in limited conditions.

The fourth strategy is to improve waste bank facilities and infrastructure. Providing adequate facilities and infrastructure is important to support effective waste bank operations. Waste banks must provide sorting containers that follow established waste management standards. In addition, operational equipment such as waste containers, shredders, composters, and other facilities must be provided completely and adequately in each waste bank unit. In this context, Makassar City Regional Regulation No. 4/2011 mandates that providing adequate facilities and infrastructure will support the achievement of waste reduction targets. Therefore, waste banks must collect data on the completeness and quality of their waste facilities and conduct regular maintenance to ensure that waste bank operations go well.

4. CONCLUSIONS

The implementation of the Central Waste Bank in Makassar City has shown quite good economic results because it can increase the income of the community, especially the lower-middle income, and succeed in

reducing waste. Nevertheless, some issues still need to be addressed, including the lack of community participation, services and the role of waste bank managers that are not yet optimal, and facilities that support the operations of waste banks that are not yet adequate. Based on the study results, it can be concluded that waste banks in Makassar City have fulfilled two of the three pillars of sustainability, namely the economic and environmental aspects, but have not fully fulfilled the social aspects. One of the main reasons is the lack of active participation from the community in the program. Community participation is crucial in ensuring that waste banks function optimally, but low awareness and understanding of the importance of waste management can hinder the program's success. Therefore, waste banks in Makassar City have not yet reached the expected level of sustainability.

Several strategies need to be implemented to achieve better sustainability and support the achievement of targets 3 and 8 of the SDGs related to circular economy. First, community participation should be encouraged more intensively through direct socialisation and using social media and webinars to educate the importance of waste management. Second, waste sorting regulations must be an affirmation to ensure community compliance with more structured waste management. Third, the role of waste bank managers needs to be strengthened by training and increasing operational capacity. Fourth, adequate facilities and infrastructure should be prioritised to support operational activities and increase waste banks' effectiveness in Makassar City.

Although this article provides valuable insights, it acknowledges its limitations. This study does not fully capture the experiences and perspectives of waste bank users regarding the system's effectiveness and its impact on their waste sorting habits and overall well-being. To address this limitation in future research, it would be beneficial to include interviews or surveys with waste bank users to gather direct feedback on their experiences.

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