

ANALYSIS OF EXISTING CONDITIONS AND FACTORS INFLUENCING THE SUSTAINABILITY OF THE NGUDI LESTARI WASTE BANK IN SEMARANG

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Abstract

Urban waste management is a pressing issue that requires sustainable, community-based solutions. The Ngudi Lestari Waste Bank in Tinjomoyo Village, Semarang City, serves as a participatory model that provides economic, social, and environmental benefits. This study analyzes the existing conditions and identifies factors influencing the sustainability of the waste bank. A mixed-methods approach was employed, including questionnaires from 69 respondents, in-depth interviews with management, stakeholders, customers, and partners, as well as field observations. Quantitative data were analyzed descriptively using SPSS, while a SWOT analysis identified strengths, weaknesses, opportunities, and threats. Results indicate that the waste bank is in very good condition, with an overall mean of 4.62. The economic (4.62), social (4.59), environmental (4.69), technological (4.62), and institutional governance (4.60) aspects all demonstrate strong performance. Key strengths include economic benefits for members, positive environmental impacts, and a robust organizational structure. Social and technological aspects, while performing very well, still require attention in community education and digital system integration. Supporting factors include active community participation, institutional backing, and beneficial environmental outcomes, whereas inhibiting factors involve limited facilities, fluctuating waste prices, and uneven community awareness. The SWOT analysis suggests that strategies to enhance sustainability should focus on strengthening institutional capacity, digitalizing management systems, and expanding partnerships with educational institutions. Recommended actions include enhancing environmental education programs, implementing a digital waste savings system, and strengthening policy support. Overall, the Ngudi Lestari Waste Bank effectively contributes to community-based waste management and has strong potential to serve as a model for sustainable waste management at the local level.

Keywords: *Waste Bank, Sustainability, Community-Based Waste Management, SWOT, Semarang*

INTRODUCTION

Waste management has become an increasingly urgent global issue in line with the growth of population and economic activities. According to the World Bank, global waste volume is projected to reach 3.4 billion tons by 2050, an increase of approximately 70% from current (Liu & King, 2018). The increase in waste generation is mainly due to population growth, urbanization, increased purchasing power, and consumption patterns of packaged and single use products (Fatika, 2024). This situation poses significant challenges to waste management capacity, environmental sustainability, and public welfare.

Indonesia, as one of the world's most populous countries, faces similar challenges, as its urban waste management systems remain suboptimal. In Semarang City, waste generation reaches 1,189.71 tons per day, 72% of which comes from households (*Sistem Informasi Pengelolaan Sampah Nasional (SIPSN)*, 2024). The Jatibarang landfill, operating since 1992, is now overcapacity (Annizar, 2023). This situation calls for a paradigm shift in waste management from a linear "collect-transport-dispose" system toward a circular economy emphasizing resource efficiency and waste reduction.

Recent studies emphasize that the sustainability of waste management systems depends not only on technical aspects but also on institutional, social, and technological innovation. van Leeuwen & Surya (2024) using a qualitative approach with actor-network analysis, found that institutional structures and power relations often exclude marginalized groups such as informal waste pickers, thus requiring more inclusive and participatory policies.

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Meanwhile, Agyapong et al. (2024) using a quantitative Structural Equation Modeling (SEM) approach, found that managerial support, technological innovation, and environmentally friendly organizational culture play key roles in promoting the adoption of circular economy practices, especially in the industrial sector. One innovative community-based waste management approach is the establishment of waste banks, which apply the 3R principles (Reduce, Reuse, Recycle) and function as tools for education and economic empowerment (Usis, 2021). Waste banks are managed through community participation and provide economic value through waste-based savings (Palahudin et al., 2024). As of 2021, there were 47,131 waste banks across Indonesia, with Central Java among the provinces with the highest number (Kementerian Lingkungan Hidup dan Kehutanan, 2021). Policies such as Semarang Mayor Regulation No. 7 of 2025 and Presidential Regulation No. 97 of 2017 strengthen community-based waste management efforts. However, the sustainability of waste banks still faces challenges, including weak institutions, limited resources, and fluctuating community participation (Yandri et al., 2024).

Previous research has shown that the success of community-based waste management programs is highly influenced by institutional support, community participation, and technological innovation. Budihardjo et al. (2022) highlighted the importance of local government policy support in strengthening community-based waste management systems through the Community-based Material Recovery Facility (CdMRF) approach. The Ngudi Lestari Waste Bank in Tinjomoyo Village, Banyumanik District, Semarang City, is a good example of community-based waste management practice. Established in 2019, it became a CSR partner of PT Pegadaian with a focus on institutional strengthening and community circular economy development. Although it already has 314 active members and provides both economic and environmental benefits, it still faces challenges related to funding, facilities, and consistent community participation (Situmeang et al., 2023). This study aims to analyze the existing conditions and identify supporting and inhibiting factors for the sustainability of the Ngudi Lestari Waste Bank. The mixed-methods approach was used to comprehensively assess economic, social, environmental, technological, and institutional aspects, leading to practical strategic recommendations for improving community-based waste management systems.

RESEARCH METHODS

This study employed both quantitative and qualitative descriptive approaches. The research was conducted at the Ngudi Lestari Waste Bank, located in Tinjomoyo Village, Banyumanik District, Semarang City (Figure 1). Data were collected through questionnaires distributed to 69 waste bank members, in-depth interviews with the village head, waste bank administrators, community leaders, and customers, as well as direct observations of collection, weighing, and processing activities.

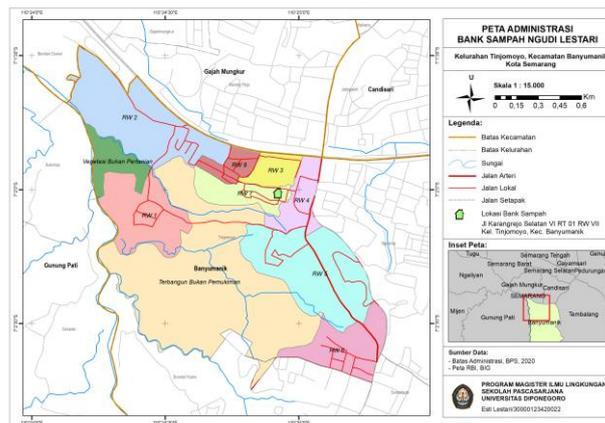


Figure 1. Research Location Map Of The Ngudi Lestari Waste Bank In Semarang City

Quantitative data were analyzed descriptively using SPSS to determine respondents' perceptions regarding economic, social, environmental, technological, and institutional aspects. A SWOT analysis was then applied to identify internal factors (strengths and weaknesses) and external factors (opportunities and threats) influencing the sustainability of the Ngudi Lestari Waste Bank.

RESULTS AND DISCUSSION

Existing Conditions of the Ngudi Lestari Waste Bank

The results of the descriptive analysis indicate that the respondents’ average perception score for sustainability indicators falls within the very good category, with an overall mean of 4.62. This suggests that the Ngudi Lestari Waste Bank operates effectively and sustainably, particularly in the economic (4.62), social (4.59), environmental (4.69), technology (4.62), and institutional governance (4.60) aspects. The detailed mean scores for each sustainability dimension are presented in Table 1. Despite these strong results, several challenges remain, especially concerning waste price stability, community engagement, and the adoption of digital technologies. Addressing these challenges is essential to further enhance the sustainability and operational efficiency of the waste bank.

Table 1. Respondents’ Average Perception Scores On Sustainability Aspects Of The Ngudi Lestari Waste Bank

Aspect	Mean	Category	Interpretation
Economic	4.62	Very Good	Provides economic benefits for members
Social	4.59	Very Good	Good participation, awareness of waste sorting needs reinforcement
Environmental	4.69	Very Good	Positive environmental impact
Technology	4.62	Very Good	Uses technology; digital integration can be enhanced
Institutional Governance	4.60	Very Good	Strong structure and coordination

Based on the results presented in Table 1, each sustainability aspect was analyzed in more detail to identify specific strengths and challenges. The discussion below elaborates on five key aspects—economic, social, environmental, technological, and institutional governance—of the Ngudi Lestari Waste Bank.

1. Economic Aspect

The average score for the economic aspect ranges from 4.55–4.72 (very good). This indicates that the Ngudi Lestari Waste Bank positively impacts members’ economies, both through additional income and waste-based savings. The community has understood the economic value of waste, motivating them to participate. However, strategies are needed to increase added value through recycled product diversification and waste price stabilization.



2. Social Aspect

The average scores range from 4.33 to 4.75, indicating that while community awareness of waste sorting is relatively high, it is still lower compared to other social activities. Participation in waste bank activities is also slightly uneven, suggesting that some members are more actively involved than others. Strengthening environmental education and social engagement is essential to further enhance community participation and collective responsibility.



Figure 3. Residents' Social Interaction And Waste Sorting Activities At The Ngudi Lestari Waste Bank

3. Environmental Aspect

The environmental aspect is rated very good, with an average score of 4.61–4.77. The waste bank program effectively supports sustainable waste management, contributing to cleanliness and waste reduction. Many respondents reported behavioral changes in waste sorting at the household level. However, expansion of collection coverage and facilities is still needed.

4. Technological Aspect

The average score is 4.57–4.65 (very good). While communication and recording systems function, they are still mostly manual. The community is receptive to digital innovations, such as waste banking applications. Digitalization would enhance efficiency, transparency, and data integration.

5. Institutional Governance Aspect

The average score is 4.51–4.71 (very good). The organizational structure functions effectively with good coordination and active participation from members. However, continuous training and government policy support are needed for stronger institutional development and partnerships.

Overall, the Ngudi Lestari Waste Bank is in good and sustainable condition, especially in environmental, economic, and governance aspects. It functions effectively as an educational and empowerment platform for the community.

SWOT Analysis

Based on questionnaires and in-depth interviews, several supporting and inhibiting factors were identified.

1. Supporting Factors

a. Strengths

The main strengths include high community participation, strong institutional support from the local government and the Environmental Agency, diversification of recycled products, clear SOPs, and the use of digital platforms and social media for promotion and communication. These factors show that the Ngudi Lestari Waste Bank has a solid social and institutional foundation to develop as an independent and inclusive community-based waste management model.

b. Opportunities

The sustainability potential is high due to local government support, partnerships with MSMEs and educational institutions, growing environmental awareness, and technological advancements. The increasing acceptance of eco-friendly lifestyles in urban areas presents opportunities to expand partnerships and public education.

2. Inhibiting Factors

a. Weaknesses

Internal weaknesses include limited operational facilities such as weighing scales, storage, and transportation, unstable waste prices affecting savings value, uneven community awareness (especially among youth), and limited innovation in recycled products. These weaknesses indicate a need for stronger managerial capacity and operational infrastructure.

b. Threats

External threats include changes in government policy, competition from independent waste collectors offering instant payments, and fluctuations in recycling market prices affecting income stability. To mitigate these risks, the waste bank must strengthen institutional resilience, diversify funding sources, and improve branding to compete with conventional collectors.

The sustainability of the Ngudi Lestari Waste Bank is supported by strong institutional and community participation and technology use but limited by infrastructure and market instability. The recommended strategies are maximizing strengths to exploit opportunities (SO Strategy) and addressing weaknesses to face threats (WT Strategy).

CONCLUSION

The analysis of questionnaire and interview results indicates that the Ngudi Lestari Waste Bank is in very good condition. All aspects—economic, social, environmental, technological, and institutional—contribute significantly to supporting its sustainability. The SWOT analysis shows that sustainability is strengthened by strong community participation, institutional support, and notable economic and environmental benefits. However, some limitations exist, including insufficient facilities and the absence of integrated digital management systems. Opportunities arise from supportive government policies and partnerships with the private sector, while threats include fluctuating waste prices and uneven community awareness. Overall, the Ngudi Lestari Waste Bank effectively contributes to community-based waste management and has strong potential to serve as a model for sustainable waste management at the local level, provided that current weaknesses are addressed through institutional innovation and technological advancement.

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