



RESEARCH ARTICLE

Analysis of the Role of Berkah Garbage Bank on the Economic Income of the Community In Belawan

Yanti Br Naibaho¹⁾, Annisa Ilmi Faried^{2*)}

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Abstract

This study examines the role of Bank Sampah Berkah (BSB) in Belawan, Medan, in addressing waste management issues while simultaneously improving the economic well-being of the community. Prior to BSB's establishment in 2016, the majority of Belawan residents (76.2%) disposed of waste indiscriminately, resulting in high daily waste generation (6 kg by 32 respondents, 4–6 kg by 42 respondents). BSB's presence significantly altered this behavior, evidenced by the elimination of respondents generating 6 kg of waste and a drastic increase in the group producing less than 3 kg of waste (rising to 40 respondents). The research findings indicate increased public awareness and participation in waste sorting, driven by direct financial benefits from waste savings (estimated average >IDR 200,000/month per customer). These funds are utilized for basic needs, children's education, and even business capital. Although BSB manages a smaller volume of waste (9,245.64 kg/year) compared to Bank Sampah Unit Tri Golan Jaya (148,560 kg/year), BSB excels in its measurable and significant microeconomic impact on its customers. Bank Sampah Berkah proves to be an effective model for community-based waste management that empowers the economy, despite facing challenges of fluctuating customer participation and limited access to recycling product markets.

Keywords: Bank Sampah Berkah, Waste Management, Income Improvement, Community Welfare, Circular Economy, Belawan

INTRODUCTION

The issue of waste has become a pressing global concern, and Indonesia is no exception. An estimated 60-70% of all generated waste still ends up in landfills (TPA) or is even disposed of indiscriminately (Arifin et al., 2019; Damanhuri & Suryo, 2018). This situation is particularly severe in coastal areas like Belawan, Medan, where waste, especially plastic, frequently pollutes fragile marine ecosystems (Lubis, 2018).

As an innovative response, Waste Banks (Bank Sampah) have emerged as a solution that integrates waste management with community economic empowerment efforts, transforming what was once considered waste into a valuable economic asset (Handayani, 2020; Hidayah, 2020). This research specifically focuses on Bank Sampah Berkah (BSB) in Belawan, Medan. BSB, established in 2016 by Gugah Nurani Indonesia (GNI) and in partnership with Yayasan Buddha Tzu Chi Indonesia (YBTCI), has two main objectives: to reduce waste generation and to increase the income of local residents.

While previous studies have extensively examined waste banks in general, there remains a significant research gap. Many studies tend to be general and lack in-depth analysis within the specific context of coastal communities, which face unique challenges such as marine waste and accessibility issues. The specific aspect of the circular economy, which creates added value from waste, as well as the long-term welfare impact, has also not been explored in detail. Furthermore, in-depth analysis of factors driving and hindering coastal community

participation, and holistic qualitative studies dissecting waste bank operations at the micro level, are still limited.

Therefore, this research seeks to fill these gaps by focusing on the unique coastal context of Belawan. We integrate circular economy and community empowerment analysis, analyze the direct impact on household income improvement with specific coastal waste value chains, utilize an in-depth qualitative case study approach, identify unique coastal challenges and opportunities, and formulate innovative strategies based on SWOT analysis. This research aims to analyze the role of Bank Sampah Berkah in improving the economic income of the Belawan community and to identify the factors influencing the sustainability of the program.

Literature Review

Waste Banks and the Circular Economy

A Waste Bank is a community-based waste management model that aims to transform the perception of waste from a mere discard into an asset with economic value (Rahmawati & Subagiyo, 2021). Members of a waste bank, known as customers, deposit sorted waste (plastics, paper, metals, etc.) and receive financial compensation, recorded like savings (Putra, 2021). This concept is an integral part of the Circular Economy, an economic system designed to minimize waste and maximize resource utilization through recycling, reuse, and repair (Ellen MacArthur Foundation, 2015). The utilization of waste through ecobricks in Pahlawan Village demonstrates that participatory waste management not only has a positive environmental impact but also has the potential to increase the community's economic value. This aligns with the waste bank concept, which encourages people to sort, collect, and manage waste as a form of savings with economic exchange value. This community empowerment in waste management has proven capable of fostering new knowledge and skills that are economically valuable and circular-based (Faried, Sembiring, & Wahyuni, 2023). Within the context of waste banks, the circular economy is implemented by integrating waste into the value chain, transforming it into raw materials or new products, thereby

¹Development Economics Study Program, Universitas Pembangunan Panca Budi

*) *corresponding author*

Annisa Ilmi Faried

Email: annisailmi@dosen.pancabudi.ac.id

reducing reliance on primary resources and environmental impact (Faried, 2023). The circular economy approach to waste management leads to a green recovery that can improve community welfare through cost reduction and the creation of valuable products (Faried, Sembiring, & Wardhani, 2023, p. 5). This approach aligns with Environmental Economic Theory, which seeks to internalize negative externality costs (e.g., waste pollution) into positive economic value, transforming waste into valuable resources.

Community Economic Empowerment

Community economic empowerment is the process of increasing the capacity of individuals and communities to access and manage economic resources to improve their welfare (Mardikanto, 2014). Waste management not only reduces waste but also opens up opportunities for additional income for the community by processing waste into marketable products, thereby enhancing economic well-being and environmental sustainability (Faried, 2023). Waste banks contribute to this empowerment by providing additional income sources, creating recycling-based business opportunities, and increasing community financial literacy (Indrawati, 2020; Sari, 2019). Previous research shows that waste banks are effective in increasing the income of low- and middle-income families (Setiawan & Adi, 2019; Wulandari, 2018). Within the Sustainable Livelihood Framework, BSB contributes to increasing financial, human (knowledge), and social capital, which collectively strengthens the sustainable livelihoods of the community.

Environmental Awareness and Community Participation

Community participation is key to the success of community-based waste management programs. Increased environmental awareness encourages individuals to be more active in sorting and depositing waste, which in turn strengthens waste bank operations and expands their environmental impact (Rahmawati, 2021). The role of waste banks in raising this awareness not only reduces pollution but also builds social cohesion and a sense of collective responsibility (Suryani, 2020). This phenomenon can be explained by the Theory of Planned Behavior (Ajzen, 1991), where the financial benefits and education from BSB shape positive attitudes towards waste sorting, subjective norms from community participation encourage such behavior, and BSB's operational support increases perceived behavioral control. Furthermore, Waste Banks also build Social Capital by increasing interaction, trust, and networks among citizens, strengthening the basis for collective action in environmental management.

Sampling Procedures and Research Ethics

Participant selection will involve a purposive approach for customers to ensure representation of active and informative individuals. For workers, a census method will be employed due to their limited number. Before data collection, all participants will receive a full explanation of the research objectives and their rights as respondents. Participation will be voluntary, and informed consent will be obtained in writing. All research procedures will adhere to ethical research standards, including data confidentiality and respondent anonymity.

Measurement and Research Instruments

Data collection will be conducted using various methods:

1. **Structured Interviews:** Interview instruments will be developed by the researchers, covering questions related to customer motivation, income impact, challenges faced, BSB operational efficiency, and perceived benefits. The interview guidelines will be validated through expert judgment.
2. **Standardized Observation:** Observation sheets will be used to directly observe BSB's operational processes, from waste

reception, sorting, and transactions, to interactions between management and customers.

3. **Focus Group Discussion (FGD):** FGD guides will be developed to facilitate group discussions with customer and worker representatives, exploring collective experiences, shared issues, and their perceptions of BSB's impact. The FGD guides will also be validated by experts.
4. **Documentation:** Secondary data will be collected from BSB's monthly operational reports (e.g., number of active customers, transaction frequency, sales value), internal records, and visual documentation (photos and videos) of BSB activities.

Data Analysis

Data will be analyzed sequentially, beginning with quantitative analysis, followed by qualitative analysis.

Quantitative Data Analysis

1. **Data Collection:** BSB operational data, such as the number of saving customers and total waste purchases, will be collected from BSB's monthly reports.
2. **Descriptive Analysis:** Data will be presented in graphs, tables, percentages, and monthly trends to provide an overview.
3. **Trend Analysis (Moving Average):** Used to identify long-term patterns in customer participation.
4. **Pearson Correlation Analysis:** Measures the strength and direction of the relationship between the number of active customers and total waste purchases (as an indicator of income).
5. **Simple Linear Regression Analysis:** Tests the cause-and-effect relationship and the magnitude of the influence of the number of saving customers (independent variable) on community economic income (dependent variable), using the model $Y=a+bX$.
6. **Coefficient of Determination (R²) Test:** Measures how much of the variation in the dependent variable is explained by the independent variable.
7. **Classical Assumption Test:** Includes Normality Test, Heteroscedasticity Test, and Autocorrelation Test. These tests will be performed using SPSS software to ensure that the regression model meets statistical requirements (Best Linear Unbiased Estimator - BLUE) and that the results are valid.

Qualitative Data Analysis

1. **Data Collection:** Derived from interviews, observations, and Focus Group Discussions (FGDs).
2. **Data Reduction:** The process of filtering relevant information and grouping it based on specific themes.
3. **Data Presentation:** Presented in the form of descriptive narratives, direct quotes from informants, and thematic matrices.
4. **Conclusion Drawing:** Based on patterns or findings emerging from the qualitative data.

Integration of Findings

This mixed-methods approach integrates quantitative and qualitative results. Quantitative results will be presented first, then explained and enriched by qualitative findings, providing a deeper understanding of "why" certain patterns or trends emerge.

Data Validity and Reliability

To ensure the quality of data and research results, several validity and reliability tests will be conducted:

1. **Instrument Validity Test with Expert Judgment:** Interview guidelines and FGD guides will be reviewed by experts to ensure the relevance, clarity, completeness, and accuracy of the instruments.

2. Pilot Test: Research instruments will be piloted on a small number of respondents to identify weaknesses and ensure respondent understanding.
3. Triangulation: This method will be used to verify data from various sources and techniques:
 - a. Source Triangulation: Using data from various parties (customers, BSB workers, operational reports, FGDs).
 - b. Technique Triangulation: Combining various data collection methods (interviews, observations, FGDs, documentation).
 - c. Time Triangulation: Data collection will be conducted at different time periods to observe consistency.
4. Member Checking Technique: Key respondents will verify the accuracy and interpretation of the collected data to enhance credibility.

RESULTS AND DISCUSSIO

Profile of Bank Sampah Berkah (BSB)

Bank Sampah Berkah (BSB) commenced operations in 2016 within Belawan II Urban Village as a collaborative initiative between Gugah Nurani Indonesia (GNI) and Yayasan Buddha Tzu Chi Indonesia (YBTCI) Sinarmas Belawan Branch. The institutional framework encompasses waste collection, sorting, weighing, and savings account management for community members. BSB operates on a hybrid model combining environmental management with microfinance services, serving as both a waste processing facility and a community savings institution.

Analysis of Bank Sampah Berkah Operational Data 2024

Operational data from BSB for 2024 offers a clear picture of its activities and impact.

Table 1 presents monthly customer participation data revealing significant seasonal and promotional influences on engagement levels.

Table 1. Monthly Customer Participation at BSB (2024)

Month	Active Customers	Monthly Change (%)	Cumulative Participation
January	80	-	80
February	90	+12.5	170
March	75	-16.7	245
April	68	-9.3	313
May	62	-8.8	375
June	56	-9.7	431
July	45	-19.6	476
August	34	-24.4	510
September	42	+23.5	552
October	38	-9.5	590
November	79	+107.9	669
December	120	+51.9	789
Mean	65.75	-0.18	454.08
Std. Dev.	26.84	36.45	242.17

Key Findings:

1. Customer participation demonstrates high volatility (CV = 40.8%)
2. Significant decline during mid-year period (June-August: 56→34 customers)
3. Substantial recovery in final quarter (October-December: 38→120 customers)
4. December represents peak engagement (+107.9% from October baseline)

Number of Customers Saving at Bank Sampah Berkah in 2024

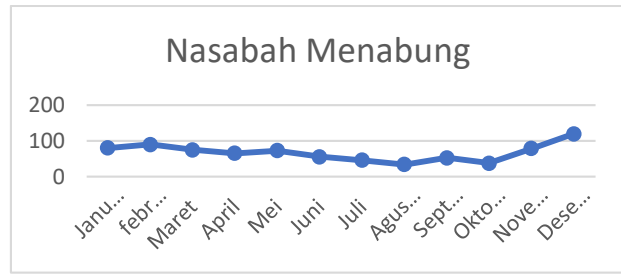


Image of the Percentage of Customers Saving at Bank Sampah Berkah in 2024

The number of active saving customers at BSB showed fluctuations throughout 2024. At the beginning of the year, the numbers were quite high (January: 80, February: 90), but then experienced a decrease in the following months (June: 56, August: 34, October: 38). Interestingly, this trend significantly reversed in the second half of the year, especially in November (79) and December (120). This pattern indicates the success of promotional efforts or increased public awareness, particularly towards the year-end.

Volume of Waste Received Each Month

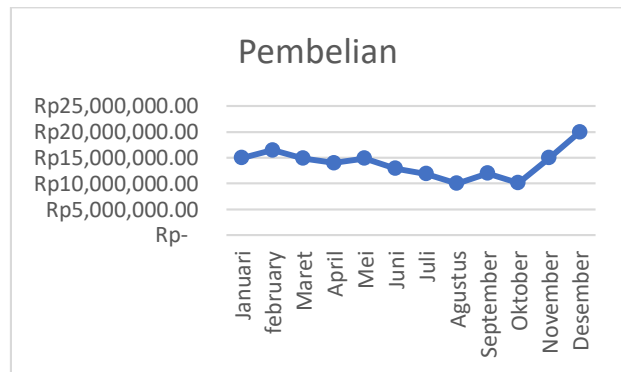


Image of Total Waste Purchases by Bank Sampah Berkah in 2024

The volume of waste deposited by customers, reflected in the "Total Waste Purchases (Rp)," also shows a pattern of monthly fluctuations. For instance, January saw Rp15,000,000 and December surged to Rp20,000,000. Decreases in certain months, such as July (Rp11,900,000) and August (Rp10,000,000), were likely influenced by seasonal factors (e.g., lean fishing seasons in Belawan) or major holidays. Conversely, the significant jump at the end of the year could be due to more intensive campaigns or an increase in the community's economic needs leading up to holidays.

Figure 1 illustrates the relationship between customer participation and economic transactions throughout 2024.

Table 2. Monthly Waste Purchase Values and Economic Indicators

Month	Waste Purchases (IDR)	Revenue per Customer (IDR)	Waste Volume (kg)*
January	15,000,000	187,500	1,500
February	16,500,000	183,333	1,650
March	14,200,000	189,333	1,420
April	13,800,000	202,941	1,380
May	12,900,000	208,065	1,290
June	11,700,000	208,929	1,170
July	11,900,000	264,444	1,190
August	10,000,000	294,118	1,000
September	12,400,000	295,238	1,240
October	11,200,000	294,737	1,120
November	18,800,000	237,975	1,880
December	20,000,000	166,667	2,000

Total 2024	168,400,000	210,278	16,840
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*Estimated based on average IDR 10,000/kg market rate

Economic Performance Analysis:

1. Total annual transactions: IDR 168,400,000 (≈ USD 11,227)
2. Average monthly transaction value: IDR 14,033,333
3. Revenue efficiency shows inverse relationship with participation volume
4. Peak efficiency during low-participation months (July-October: IDR 264,444-295,238 per customer)

Results of Waste Purchases from Customers

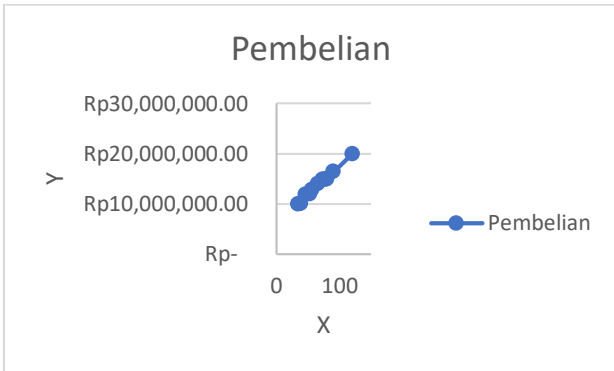


Image of the Relationship between the Number of Saving Customers and Total Waste Purchases at Bank Sampah Berkah in 2024. X-axis: Number of Customers, Y-axis: Total Purchases (Rp)

A scatter plot visualization of the monthly data shows the combination of the number of customers and the monetary value of waste purchases for that month. The stability of monthly waste purchases creates opportunities for regular additional income for customers. Furthermore, the Pearson correlation coefficient between the number of active saving customers and total waste purchases is 0.957. This is a very high figure, indicating a very strong and positive relationship. Empirically, this supports the idea that an increase in the number of BSB customers directly contributes to an increase in income generated from waste.

Economic, Social, and Ecological Impact

Community participation in BSB delivers multifaceted, interconnected impacts:

1. Economic Impact: BSB provides a significant source of additional income, especially for low-income groups and those with irregular earnings. The average additional income per customer varies but is quite substantial. For instance, Ibu Siti, an active customer, stated, "The money from the Waste Bank really helps with kitchen groceries, and sometimes it can even be for my children's school allowance." In addition, the program indirectly encourages the emergence of small recycling-based businesses, such as handicrafts made from recycled materials.
2. Social Impact: BSB has successfully increased social interaction and strengthened community cohesion. There's a noticeable increase in the frequency of meetings among residents when they deposit waste, as well as a rise in collective awareness about the importance of waste sorting. Bapak Budi, one of BSB's administrators, observed, "Before, people threw trash anywhere, now they're starting to care. They often gather here, exchange ideas, not just exchange waste. This makes Belawan cleaner and the residents become closer."
3. Ecological Impact: The volume of waste deposited at BSB directly contributes to the reduction of waste in the environment, especially in Belawan's vulnerable coastal waters. This supports the creation of a cleaner environment, protects marine ecosystems, reduces the

burden on landfills (TPA), and contributes to the reduction of harmful methane gas emissions.

Classical Assumption Tests

Before conducting the regression analysis, a series of classical assumption tests were performed to ensure the validity of the statistical model:

1. Normality Test: The results showed that residuals were normally distributed (Sig. value > 0.05), satisfying the normality assumption.
2. Heteroscedasticity Test: Through scatter plot analysis, no specific pattern indicating heteroscedasticity was found (points were randomly scattered).
3. Autocorrelation Test: The Durbin-Watson value indicated the absence of autocorrelation, both positive and negative, between residuals.

Based on these classical assumption test results, it can be concluded that the simple linear regression model used meets the statistical requirements for further analysis.

In-depth Interviews with Key Informants

In-depth interviews with BSB management, partner representatives, and active customers provided qualitative insights that reinforced the quantitative findings:

1. Ibu Syafyenni (Head of BSB Management): Identified key challenges as inconsistencies in waste deposits by customers and fluctuations in the market selling price of recycled waste. She emphasized that community support and continuous education are crucial for maintaining operations.
2. Bapak Dicky Siburian (Partner Representative): Affirmed that BSB is an integral part of a broader empowerment program and observed a high level of commitment from Belawan residents to participate.
3. Ibu Azizah (Active Customer): Acknowledged that BSB significantly helps supplement her family's income. Additionally, she also felt an increased awareness in waste sorting and environmental cleanliness in her surroundings.

SWOT Analysis of Bank Sampah Berkah

This SWOT analysis provides a comprehensive overview of BSB's strategic position in waste management and community economic empowerment in Belawan.

Table 3. SWOT Analysis Matrix of Bank Sampah Berkah

INTERNAL FACTORS	
STRENGTHS	
a.	Strategic and easily accessible location in Belawan II Urban Village, making it convenient for customers to deposit waste.
b.	Strong support from the local community and active customers, demonstrated by significant participation levels.
c.	Solid partnerships with non-profit organizations like Gugah Nurani Indonesia (GNI) and Yayasan Buddha Tzu Chi Indonesia (YBTCI), providing technical and non-financial support.
d.	Direct and stable access to large recycling factories/collectors, ensuring an efficient supply chain and reducing the risk of waste accumulation.
e.	Provides direct and tangible economic benefits as additional income for the community, especially for low-income and informal workers.
THREATS	
a.	WO Strategy (Leveraging Opportunities to Overcome Weaknesses)
b.	Utilize solid partnerships with GNI/YBTCI and the growing environmental awareness trend to secure more

- c. comprehensive HR management training and improved operational skills.
- d. With increasing environmental awareness and potential government support, BSB can actively seek grants or CSR funds from large corporations for facility development (e.g., procurement of shredding/baling machines).
- e. Leverage circular economy trends and develop partnerships with local MSMEs to diversify value-added products from existing waste types (e.g., handicrafts from plastic/paper) or new waste types.
- f. Optimize the types of waste accepted (e.g., glass bottles, metal, fabric scraps) according to evolving recycling market demand, supported by education and training for customers for better sorting.

EXTERNAL FACTORS

WEAKNESSES

- a. Limited human resources (HR) for management, leading to a high workload and potentially less focus on innovation development.
- b. Limited operational capital for facility development, such as acquiring modern shredding or pressing machines.
- c. The types of waste accepted are still limited (primarily focusing on plastic and paper), not yet encompassing all types of economically valuable waste.
- d. Fluctuations in the selling price of recycled waste in the market, which can affect the waste bank's income and incentives for customers.
- e. Lack of formal legality or a strong legal framework from the local government, which could impact operational sustainability and scale.

OPPORTUNITIES

- a. Strategies (Maximizing Strengths to Seize Opportunities)
- b. Increased global and local public environmental awareness regarding the importance of waste management.
- c. Local government support for environmental and city cleanliness programs, including potential regulations and fund allocation.
- d. Growing popularity of circular economy trends and sustainable lifestyles, opening new markets for recycled products.
- e. Potential expansion of BSB's operational area to other sub-districts or regions around Belawan that are not yet covered.
- f. Potential expansion of BSB's operational area to other sub-districts or regions around Belawan that are not yet covered.
- g. ST Strategies (Using Strengths to Overcome Threats)
- h. Presence of informal waste collectors who often offer competitive or higher prices, attracting customers.
- i. Lack of public understanding regarding the importance and proper methods of waste sorting, reducing the quality of deposited waste.
- j. Government policies that do not support or even hinder waste bank operations in the future.
- k. Changes in regulations related to waste management or unpredictable fluctuations in recycled commodity prices in the global market.

Key Strategies from SWOT Analysis:

1. **SO Strategy (Strengths-Opportunities):** Leverage BSB's strong partnerships (with GNI/YBTCI) and the high environmental awareness of the community to intensify education programs and broaden the reach of waste bank services to new areas.
2. **ST Strategy (Strengths-Threats):** Reinforce BSB's strengths in social aspects (community cohesion) and education, while concentrating on improving waste sorting quality. This approach will help BSB effectively compete with informal collectors and foster customer loyalty.

3. **WO Strategy (Weaknesses-Opportunities):** Capitalize on opportunities from government support and Corporate Social Responsibility (CSR) funds from large corporations. These resources can be used to enhance facilities (e.g., acquiring modern machinery) and diversify value-added products from both existing and new types of waste.
4. **WT Strategy (Weaknesses-Threats):** Engage in proactive communication and advocacy with local governments to secure formal legal status for BSB. Additionally, mitigate operational risks stemming from limited facilities and human resources by seeking additional funding for equipment modernization and ongoing HR training.

Results and Discussion of Regression Analysis

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	99376 0,671	12058 4,270		8,2 41	,0 0
	JUMLA	17007, 258	1691,5 47	,954	10, 054	,0 0
	NASAB					0
	AH					0
	YANG					0
	MENA					0
	BUNG					0

a. Dependent Variable: PENDAPATAN

A simple linear regression analysis was conducted to test the relationship and influence between the number of saving customers (independent variable, X) and community economic income (dependent variable, Y). Simple Linear Regression Equation Model

The regression equation obtained is: $Y = 993,760.671 + 17,007.258X$ Explanation of the Equation:

- a. Constant (a) = Rp993,760.671: This figure indicates that if the waste bank factor (number of saving customers) is considered constant or non-existent, the average income obtained is approximately Rp993,760.671.
- b. Regression Coefficient (b) = Rp17,007.258: This means that every one-unit increase in the number of saving customers (X) will lead to an increase in income (Y) of Rp17,007.258. This figure confirms a positive influence of customer participation on income.

Hypothesis Testing:

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	99376 0,671	12058 4,270		8,24 1	,000
	JUMLAH	17007, 258	1691,5 47	,954	10,0 54	,000
	NASABAH					
	YANG					
	MENABUNG					

a. Dependent Variable: PENDAPATAN

Based on the Coefficients table (Sig. = 0.000 < 0.05 and t-calculated = 10.054 > t-table = 1.994), H0 is rejected and H1 is accepted. This means the Waste Bank has a positive and significant effect on Community Economic Income. The higher the participation rate in the Waste Bank, the greater the income.

Coefficient of Determination (R2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,954 ^a	,910	,901	135755,62997

a. Predictors: (Constant), JUMLAH NASABAH YANG MENABUNG

The **Model Summary** table shows an **R Square** value of 0.910 or 91.0%. This indicates that 91% of the variation in community economic income is influenced by the waste bank factor (number of saving customers), while the remaining 9% is influenced by other factors outside of this study.

Model Significance Test (ANOVA)

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18630,14755	1	18630,14755	10,1	,000
	Residual	18429,59106	10	1842,95106	88,7	
	Total	20473,66667	11			

a. Dependent Variable: PENDAPATAN

b. Predictors: (Constant), JUMLAH NASABAH YANG MENABUNG

Based on the ANOVA table (Sig. = 0.000 < 0.05), H0 is rejected and H1 is accepted. This confirms that the regression model as a whole is significant, meaning there is an influence between the Waste Bank Variable and the Community Economic Income Variable in Belawan.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the research analysis, the role of Bank Sampah Berkah (BSB) in Belawan has proven highly significant in boosting the local community's economic income. A descriptive qualitative approach, reinforced by simple linear regression analysis, shows that an increase in the number of saving customers positively and significantly contributes to the rise in community economic income (with a positive regression coefficient of Rp17,007.258). This increase is tangibly felt by low-income and informal worker groups. BSB's success is supported by significant customer participation with an upward trend at the end of 2024, effective and stable operational management, strong support from non-governmental organizations (GNI, YBTCI), and stable market access to recycling factories, which ensures the sale value of waste.

Beyond its economic impact, BSB also contributes to increasing public awareness of sustainable waste management and its ecological benefits, actively reducing waste volume and potential greenhouse gas emissions. The coefficient of determination (R2) of 91% indicates BSB's dominant influence on community economic income. Theoretical implications strengthen the theories of Circular Economy, Sustainable Development, and Community Economic Empowerment at the community level. Practical implications provide strong empirical evidence for local governments and NGOs to replicate or develop similar waste bank programs.

4.2. Limitations of the Research

Despite the robust findings, there are several limitations to acknowledge: The quantitative data only covers one year (2024). This restricts the analysis of long-term trends and the ability to conduct panel data analysis. The study also lacks clear baseline data from before BSB was established (2016), making it difficult to claim pure causality without a pre- and post-intervention comparison. The absence of a control group further limits the generalizability of the findings, as there's no comparison with communities that didn't receive BSB's intervention.

Furthermore, the type of data collected (predominantly qualitative and aggregated operational data) restricts the ability to perform more complex inferential analyses like path analysis, moderation analysis, or multiple regression analysis. Detailed demographic profiles of the respondents were also not presented, which could influence participation patterns and income impact. Although triangulation efforts were made, this research might still face some uncontrolled threats to internal and external validity. Finally, 9% of the income variation was influenced by other factors not explored in this study.

Recommendation

The following recommendations are formulated to ensure the sustainability and optimization of Bank Sampah Berkah's role: For Local Government (Medan City Government/Environmental Agency):

1. Legalization and Incentives for Waste Banks: Issue local regulations that officially recognize the role of waste banks, providing fiscal incentives or stimulus fund allocation for modern equipment procurement and management training. This will provide crucial legal certainty and financial support for BSB's development.
2. Replication Model for Other Waste Banks: Develop pilot programs, standardized training modules, facilitate access to recycling factories, and establish communication forums among waste banks. This will extend BSB's benefits to other regions and create a strong network. For Bank Sampah Berkah Management:
 - a. Enhancing Technological Capacity and Diversifying Recycled Products: Gradually invest in more efficient waste processing technology (shredding/pressing machines) and provide advanced training to create value-added products (handicrafts, mini-furniture) through collaboration with local artisans. This will increase waste efficiency and economic value.
 - b. Strengthening Strategic Partnerships with the Recycling Industry Sector: Develop long-term contracts or formal partnerships with recycling factories/industries for price stability and absorption volume. Solid partnerships will reduce the risk of price fluctuations and ensure supply continuity.
 - c. Developing Innovative Savings Programs and Financial Literacy: Expand savings options (education, health, business capital) and integrate them with financial literacy programs, or partner with microfinance institutions. This will increase financial and educational benefits for customers.

- d. Routine Monitoring of BSB Operations: Conduct regular monitoring (bi-monthly) of customer numbers, waste volume, and purchase values to identify performance fluctuations, analyze causes, and take corrective actions. Proactive monitoring is essential for continuous adaptation and improvement.

For the Community of Belawan (Waste Bank Members):

1. Increased Active Participation and Consistent Waste Sorting: Continuously raise awareness and discipline in sorting waste at its source, and consistently deposit waste at BSB to ensure a sustainable flow of income. Active participation is the foundation of BSB's success.
2. Active Participation in Education and Training Programs: More actively participate in socialization and training activities held by BSB or its partners to gain new knowledge and skills. Continuous learning will strengthen individual and community capacity.

Long-Term Sustainability Plan:

For BSB's long-term sustainability (5-10 years ahead), the following are required: diversification of waste bank income sources, development of institutional and internal human resource capacity, continuous innovation and technological adaptation, building a strong and diverse partnership ecosystem, creating a learning and knowledge-sharing environment, and transparent and accountable governance systems.

Program Monitoring and Evaluation Indicators

To ensure BSB's effectiveness, and as suggestions for more comprehensive outcome measurement in the future:

Monitoring Indicators (Continuous Monitoring):

1. Amount of Waste Collected per Month (Kg).
2. Number of Active Saving Customers per Month.
3. Volume of Recycled Waste Sold to Factories per Month (Kg).
4. Total Income Paid to Customers per Month (Rp).
5. Frequency of Education/Socialization Activities.
6. Number of Waste Collection/Pickup Visits by Factories/Recycling Partners.

Evaluation Indicators (Periodic Assessment):

1. Increase in Members' Economic Income: Change in the average income of active customers (Target: Minimum increase of Rp17,007.258 per participation increase, or a total increase of X% per year).
2. Increase in Community Welfare (Social Impact): Changes in customers' perceived quality of life through qualitative surveys/quality of life index (Target: Positive X% increase in welfare perception).
3. Environmental Impact (Waste and Carbon Emission Reduction): Total volume of waste recycled (kg/ton) and estimated reduction of greenhouse gas emissions (tons of CO₂e) (Target: Reduce waste accumulation by X tons/year and avoid Y tons of CO₂e).
4. Increased Community Environmental Awareness: Increase in public knowledge and attitude scores, and the number of participants in socialization/training (Target: X% increase in scores, Y% increase in participants).
5. Waste Bank Operational Efficiency: Ratio of operational costs to total income (Target: Operational cost ratio not more than X% of total income).
6. Waste Bank Institutional Sustainability: Diversification of income sources, number of partnerships, competence of the management team, level of cadre regeneration (Target: Minimum Y new income sources, Z strategic partnerships in 3 years, and formation of a new cadre team).

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