Advance Sustainable Science, Engineering and Technology (ASSET)
Vol. 7, No.3, July 2025, pp. 0250305-01 ~ 0250305-010
ISSN: 2715-4211 DOI: https://doi.org/10.26877/asset.v7i3.1471

Evaluating Sustainable Waste Collection Models Using the Analytical Hierarchy Process (AHP): A Multi-Criteria Decision-Making Approach

Sri Purwati*, Nancy Oktyajati, Ica Salsa Bila

Department of Industrial Engineering, Faculty of Engineering, Universitas Islam Batik, Jl. Agus Salim No. 10 Surakarta 57147, Central Java, Indonesia

*ananda.sripurwati@gmail.com

Abstract. The growing issue of disposable baby diaper waste requires an effective collection model to support sustainable waste management. This study designs a community-based collection model using the Analytical Hierarchy Process (AHP) method to identify the most effective approach. Three models are evaluated: Model 1 (Community-Based Diaper Bank), Model 2 (Scheduled Diaper Pick-Up Program), and Model 3 (Diaper Collection Points at Public Facilities). Results show Model 1 is the most effective, with the highest Global Priority score of 0.415, due to its contributions to reducing environmental impact, raising public awareness, and incentivizing participation. Model 2 and Model 3 follow with scores of 0.353 and 0.261. The environmental criterion holds the highest weight (0.504), emphasizing its importance. These findings suggest that community-based models can enhance waste collection efficiency and support sustainability. The results can inform policy development and help guide future research on sustainable waste management practices.

Keywords: AHP model, decision-making process, diaper waste collection, multi-criteria analysis, sustainability assessment

(Received 2025-01-27, Revised 2025-02-12, Accepted 2025-03-06, Available Online by 2025-05-22)

1. Introduction

The growing consumption of disposable baby diapers has led to an alarming increase in non-biodegradable waste, creating significant environmental challenges [1]. These diapers contain materials such as plastic, polymers, and absorbents, which are not easily degradable by natural processes [2]. As a result, diaper waste can lead to environmental pollution and pose health risks to communities [3]. The use of disposable diapers has been steadily increasing over the years. In 2022, approximately 273.2 million kilograms of baby diapers were used, marking a 3.13% rise compared to the previous year. The increasing use of disposable diapers generates a corresponding increase in waste, contributing to landfill overflow and environmental pollution [4]. As a response to this issue, sustainable waste management practices are crucial to mitigate environmental damage. Community participation is often highlighted

as a critical element in creating effective waste management systems, particularly for niche waste categories like baby diapers [5]. Despite numerous studies addressing general waste management, specific research on models tailored to diaper waste remains scarce.

Previous studies have proposed various approaches to manage waste effectively. For instance, community-based waste banks have proven successful in engaging local communities to reduce household waste and promote recycling [6][7][8][9]. Scheduled waste collection programs, on the other hand, ensure convenience and consistency in waste disposal [10][11]. Additionally, the use of collection points at public facilities has been explored to increase accessibility for broader populations [12][13]. While these models offer promising results, their application to disposable baby diaper waste has not been comprehensively analyzed. A few studies touch on the environmental and socio-economic impacts of diaper waste, but they still lack integration of community participation into the design of waste collection models.

The gap in existing research lies in the lack of a comparative analysis of waste collection models specifically for diaper waste. Many studies focus on single approaches or generic waste streams, leaving a critical gap in understanding which model is most effective and efficient when implemented for diaper waste. Furthermore, little attention has been given to the role of community involvement in enhancing the performance of these models [14]. In-depth exploration of multi-criteria decision-making (MCDM) methods, especially the Analytical Hierarchy Process (AHP), could further inform the design of these models. Previous applications of AHP in sustainability evaluations have demonstrated its ability to incorporate multiple factors and stakeholder preferences in decision-making processes, offering valuable insights for waste management solutions.

This research is crucial as it integrates environmental, socio-cultural, and economic aspects into the design of a diaper waste collection model. By leveraging community participation, this study aims to create a structured and efficient system that not only addresses diaper waste but also fosters a circular economy. This paper provides an overview of the methods used, followed by a detailed presentation of the results, a discussion on the implications of the findings, and a summary of the main conclusions and policy recommendations. The findings are expected to contribute significantly to sustainable waste management practices and inform policymakers and practitioners in developing tailored solutions for niche waste categories.

The objective of this study is to design and evaluate community-based models for disposable baby diaper waste collection using the Analytical Hierarchy Process (AHP) method. By comparing three models: Community-Based Diaper Bank, Scheduled Diaper Pick-Up Program, and Diaper Collection Points at Public Facilities. This research seeks to identify the most effective approach to support sustainable waste management.

2. **Methods**

This research method aims to design an effective and efficient community participation-based baby diaper waste collection model using the Analytic Hierarchy Process (AHP). AHP was chosen due to its ability to address complex decision-making problems involving multiple criteria, considering economic, environmental, and socio-cultural aspects in determining the optimal baby diaper waste collection model [15][16][17]. The research stages are divided into several phases as follows:

2.1. Design of Community Participation-Based Baby Diaper Waste Collection Model

Based on literature studies and field research, an analysis was conducted to design three community participation-based baby diaper waste collection models. Collection of baby waste will receive compensation of IDR 1,250 per kg of dry disposable baby diaper waste [4]. The proposed models are:

a. Model 1 (Community-Based Diaper Bank), where the community can collect baby diaper waste at designated locations and receive compensation.
b. Model 2 (Scheduled Diaper Waste Pickup Program), which allows for scheduled door-to-door collection of diaper waste.

c. Model 3 (Diaper Collection Points at Public Facilities), which places diaper waste collection posts in strategic public facilities.

Each model is designed to make it easier for the community to participate in diaper waste collection while educating them on proper waste management methods. These models also aim to create a positive environmental impact and support the concept of a circular economy.

2.2. Determining Respondents and Data Collection Using Purposive Sampling Method

For evaluating and prioritizing the diaper waste collection models, a purposive sampling method was employed. Respondents were selected based on their knowledge and expertise in diaper waste management and the circular economy. The sample consisted of 30 participants, including baby diaper consumers, diaper manufacturers, government representatives, environmental experts, waste management professionals, and local community members. This diverse group provided comprehensive insights into community preferences and practical considerations for the proposed collection models.

2.3. Evaluation of Baby Diaper Waste Collection Models Using The Analytic Hierarchy Process

At this stage, respondents evaluated each model based on the defined criteria and sub-criteria using the Analytic Hierarchy Process (AHP). The criteria and sub-criteria were selected based on a combination of literature sources and expert judgment to ensure they were relevant and reflective of the practical needs in diaper waste management. This process ensured that the evaluation was not only grounded in academic theory but also aligned with real-world requirements and considerations.

The AHP hierarchy was structured to capture both quantitative and qualitative factors influencing the decision-making process. The AHP hierarchy structure can be described as follows:

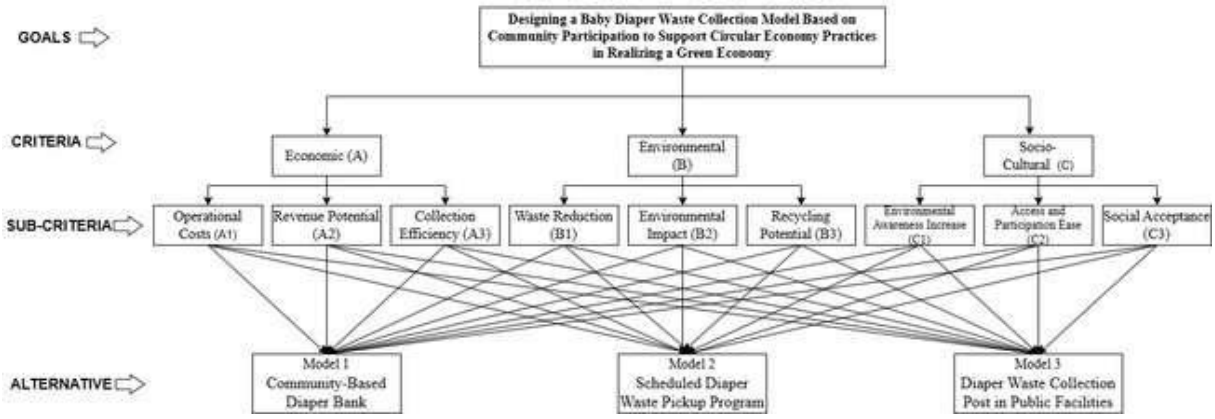

Figure 1. AHP Hierarchy Structure in Designing a Community Participation-Based Baby Diaper Waste Collection Model to Support Circular Economy Practices in Achieving Green Economy

Table 1. Criteria and Sub-Criteria

Criteria	Sub-Criteria	Description
Economic (A)	Operational Costs (A1)	How much cost is required to run the waste collection model? [18].
	Revenue Potential (A2)	Potential income from collecting and recycling diaper waste [19].
	Collection Efficiency (A3)	Efficiency level in collecting diaper waste from the community [20][21].
Environmental (B)	Waste Reduction (B1)	How much does the model contribute to reducing diaper waste? [22].
	Environmental Impact (B2)	The model's impact on environmental conservation, such as pollution reduction [23].

	Recycling Potential (B3)	The model's ability to recycle diaper waste into new products [24].
Socio-Cultural (C)	Environmental Awareness Increase (C1)	The model's ability to raise public awareness on waste management [25].
	Access and Participation Ease (C2)	How easy it is for the public to participate in waste collection and processing [26].
	Social Acceptance (C3)	How well the model is accepted by the local community [27].

2.4. Analysis and Recommendation Formulation

Following the AHP evaluation, the results were analyzed to determine the most optimal waste collection model. The consistency ratio was calculated to assess the reliability of the pairwise comparisons. Based on the obtained weights, the most effective and efficient model was identified. The recommended model will be proposed for community implementation, considering factors that enhance the success of diaper waste management.

3. **Results and Discussion**

3.1. Calculation of Criterion Weights

Based on the results from the questionnaire filled out by 30 respondents to assess the importance level of the criteria, responses were obtained according to the rating scale provided in the questionnaire. These answers reflect the perceptions of each respondent or expert regarding the criteria, which were then processed by calculating the pairwise comparison matrix. Below is the pairwise comparison matrix between the criteria from 30 respondents:

Table 2. Pairwise Comparison Matrix Between Criteria

Criteria	Economy	Environment	Socio-Cultural
Economy	1.00	0.60	0.70
Environment	1.66	1.00	2.59
Socio-Cultural	1.44	0.39	1.00
Total	**4.10**	**1.99**	**4.28**

Next, the pairwise comparison matrix is used to determine the weight of each criterion. The average weight of each criterion is shown in the table below:

Table 3. Criterion Weights

Criteria	Economy	Environment	Socio-Cultural	Average Weight	Priority
Economy	0.244	0.303	0.163	0.236	**3**
Environment	0.405	0.503	0.604	0.504	**1**
Socio-Cultural	0.351	0.194	0.234	0.260	**2**
Eigen Vector				**1.00**	

The weighting results highlight the environment as the top priority (0.504), followed by socio-cultural (0.260) and economic (0.236) aspects. This underscores the need to minimize pollution, enhance waste management, and promote waste reuse for effective community-based diaper waste collection. While economic and socio-cultural factors rank lower, they remain crucial for participation through incentives and social alignment, ensuring a sustainable and widely accepted circular economy. Next, the matrix consistency assessment is conducted as follows:

Table 4. Consistency of Matrix for Criteria

Parameter	Value	Result
Max. Eigen Value	3.083	
CI	0.041	7.12% < 10%
RI	0.58	(CONSISTENT)
CR=CI/RI	7.12%	

The consistency calculation in Table 4 shows a CR of 7.12%, below the 10% threshold, confirming the experts' assessments are consistent. The Max. Eigen Value of 3.083, close to the three evaluated criteria, validates the AHP structure. A low CI (0.041) and RI (0.58) further indicate minimal inconsistency. These results ensure reliable weightings for economic, environmental, and socio-cultural criteria, forming a solid foundation for an optimal waste collection model.

3.2. Calculation of Sub-Criterion Weights

This study analyzes three main aspects: economic, environmental, and socio-cultural, each with three sub-criteria. These sub-criteria aim to map key factors that influence the success of the community-based baby diaper waste collection model in supporting circular economy practices and achieving a green economy.

a. Sub-Criteria of the Economic Aspects

The following table shows the pairwise comparison matrix for the sub-criteria of the economic aspect, based on input from 30 respondents:

Table 5. Pairwise Comparison Matrix of Economic Sub-Criteria

Economic Sub-Criteria	A1	A2	A3
A1	1.00	1.20	1.05
A2	0.83	1.00	1.00
A3	0.95	1.00	1.00
Total	**2.79**	**3.20**	**3.05**

The pairwise comparison matrix is then used to determine the weights of the economic sub-criteria. The average weight values for each sub-criteria are summarized in the following table:

Table 6. Weights of Economic Sub-Criteria

Sub-Criteria	A1	A2	A3	Average Weight	Priority
A1	0.244	0.605	0.245	0.365	**1**
A2	0.203	0.503	0.234	0.313	**3**
A3	0.233	0.502	0.234	0.323	**2**
Eigen Vector				**1.00**	

The economic aspect's weighting results (Table 6) show that operational cost (A1) is the top priority with a weight of 0.365, highlighting its importance in developing the model. Collection efficiency (A3) follows with a weight of 0.323, emphasizing the need for effective waste collection. Revenue potential (A2) ranks third with a weight of 0.313, underscoring the economic value of waste collection and recycling. The model design should focus on minimizing costs, improving efficiency, and maximizing revenue for economic sustainability.

Table 7. Consistency of the Matrix of Economic Sub-Criteria

Parameter	Value	Result
Max. Eigen Value	3,003	
CI	0,001	0,22% < 10%
RI	0,58	(CONSISTENT)
CR=CI/RI	0,22%	

The consistency analysis (Table 7) shows reliable results, with a Consistency Ratio (CR) of 0.22%, well below the 10% threshold. The low Consistency Index (CI) of 0.001 and Max. Eigen Value of 3.003 confirm the evaluation's accuracy. These results validate the economic sub-criteria weights as reliable

and logical, supporting the community-based baby diaper waste collection model's sustainable development.

b. Sub-Criteria of the Environmental Aspects

The following is the pairwise comparison matrix of the environmental sub-criteria based on the responses of 30 participants:

Table 8. Pairwise Comparison Matrix of Environmental Sub-Criteria

Environmental Sub-Criteria	B1	B2	B3
B1	1.00	1.08	1.77
B2	0.93	1.00	2.19
B3	0.56	0.46	1.00
Total	**2.49**	**2.53**	**4.96**

The average weight of each sub-criterion is presented in the table below:

Table 9. Weights of Environmental Sub-Criteria

Sub-Criteria	A1	A2	A3	Average Weight	Priority
A1	0.244	0.541	0.414	0.400	**2**
A2	0.227	0.503	0.510	0.413	**1**
A3	0.138	0.230	0.234	0.200	**3**
Eigen Vector				**1.00**	

The weighting results (Table 9) show that Environmental Impact (B2) has the highest weight of 0.413, highlighting its priority in minimizing pollution. Waste Reduction (B1) follows with a weight of 0.400, focusing on reducing disposable diaper volume. Recycling Potential (B3) holds the lowest weight of 0.200 but still plays a role in supporting circular economy practices. The model design should prioritize minimizing environmental impacts, followed by waste reduction and enhancing recycling efforts for sustainable waste management.

Table 10. Consistency of the Matrix of Environmental Sub-Criteria

Parameter	Value	Result
Max. Eigen Value	3.037	
CI	0.019	3.23% < 10%
RI	0.58	(CONSISTENT)
CR=CI/RI	3.23%	

The consistency analysis for the environmental sub-criteria (Table 10) shows a Consistency Ratio (CR) of 3.23%, well below the 10% threshold, and a Consistency Index (CI) of 0.019, indicating high consistency. The Max. Eigen Value of 3.037, close to the number of sub-criteria, confirms logical and accurate evaluations. These results validate the weights for Waste Reduction (B1), Environmental Impact (B2), and Reuse (B3), reinforcing their reliability for decision-making in designing a community-based disposable diaper waste collection model.

c. Sub-Criteria of the Socio-Cultural Aspects

The following presents the results of the pairwise comparison matrix among the socio-cultural sub-criteria from 30 respondents:

Table 11. Pairwise Comparison Matrix of Socio-Cultural Sub-Criteria

Socio-Cultural Sub-Criteria	C1	C2	C3
C1	1.00	1.16	1.77
C2	0.86	1.00	1.86
C3	0.56	0.54	1.00
Total	**2.42**	**2.70**	**4.63**

The average weight values for each sub-criterion can be found in the table below:

Table 12. Weights of Socio-Cultural Sub-Criteria

Sub-Criteria	C1	C2	C3	Average Weight	Priority
C1	0.244	0.585	0.414	0.414	**1**
C2	0.210	0.503	0.434	0.382	**2**
C3	0.138	0.270	0.234	0.214	**3**
Eigen Vector				**1.00**	

The socio-cultural sub-criteria weighting (Table 12) shows that Environmental Awareness Increase (C1) has the highest weight (0.414), highlighting its importance for the model's success. Access and Participation Ease (C2) follows with a weight of 0.382, indicating its significance in community involvement. Social Acceptance (C3), with a weight of 0.214, remains important for local acceptance. These results suggest that the model should focus on raising awareness, facilitating participation, and ensuring social acceptance for long-term sustainability.

Table 13. Consistency of the Matrix of Socio-Cultural Sub-Criteria

Parameter	Value	Result
Max. Eigen Value	3.027	
CI	0.014	2.36% < 10%
RI	0.58	(CONSISTENT)
CR=CI/RI	2.36%	

Based on Table 13, the consistency analysis of socio-cultural sub-criteria indicates that the evaluation matrix is consistent, with a Consistency Ratio (CR) of 2.36%, well below the maximum threshold of 10%. The Consistency Index (CI) of 0.014 and the Max. Eigen Value of 3.027, which is close to the number of sub-criteria (3), further validate the accuracy and logic of this evaluation. This consistency demonstrates that the weights assigned to the socio-cultural sub-criteria were determined carefully and accurately. These results support the reliability of the established priorities, with Environmental Awareness Increase (C1) as the primary focus, followed by Access and Participation Ease (C2) and Social Acceptance (C3). This consistency ensures that the analysis can serve as a robust basis for decision-making regarding baby diaper waste management based on community participation.

3.3. Calculation of Alternative Weights

The following are the average results of alternative weights based on sub-criteria:

Tabel 14. Details of Weighting Results for Criteria, Subcriteria, and Alternatives

Average Weight of Criteria		Average Weight of Sub-Criteria		Average Weight of Alternatives		
				Model 1	**Model 2**	**Model 3**
A	0.236	A1	0.365	0.435	0,387	0,208
		A2	0.313	0.448	0,317	0,269
		A3	0.323	0.393	0,385	0,232
B	0.504	B1	0.400	0.425	0,328	0,266
		B2	0.413	0.431	0,304	0,299
		B3	0.200	0.347	0,361	0,287
C	0.260	C1	0.414	0.406	0,350	0,252
		C2	0.382	0.349	0,465	0,192
		C3	0.214	0.455	0,318	0,265

3.4. Selecting the Most Effective and Efficient Baby Diaper Waste Collection Model

After determining the criteria, sub-criteria, and alternatives, the next step is to synthesize the data to calculate the Global Priority, identifying the most effective disposable diaper waste collection model. This process integrates the weights of criteria, sub-criteria, and alternatives using the following formula:

Global Priority = (Average Weight of Criteria) × (Average Weight of Sub-criteria) × (Average Weight of Alternatives) (1)

The Global Priority calculation results provide a final ranking of each alternative based on its contribution to the criteria and sub-criteria. This ensures objective, data-driven decisions. Below are the results, including the complete breakdown of weights for criteria, sub-criteria, and alternatives, along with the calculation method. Detailed analysis is shown in the table below:

Tabel 15. Global Priority

		Global Priority		
		Model 1	**Model 2**	**Model 3**
A	A1	0,038	0,033	0,018
	A2	0,033	0,023	0,020
	A3	0,030	0,029	0,018
B	B1	0,086	0,066	0,054
	B2	0,090	0,063	0,062
	B3	0,035	0,037	0,029
C	C1	0,044	0,038	0,027
	C2	0,035	0,046	0,019
	C3	0,025	0,018	0,015
	Total	**0,415**	**0,353**	**0,261**
	Ranking	**1**	**2**	**3**

The Global Priority analysis clearly identifies Model 1 as the most effective disposable diaper waste collection model, with a score of 0.415, followed by Model 2 (0.353) and Model 3 (0.261). The analysis reveals that the environmental criterion (B) holds the highest weight (0.504), underscoring the critical role of environmental impact in determining the model's effectiveness. This aligns with previous studies emphasizing the dominance of environmental factors in sustainable waste management [4]**.** Socio-cultural and economic criteria follow, with weights of 0.260 and 0.236, respectively, indicating their secondary importance in this context.

Model 1 excels in key sub-criteria, particularly in Environmental Impact (B2) and Waste Reduction (B1), which highlights its strength in minimizing environmental harm and promoting sustainable practices. Raising Environmental Awareness (C1) also plays a significant role in enhancing community engagement. However, the strong focus on environmental impact may necessitate trade-offs, such as higher operational costs, which need further exploration in future research. Model 2, while strong in Accessibility and Participation (C2), scores lower in environmental sub-criteria, suggesting that improving community involvement alone may not be sufficient for long-term success without robust environmental strategies. This trade-off between community engagement and environmental concerns mirrors findings from similar studies [4], where economic and social factors were balanced against environmental goals.

Model 3, with its low scores across sub-criteria, particularly in Environmental Impact and Waste Reduction, is less effective overall. Its emphasis on Reuse (B3) presents a potential for future refinement, especially in regions where upcycling and product innovation are feasible. While Model 3’s focus on reuse offers some benefits, it falls short in other areas, making it less suitable as the primary solution.

The findings also highlight the potential biases in the pairwise comparison process used in AHP. These biases could influence the weighting of criteria and alternatives, potentially affecting the final decision. To address this, future research could incorporate sensitivity analysis or expert validation to improve the robustness of the results.

In conclusion, Model 1 is recommended for its strong environmental benefits and ability to raise public awareness, fostering sustainable circular economy practices. Model 2 can be considered as an alternative where community participation is prioritized, while Model 3, despite its potential, is less suitable due to its overall low effectiveness. The implications of these findings suggest that successful waste management models must balance environmental, socio-cultural, and economic factors carefully, and future studies should explore hybrid decision-making approaches and real-world impact assessments for long-term sustainability.

4. Conclusions

This study identified the most effective model for collecting baby diaper waste through a Global Priority analysis. Model 1 was determined to be the best due to its positive environmental impact and ability to raise public awareness, aligning with sustainable waste management goals. To optimize its implementation, public education, supporting infrastructure, and collaboration with policymakers and private stakeholders are essential for financial and regulatory support. Additionally, digital platforms for waste tracking and incentive-based participation could boost engagement and efficiency. Methodologically, the study highlights AHP's effectiveness in waste collection evaluation. Future research could integrate AHP with fuzzy logic or MCDM techniques for improved accuracy. A longitudinal study assessing Model 1's real-world impact would further validate its sustainability and adaptability, contributing to circular economy strategies and sustainable urban planning.

Acknowledgments

The author expresses gratitude to the Ministry of Education, Culture, Research, and Technology through the Directorate of Research, Technology, and Community Service (DRTPM) for the funding provided under the Beginner Lecturer Research (PDP) scheme in the 2024 Fiscal Year Research Program.

References

[1] D. A. Melati and F. N. Na'im, "Online community impact to reduce diaper waste in Indonesia (study case at mamaberclodi community)," *Interact. Community Engag. Soc. Environ.*, vol. 1, no. 1, pp. 52–66, 2023, doi: 10.61511/icese.v1i1.2023.248.

[2] S. Purwati, N. Oktyajati, S. Mukarromah, R. A. Saputra, and I. W. Febriansyah, "Training on Utilization of Baby Diaper Waste into Resin Handicraft Products to Improve Community Economy," *Jati Emas (Jurnal Apl. Tek. dan Pengabdi. Masyarakat)*, vol. 8, no. 4, pp. 6–9, 2024.

[3] M. E. M. E. Ntekpe *et al.*, "Disposable Diapers: Impact of Disposal Methods on Public Health and the Environment OPEN ACCESS," *Am. J. Med. Public Heal.*, vol. 1, no. 2, pp. 1–7, 2020.

[4] S. Purwati, N. Oktyajati, and I. S. Bila, "Tingkat Kesediaan dan Ekspektasi Kompensasi Konsumen dalam Pengumpulan Limbah Popok Bayi," vol. 13, no. 1, 2024.

[5] N. A. I. Paranita, "Pengenalan Pengolahan Sampah Popok menjadi Media Tanaman Hias dalam Pemberdayaan Masyarakat untuk Pengelolaan Limbah Rumah Tangga," *J. Pengabdian, Riset, Kreat. Inovasi, dan Teknol. Tepat Guna*, vol. 1, no. 2, pp. 46–54, 2023, doi: 10.22146/parikesit.v1i2.9613.

[6] N. A. A. Abus, A. Suriadi, T. Lubis, A. A. Abus, and A. F. Abus, "Waste Bank management as an alternative community-based waste management strategy in Langsa City, Aceh Province," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 1375, no. 1, 2024, doi: 10.1088/1755-1315/1375/1/012007.

[7] Arwin Sanjaya *et al.*, "Pemanfaatan Bank Sampah dalam Meningkatkan Kesejahterahan Masyarakat Desa Kersik," *Int. J. Community Serv. Learn.*, vol. 7, no. 1, pp. 1–10, 2023, doi: 10.23887/ijcsl.v7i1.56668.

[8] H. D. Purba, C. Meidiana, and D. W. Adrianto, "Waste Management Scenario through Community Based Waste Bank: A Case Study of Kepanjen District, Malang Regency, Indonesia," *Int. J. Environ. Sci. Dev.*, vol. 5, no. 2, pp. 212–216, 2014, doi: 10.7763/ijesd.2014.v5.480.

[9] S. Amalia, "Social Capital in Community-Based Waste Bank Management," *J. Ilmu Sos.*, vol. 18, no. 2, pp. 93–108, 2019, doi: 10.14710/jis.18.2.2019.93.

[10] A. Aprilia, "Waste Management in Indonesia and Jakarta: Challenges and Way Forward," *Backgr. Pap. 23rd ASEF Summer Univ. ASEF Educ. Dep. Oct. 2021*, no. October, pp. 1–18, 2021, [Online]. Available: https://asef.org/wp-content/uploads/2022/01/ASEFSU23_Background-Paper_Waste-Management-in-Indonesia-and-Jakarta.pdf

[11] A. Pangarso *et al.*, "Sistem penjemputan sampah untuk pengelolaan sampah terpadu di Komunitas

Muda Berseri," *Riau J. Empower.*, vol. 5, no. 3, pp. 163–174, 2022, doi: 10.31258/raje.5.3.163-174.
[12] D. J. Moosom and M. Z. M. Noor, *Integrating Urban Strategies For Waste Collection Facilities In Urban Public Space*. 2023.
[13] M. Ridha, D. Rohmat, and W. Kastolani, "Waste collecting point as the school of the waste management system," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 683, no. 1, 2021, doi: 10.1088/1755-1315/683/1/012015.
[14] H. Puspasari, Y. Yusuf, and I. A. Kurniawan, "Kolaborasi Berbasis Masyarakat Dalam Pengelolaan Sampah Popok Bayi Oleh Komunitas Sarana Olah Sampah Di Kota Tangerang," *J. Ilm. Ilmu Adm.*, vol. 12, no. 2, pp. 115–127, 2022, doi: 10.33592/jiia.v12i2.3218.
[15] P. Chompook, J. Roemmontri, and A. Ketsakorn, "the Application of Analytic Hierarchy Process (Ahp) for Selecting Community Problems: Multicriteria Decision-Making Approach on Environmental Health Aspects," *J. Sustain. Sci. Manag.*, vol. 18, no. 10, pp. 138–149, 2023, doi: 10.46754/jssm.2023.10.009.
[16] M. J. X. Belem, M. V. Junior, G. Mummolo, and F. Facchini, "An ahp-based procedure for model selection for eco-efficiency assessment," *Sustain.*, vol. 13, no. 21, pp. 1–21, 2021, doi: 10.3390/su132112121.
[17] M. Gunamantha, M. V. Oviantari, and N. W. Yuningrat, "The application of the analytical hierarchy process (AHP) in determining organic waste process technology-oriented-reducing greenhouse gas," *E3S Web Conf.*, vol. 467, pp. 1–6, 2023, doi: 10.1051/e3sconf/202346704006.
[18] A. Yulda, T. Nurcihikita, and Y. Efriyandi, "Analysis of Circular Economy Potential in Waste Management : Operational Efficiency and Economic Impact at TPS3R Bungo Lintas," vol. 5, no. 4, pp. 3993–4010, 2024.
[19] A. Johari, H. Alkali, H. Hashim, S. I. Ahmed, and R. Mat, "Municipal solid waste management and potential revenue from recycling in Malaysia," *Mod. Appl. Sci.*, vol. 8, no. 4, pp. 37–49, 2014, doi: 10.5539/mas.v8n4p37.
[20] J. P. Doussoulin and C. Colther, "Evaluating the Efficiency of Municipal Solid Waste Collection Services in Developing Countries: The Case of Chile," *Sustain.*, vol. 14, no. 23, pp. 1–19, 2022, doi: 10.3390/su142315887.
[21] R. O. Ampong, K. Miezah, A. Banunle, E. E. Y. Amuah, and E. G. Amoah, "Comparative analysis of the effectiveness and efficiency of formal and informal waste collectors in urban waste management system," *Heliyon*, vol. 10, no. 20, p. e39017, 2024, doi: 10.1016/j.heliyon.2024.e39017.
[22] C. O. Ugwu, C. G. Ozoegwu, P. A. Ozor, N. Agwu, and C. Mbohwa, "Waste reduction and utilization strategies to improve municipal solid waste management on Nigerian campuses," *Fuel Commun.*, vol. 9, p. 100025, 2021, doi: 10.1016/j.jfueco.2021.100025.
[23] W. Shi *et al.*, "How Environmental Regulation Affects Pollution Reduction and Carbon Reduction Synergies—An Empirical Analysis Based on Chinese Provincial Data," *Sustain.* , vol. 16, no. 13, 2024, doi: 10.3390/su16135331.
[24] M. J. Siregar, "Recent Technology for Recycling of Used Diapers Waste," *Int. J. Innov. Eng.*, vol. 2, no. 2, pp. 13–25, 2022, doi: 10.59615/ijie.2.2.13.
[25] Y. A. K. N. S. N. J. O. H. Lanita Winata, "A Model of Waste Management Improvement in Indonesia," *J. Akunt.*, vol. 23, no. 3, p. 393, 2020, doi: 10.24912/ja.v23i3.604.
[26] A. F. Yasin and N. Abu, "Gerakan Pungut Sampah (GPS) Sebagai Upaya Membangun Kesadaran Lingkungan (Studi Kasus Kelurahan Kampung Baru Kota Sorong," *AMMA J. Pengabdi. Masy.*, vol. 2, no. 10, pp. 1193–1203, 2023.
[27] H. M. Ali, C. Sitinjak, M. H. Md Said, J. Z. Hassim, R. Ismail, and V. Simic, "Model predicting social acceptance behavior to implement ELV policy: Exploring the role of knowledge toward ELV policy on social acceptance in Malaysia," *Front. Public Heal.*, vol. 10, 2023, doi: 10.3389/fpubh.2022.1093732.