Volume 6, No. 4 April, 2025
p ISSN 2723-6927-e ISSN 2723-4339

COMMUNITY PERCEPTION AND SPATIAL DIAPER WASTE IN LILIBA VILLAGE, KUPANG CITY

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Abstract
The improper management of diaper waste in Liliba Village, Indonesia, poses a serious environmental and public health concern. Currently, diaper waste is often discarded indiscriminately without prior processing, resulting in unpleasant odors and public complaints. This study aims to analyze community perceptions regarding diaper waste and to map its spatial distribution within Liliba Village. Employing an observational research design, the study investigated two main variables: public perception of diaper waste and the spatial distribution of diaper waste. A total of 111 respondents, all of whom were parents of toddlers, were selected as the study sample. Data were collected using structured questionnaires and Geographic Information System (GIS) applications. Analysis was conducted using univariate and bivariate statistical techniques. The results indicate that both gender and occupation significantly influence community perceptions of diaper waste and their views on proper waste management. Spatial analysis revealed that diaper waste is primarily found in temporary disposal sites (TPS) and in various unregulated locations, especially within the buffer zones surrounding residential areas of the respondents. These findings highlight the urgent need for targeted waste management education and infrastructure development to improve sanitation practices in Liliba Village. The integration of spatial data through GIS provides valuable insights for local authorities to implement geographically focused waste intervention strategies.

Keywords: Community perception; spatial

Introduction

Diapers are diapers or swaddles that are used only once and then discarded (1). Diapers can be defined as garments worn by individuals who cannot control their bladder or bowel movements, or are unable or unwilling to use the toilet (2). Diapers have been around since ancient times. Diapers or disposable diapers were invented in the 1940s (3). Diapers are a daily necessity especially for those who have babies, toddlers and the elderly.

Diapers are made to hold a certain amount of urine and feces. Diapers are made of various chemicals such as sodium polyacrylate as an absorbent material, chlorine (Cl2) as a bleach, tributyl tin and plastics that are difficult to decompose by the environment (4). Diapers are one of the sources of waste found in the environment.

The presence of carelessly disposed diaper waste is a source of pollution for the environment, disturbing aesthetics because it smells of urine and feces. The results of a survey showed that diaper waste accounts for 15% of the waste in the river (5). The presence of diaper waste in the river can cause flooding because it blocks the flow of the river. The results of the initial survey in Liliba Village found diaper waste disposed of inside the temporary shelter (TPS)

and outside the TPS. The community complained about the odor caused by the dumped diaper waste.

Public awareness about the importance of keeping the environment clean is one of the factors in managing waste(6). Community participation in managing waste is closely related to the production of waste produced(7) including in managing diaper waste. Diaper waste management is related to people's perception of diaper waste itself. The perception of waste is also a determining factor for a person to manage waste properly. The study aims to determine community perceptions and spatial diaper waste in Liliba Village, Kupang City.

Several previous studies have examined public perceptions of waste management, yet research focusing specifically on diaper waste remains limited. For instance, Nugroho and Sari (2020) analyzed community behavior and perception towards domestic waste in urban areas, emphasizing that waste segregation behavior is influenced by knowledge and socioeconomic background. However, the study did not address waste types with unique environmental impacts, such as diaper waste. Similarly, Mulyani and Hasanah (2022) explored the role of public awareness in household waste reduction but did not utilize spatial analysis tools to understand the physical distribution of waste. Both studies highlight the importance of perception in waste management but fall short in applying geospatial methodologies or focusing on complex, non-biodegradable waste types like diapers. This research addresses those gaps by integrating perception analysis with Geographic Information System (GIS) mapping to analyze the spatial distribution of diaper waste in Liliba Village, Kupang City. By doing so, it provides a more detailed understanding of how diaper waste is produced, perceived, and managed within a specific community context. The objective of this research is to investigate community perceptions and spatial patterns of diaper waste, while its benefits lie in informing localized environmental policies, supporting the development of targeted public education programs, and offering a model for other urban areas facing similar unmanaged waste challenges.

Research Methods

This study employed an observational descriptive-analytic design to explore public perceptions and the spatial distribution of diaper waste in Liliba Village, Kupang City. The research was conducted on-site in Liliba Village, focusing on two key variables: (1) public perception of diaper waste and (2) the spatial pattern of diaper waste disposal. The study population consisted of all households in Liliba Village, while the sample was selected using purposive sampling, targeting families with toddlers, totaling 111 respondents. The study received ethical clearance from the Health Research Ethics Committee of Nusa Cendana University (Approval No. 105/UN15.16/KEPK/2020).

Data were collected using two main research instruments: a structured questionnaire to assess community perceptions and a Geographic Information System (GIS) application to record and visualize the spatial locations of diaper waste. The questionnaire instrument was tested for validity and reliability through a pilot study involving 20 respondents from a neighboring area, resulting in a Cronbach’s Alpha coefficient > 0.80, indicating good reliability. The GIS component involved marking diaper waste locations and overlaying them with residential zones using coordinate-based mapping.

The data collection process was carried out over a two-week period and involved trained enumerators who administered questionnaires directly to respondents and collected geospatial data using GPS-enabled mobile devices. All quantitative data were processed using SPSS for univariate and bivariate analysis, including Fisher’s Exact Test and multinomial logistic

regression to examine associations between demographic factors and perceptions. Spatial data were processed using ArcGIS to generate visual maps and identify waste concentration zones relative to residential buffer areas. These combined methods allowed for a comprehensive understanding of both perceptual and geographic dimensions of diaper waste issues in the study area.

Result and Discussion

Liliba Village is located in the administrative area of Kupang City, East Nusa Tenggara Province. Kelurahan Liliba has an area of 1,003 km^2 which is divided into 52 neighborhood associations (RT) and 16 community associations (RW). The total population is 14,910 people, 7,312 men and 7462 women. The characteristics of the respondents can be seen in Table 1.

Table 1. Characteristics of respondents

Respondent Characteristics	n%
Gender	
Male	56 (50,5)
Female	55 (49,5)
Type of work	
Employee	55 (49,5)
Self-employed	9 (8,1)
Housewife	47 (42,4)
Number of children under five	
1 person	101 (91,0)
2 people	8 (7,2)
3 people	1 (0,9)
Amount of waste per day	
1 piece diaper	5 (4,5)
2 pieces of diaper	50 (45,0)
3 pieces of diaper	40 (36,0)
> 3 pieces diapers	16 (14,4)

Community perception

The community perceptions assessed were perceptions about diaper waste and perceptions about diaper waste management efforts.

Table 2. Community perception of diaper waste and perception of about diaper waste management efforts

Persepsi Masyarakat	TS n (%)	N n (%)	S n (%)
Persepsi tentang sampah diaper			
Menggunakan popok sekali pakai (diaper) karena praktis dan meringankan beban kerja	0 (0)	0 (0)	111 (100)
Diapers yang telah digunakan adalah sampah diapers termasuk dalam kategori limbah bahan berbahaya dan beracun (B3) yang tidak bisa dicampur dengan sampah lain	68 (61,2)	0 (0)	43 (38,8)
Sampah diapers adalah sampah yang membawa virus,bakteri	21 (18,9)	1 (0,9)	89 (80,2)
Bahan pokok pembuat diaper adalah 55% plastik yang membutuhkan waktu lama untuk terurai atau hancur	0 (0)	1 (0,9)	110 (99,1)
Diapers mengandung senyawa kimia super absorbent polymer sebanyak 42% apabila terurai dalam air, zat kimia ini berbahaya bagi lingkungan	9 (8,2)	1 (0,9)	101 (90,9)
Sampah diapers masih dapat digunakan untuk hal berguna seperti pupuk cair atau media tanam	111 (100)	0 (0)	0 (0)
Persepsi tentang upaya pengelolaan sampah diaper			
Sampah diapers yang dihasilkan adalah tanggung jawab penghasil sampah tersebut	44 (39,7)	0(0)	67 (60,3)
Membilas kotoran pada diaper sebelum membuang sampah diaper	74 (66,7)	0 (0)	37 (33,3)
Membuang sampah diaper ke tempat pembuangan sampah (TPS resmi)	67 (60,3)	0 (0)	44 (39,7)
Pemerintah menyediakan tempat pembungan sementara kusus sampah diaper tidak dicampur dengan sampah	111 (100)	0 (0)	0 (0)
Pemerintah membuat aturan atau prosedur pembuangan sampah diaper	111 (100)	0 (0)	0 (0)
Membayar iuran untuk pengelolaan sampah diaper	111 (100)	0 (0)	0 (0)
Terdapat sanksi bagi yang membuang sampah diaper tidak pada tempatnya	111 (100)	0 (0)	0 (0)
Tidak membuang sampah diaper secara sembarangan (lahan kosong, sungai)	29 (26,1)	0 (0)	82 (73,9)
Tidak membakar sampah diaper	15 (13,5)	0 (0)	96 (85,5)
Bersedia mengolah sampah diaper menjadi hal berguna seperti pupuk cair atau media tanam	110 (99,1)	0 (0)	1 (0,9)

Table 2 shows that 61.2% of respondents disagreed that diaper waste is categorized as hazardous waste, but 80.2% stated that diaper waste is waste that contains viruses and bacteria and 90.9% stated that diaper waste contains chemicals that are harmful to the environment.

Diaper waste management efforts 60.3% of respondents stated that waste is the responsibility of the waste producer, but disagreed to rinse diaper waste before disposal (66.7%). There were 60.3% of respondents who did not agree to dispose of diaper waste in authorized TPS, 73.9% had an agreed perception not to litter diaper waste and 85.5% agreed not to burn diaper waste.

Influence of gender with community perceptions of diaper waste and perceptions of diaper waste management efforts

The effect of gender on perceptions of diaper waste and perceptions of management efforts began with an independence test. This test is to determine the relationship between gender and community perceptions of waste and the relationship between gender and perceptions of diaper waste management efforts. The test used was the *Fisher Exact* test.

Table 3. Relationship between Gender and Perception of Diaper Waste and Perception of Diaper Waste Management Efforts

Variables		Gender		Total	p-value exact sig
		Male	Female		
Perception of Diaper Waste					0,000
	Disagree	0	3	3	
	Neutral	4	20	24	
	Agree	52	32	84	
Total		56	55	111	
Perception of Diaper Waste Management Efforts					0,009
	Disagree	26	39	65	
	Neutral	29	14	43	
	Agree	1	2	3	
Total		56	55	111	

The test results show there is a significant relationship between gender and public perception of diaper waste (p-value exact sig.=0.000<α =0.05), it is hypothesized that public perception of diaper waste is influenced by gender variables. There is a significant relationship between gender and public perception of diaper waste management efforts (p-value exact sig. = 0.009 <α =0.05), so it can be hypothesized that public perception of diaper waste management efforts is influenced by gender variables.

To determine the two hypotheses above, multinomial logistic regression test was used. Table 4 shows that gender has a significant effect on people's perception of diaper waste (p-value = 0.000 <α =0.05). Women tend to have an agreeable perception of diaper waste rather than neutral by 8 times compared to men. The results of multinomial regression analysis showed that gender has a significant effect on people's perception of diaper waste (p-value = 0.016 <α =0.05). The likelihood of women to disagree with diaper waste management efforts rather than neutral is 3.11 times that of men. Meanwhile, the likelihood of women agreeing with diaper waste management efforts is 4.15 times that of men (table 4).

Table 4. Test of the Effect of Gender with Gender with Perceptions about Diaper Waste and Perceptions about Diaper Waste Management Efforts

Persepsi Tentang Sampah Diaper[a]		B	Std. Error	Wald	df	Sig.	Exp (B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Tidak Setuju	Intercept	-1,897	,619	9,389	1	,002			
	[Jenis Kelamin=0]	,511	1,278	,160	1	,689	1,667	,136	20,403
	[Jenis Kelamin=1]	0[b]	.	.	0	.	.	.	.
Setuju	Intercept	,470	,285	2,719	1	,099			
	[Jenis Kelamin=0]	2,076	,592	12,278	1	,000	7,969	2,496	25,444
	[Jenis Kelamin=1]	0[b]	.	.	0	.	.	.	.
Persepsi Tentang Upaya Pengelolaan Sampah Diaper[a]									
Tidak Setuju	Intercept	1,025	,312	10,813	1	,001			
	[Jenis Kelamin=0]	-1,134	,412	7,560	1	,006	,322	,143	,722
	[Jenis Kelamin=1]	0[b]	.	.	0	.	.	.	.
Setuju	Intercept	-1,946	,756	6,626	1	,010			
	[Jenis Kelamin=0]	-1,421	1,267	1,258	1	,262	,241	,020	2,893
	[Jenis Kelamin=1]	0[b]	.	.	0	.	.	.	.

Ket. a.The reference category is: Netral.

Influence of type of work with community perceptions of diaper waste and perceptions of diaper waste management efforts

The results of the *fisher exact* test showed that there is a significant relationship between type of work and public perception of diaper waste (p-value exact sig. = 0.000 <α =0.05), so it can be hypothesized that public perception of diaper waste is influenced by the type of work variable. There is a significant relationship between job type and public perception of diaper waste management efforts (p-value exact sig. = 0.014 <α =0.05), so it can be hypothesized that public perception of diaper waste management efforts is influenced by job type variables**.**

Table 5. Relationship between Type of Work and Community Perceptions of Diaper Waste and Perceptions of Diaper Waste Management Efforts

Variabel	Pekerjaan			Total	p-value exact sig
	Pegawai	Wiraswasta	Ibu Rumah Tangga		
Persepsi Tentang Sampah Diaper					0,000
Tidak Setuju	0	1	3	4	
Netral	2	2	20	24	
Setuju	52	8	23	83	
Total	54	11	46	111	
Persepsi Tentang Upaya Pengelolaan Sampah Diaper					0,014
Tidak Setuju	24	6	35	65	
Netral	28	5	10	43	
Setuju	2	0	1	3	
Total	54	11	46	111	

The results of multinomial regression analysis showed that the type of work has a significant effect on people's perception of diaper waste (p-value = 0.000 <α =0.05). Employees tend to have an agreed perception of diaper waste rather than neutral by 22.61 times compared to housewives. Type of

employment has a significant effect on people's perception of diaper waste (p-value = 0.022 <α =0.05). Employees are 4.08 times more likely to disagree with diaper waste management efforts than housewives.

Table 6. Test of the Effect of Type of Work with Community Perceptions of Diaper Waste and Perceptions of Diaper Waste Management Efforts

Persepsi Tentang Sampah Diaper[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Tidak Setuju	Intercept	-1,897	,619	9,389	1	,002			
	[Pekerjaan=0]	-17,251	,000	.	1	.	3,219E-8	3,219E-8	3,219E-8
	[Pekerjaan=1]	1,204	1,372	,770	1	,380	3,333	,226	49,093
	[Pekerjaan=2]	0[b]	.	.	0	.	.	.	.
Setuju	Intercept	,140	,306	,209	1	,648			
	[Pekerjaan=0]	3,118	,783	15,871	1	,000	22,609	4,875	104,848
	[Pekerjaan=1]	1,247	,848	2,163	1	,141	3,478	,660	18,318
	[Pekerjaan=2]	0[b]	.	.	0	.	.	.	.
Persepsi Tentang Upaya Pengelolaan Sampah Diaper[a]									
Tidak Setuju	Intercept	1,253	,359	12,207	1	,000			
	[Pekerjaan=0]	-1,407	,454	9,611	1	,002	,245	,101	,596
	[Pekerjaan=1]	-1,070	,704	2,314	1	,128	,343	,086	1,362
	[Pekerjaan=2]	0[b]	.	.	0	.	.	.	.
Setuju	Intercept	-2,303	1,049	4,820	1	,028			
	[Pekerjaan=0]	-,336	1,279	,069	1	,792	,714	,058	8,760
	[Pekerjaan=1]	-18,543	,000	.	1	.	8,849E-9	8,849E-9	8,849E-9
	[Pekerjaan=2]	0[b]	.	.	0	.	.	.	.

Ket. a. The reference category is: Netral.

Spatial Diaper Waste

Diaper waste was found in 12 dumping points, namely in Official Temporary Waste Disposal Sites (TPS) and in other places (Non TPS) in Liliba urban village. The dumping points were located in 8 RT areas, namely RT 01, RT 02, RT 14, RT 21, RT 23, RT 44, RT 45 and RT 5. 289 diaper waste was found with an average of 24 pieces per dumping point. The most diaper waste was found at point 7, namely 46 pieces.

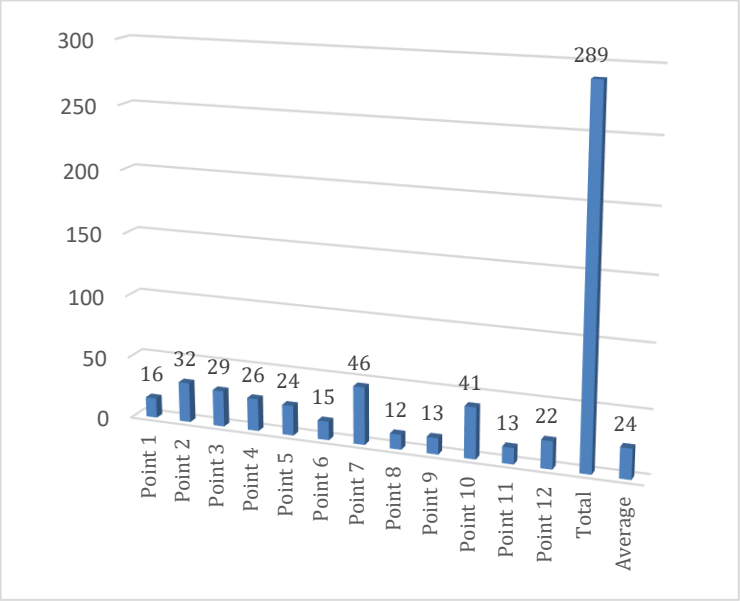

Figure 1. The amount of diaper waste found in Liliba urban village in city.

An overview of TPS locations, diaper waste disposal points and respondent locations was created in a map using the GIS method (Figure 2). This figure shows that Liliba urban village has three polling stations located on the main road of the urban village. These sites are managed by the kelurahan and cooperate with the Kupang City Cleanliness Office in transporting waste to the landfill. Waste from these three polling stations is transported every day. Figure 2 also shows that the location of most respondents is far from the TPS. There were 9 waste disposal points outside the TPS. When viewed from the specified buffer only 23 (21%) respondents disposed of diaper waste at the TPS, the rest disposed at the 9 points found.

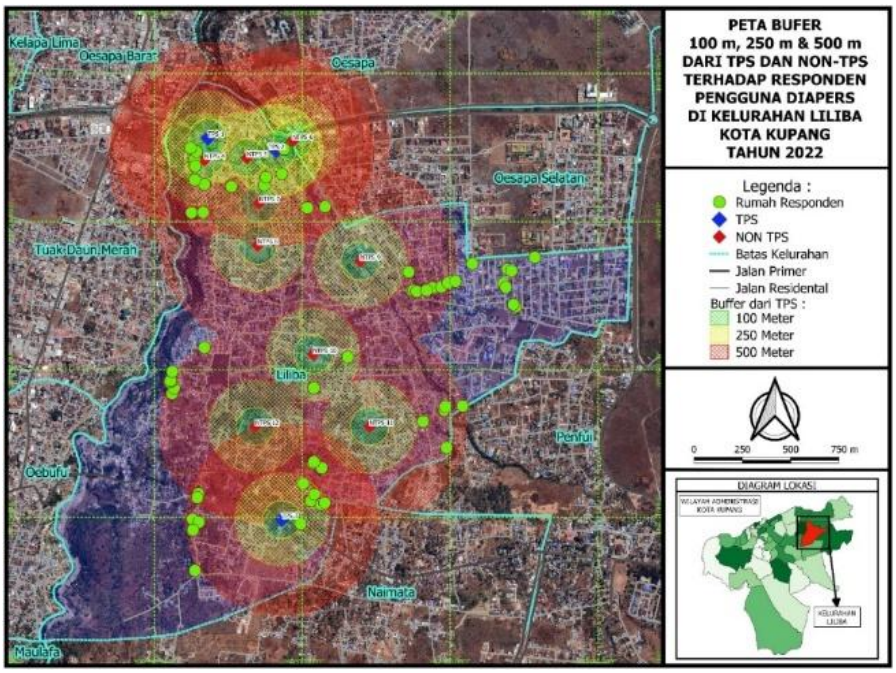

Figure 2. Spatial disposal of diaper waste in Liliba urban village, Kupang city in 2020.

This buffer area is the distance traveled by respondents to dispose of the diaper waste generated. The distribution of diaper waste was mapped using *buffers of* 100 meters, 250 meters and 500 meters. The mapping results show that the location of diaper waste disposal is within the reach of respondents (*buffer area*). Figure 2 shows that the presence of diaper waste is most prevalent at a radius of 500 meters from the respondent's location. This is in line with the perception results which show that 40% of respondents stated that they dispose of waste if it is close to home and only 29% of respondents are willing to dispose of diaper waste with a location far from home. The distance in question is more than 500 meters. Respondents who were more than 500 meters away from the waste disposal site were found to be 9 respondents. The location of respondents outside the TPS buffer area causes respondents to dispose of diaper waste arbitrarily at several unofficial disposal points that are not reached by the Kupang City waste service.

Community Perception

The results of the study obtained all respondents agreed to use disposable diapers (diapers) because it is practical, lightens the workload and is comfortable(Jesca & Junior, 2015). There were 60.3% of respondents who did not agree to dispose of diaper waste in official TPS, this is in line with Muntowo's research where respondents were more likely to dispose of it in any place(Jesca & Junior, 2015). Diaper waste management is influenced by knowledge and values related to religion(Suhanti, 2021). There is a relationship between the level of knowledge of disposable diaper waste and the amount of waste generated (Diniah, 2020). Counseling can increase understanding(Marthaliakirana, 2018)about diaper waste management. Diaper waste management by collecting fees was not agreed by respondents, this is in line with 2018 research in Liliba Village where the willingness to pay fees is one of the invalid indicators in the waste management model(Tarigan et al., 2020). In contrast to the results of research in Wonosona where the community independently manages financing voluntarily(Subqi & Albab, 2019).

Liliba Village has three polling stations. One of the factors that influence waste management is infrastructure(Widiyanto et al., 2020). One of the infrastructure in waste management is TPS. Good waste management is the availability of special diaper waste bins and the availability of diaper waste management guidebooks(Wulandari & Suwand, 2019). However, in this study, all respondents disagreed with the existence of a special diaper waste disposal site. Disagreement may be caused by the lack of access to waste transportation by the government(Maliga et al., 2022). Good implementation of regulations on waste management provides satisfaction for the community(Yudianto et al., 2021). However, in this study, respondents did not agree that there were special rules about diaper waste and sanctions for littering. Making special regulations about waste is one of the tools to maximize management and minimize the amount of waste (Nilam Sari, 2017)where the government and residents must be jointly responsible (Kaoje et al., 2017). Public awareness in managing diaper waste generated can be through increasing motivation with innovative strategies(Putra et al., 2024)such as utilizing existing technology.

Diaper Waste Distribution

The discovery of diaper waste disposal points with an average number of 24 diapers shows that the use of disposable diapers generates a large amount of waste (Ndifreke, 2020). A study in Kuala Lumpur showed that diaper waste ranked fourth in the composition of waste generated (Ali et al., 2017). This is in line with the results of a study stating that waste distribution is influenced by population density, land, distance to the river, type of road and availability of TPS(Ristianto et al., 2022). Purnadi

and friends also stated that the main factors causing the emergence of random waste disposal points include distance from main roads, distance from local roads, coverage of waste transportation service areas and distance from official TPS(Purnadi et al., 2020). The cause of high waste generation is because people tend to ignore waste management and recycling, as well as the level of education and lack of access to waste transportation by the government(Maliga et al., 2022). Improper waste generation and management can adversely affect human health. The role of government at all levels can be enhanced by adopting an integrated waste management system. Make policies, programs for the community, and develop appropriate action plans. Community involvement will improve environmental governance and end littering(Ogundele et al., 2018). The government must create public awareness through socialization activities. This has been successful in increasing public awareness of the importance of waste management(Julianti et al., 2024). Awareness of proper waste disposal has a positive impact on the environment (Ndifreke, 2020).

The existence of a geographic information system makes it easier for people to find the nearest TPS (Musa & Rahmayanti, 2021). The location of TPS that can be reached with a minimum distance will make it easier for people to independently dispose of waste to the TPS (Fathonah & Linarti, 2019). The distance from the official TPS is far, causing the emergence of indiscriminate dumping points (Mizwar & Kartini, 2016). Distribution using the GIS method can provide accurate information to see where the waste is dumped so as to facilitate its management, especially the distance of transportation that can be estimated (Wibisana & Zainab, 2022). The description of waste disposal sites can be the basis for developing efficient and effective waste management strategies and policies (Kordecki et al., 2022).

Waste management training is effective in improving knowledge, attitudes, and behaviors in managing waste to reduce the rate of littering (Izzan Naser et al., 2022). One alternative to diaper waste management is to reuse it as one of the raw materials for mushroom cultivation (Khoo et al., 2022)and is safe to use sustainably (Ma et al., 2020). Diaper waste can also be processed into compost, the resulting compost does not show the presence of pathogenic microorganisms (Colón et al., 2011). Diaper waste can also reduce water loss in the soil through infiltration and increase plant growth (Al-Jabari et al., 2019).

Conclusion

This study concludes that community perceptions of diaper waste and its management are significantly influenced by gender and occupation. These findings highlight the importance of sociodemographic factors in shaping public attitudes and behaviors toward waste, particularly non-biodegradable waste such as disposable diapers. Spatial analysis revealed that diaper waste is concentrated in 12 identified points, predominantly located within the residential buffer zones, indicating a lack of structured disposal infrastructure. These results underscore the need for targeted public education and behavioral interventions, especially for households with toddlers. The local government is encouraged to intensify community outreach and promote proper diaper waste management practices through consistent campaigns and accessible disposal facilities. Future research should expand the scope by including behavioral change models and evaluating the long-term impact of educational interventions, while also incorporating a broader geographic area to develop comprehensive policy recommendations.

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