



Public Opinion on Household Solid Waste Management in Maruthamunai Area, Sri Lanka

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Abstract

This study addresses the research gap in understanding community perceptions and practices in areas where service delivery and public engagement are weak. Solid waste management poses significant environmental and public health challenges in many urban areas of Sri Lanka, particularly where service delivery and public engagement are weak. This study examines the situation in Maruthamunai, where high organic waste generation is met with inadequate disposal practices and limited community participation. A total of 100 households were selected using a simple random sampling method across six Grama Niladhari divisions, and waste composition, source separation, collection, composting, and disposal methods were collected and analyzed using the Descriptive Analysis method with the Statistical Package for Social Sciences (SPSS) version 27. The results show that 80% of the household waste is organic materials, which makes up the majority of the household waste. The majority of the household rely on municipal trucks for waste collection, while a minority of the household's rely on community bins (6%) or open dumping (7%). Only 20% getting benefit from daily service, 10% receive irregularly scheduled collection, and 70% get collected twice a week. 58%, 6%, and 7% of garbage is disposed of by the way of burning, burying, or open dumping, respectively, while 76% of waste is managed by the municipality. However, regardless of this, just 6% of households make compost, and 39% separate their garbage. However, awareness of sustainable measures such as composting and recycling remains low (17%). The study concludes that integrated municipal services and community awareness, civic engagement can reduce environmental risks, and promote sustainable urban living.

Keywords: Awareness; Civic engagement; Composting; Government engagement; Household solid waste management

INTRODUCTION

Background of the Study

Solid waste management (SWM) has a direct impact on community well-being, economic growth, and environmental sustainability, particularly in developing countries where rapid urbanization and changing consumption patterns increase waste generation. As reported by the Central Bank of Sri Lanka (CBS, 2019), the country's economic growth and urbanization have contributed to increasing waste generation rates, placing additional pressure on already strained municipal services. Municipal solid waste in South Asia, particularly Sri Lanka, is often composed of 60–80% organic materials, making it ideal for composting-based management

systems (Visvanathan and Trankler, 2003). Effective SWM requires an understanding of the complex interactions between infrastructure, policy, and community behavior. As Marshall and Farahbakhsh (2013) argue, integrated approaches that account for the systemic nature of waste management challenges are essential for developing countries, where conventional solutions often fail to address underlying complexities. Furthermore, Medina (2002) observed that globalization and urbanization have intensified municipal solid waste problems in third-world cities, necessitating decentralized and context-specific solutions that engage local communities. Solid Waste Management is a critical environmental and public health challenge of the 21st century, particularly in developing nations experiencing

rapid urbanization and changing consumption patterns (Kaza *et al.*, 2018). Wijerathna *et al.* (2012) studied solid waste generation, characteristics, and management within households in Sri Lankan urban areas and found that the composition of waste varies significantly based on household income levels, consumption patterns, and cultural practices. Their research highlighted that urban households generate substantial quantities of organic waste that could be effectively managed through composting if appropriate systems and awareness programs are in place.

The Kalmunai Municipal Council's (MC) SWM faces a number of economic and environmental concerns. (Nuskiya and Sahana, 2021). Their study examined the role of Kalmunai MC in solid waste management and identified challenges including financial constraints, inadequate human and mechanical resources, and administrative limitations that hinder effective service delivery. The social, economic, and environment-based challenges evaluated within Kalmunai SWMS highlight the need for comprehensive policy interventions. Most areas of the Kalmunai region are the result of urban development, population growth, and the exhaustion of growing solid waste levels. Land deterioration, waterlogging, dwindling wetland areas, health risks, and the lack of natural beauty marked the region (Muneera, 2018). Muneera's study on risk reduction of improper solid waste disposal activities in Maruthamunai residential area documented how urban development and population growth have led to land degradation, waterlogging, diminishing wetlands, health risks, and loss of natural beauty. The research emphasized the need for social awareness, waste minimization through the 3R system, and the conversion of domestic waste materials into fertilizer and biogas. Mahees (2018) examined the socio-cultural aspects of the solid waste crisis in Sri Lanka and argued that cultural norms, social practices, and community dynamics play a significant role in shaping waste management behaviors. His research emphasized that sustainable waste management requires not only technical solutions but also social and cultural interventions that address deeply rooted attitudes and practices.

Organic and inorganic forms are the main divisions of urban waste (MSW). The organic components of urban solid waste can be identified under three main categories: putrescible, fermentable, and non-fermentable. Putrescible waste tends to decompose quickly and, unless carefully controlled, decomposes with the production of unpleasant odors and visual unpleasantness. A major source of putrescible waste is food preparation and consumption. Fermentable waste tends to decompose rapidly, but without the unpleasant decay. Fermentable waste is represented by crop and market debris. Non-fermentable wastes are prone to slow decomposition and thus decompose very slowly. As noted by the United Nations ESCAP (2002), understanding the different types of wastes and their sources is fundamental to designing appropriate management strategies, as each waste category requires different handling, treatment, and disposal approaches. Some studies consider urban waste to be only as MSW. Also, in developed countries, only 25% to 35% of the overall waste stream is from urban sources (Schubeler *et al.*, 1996).

According to Thivyatharsan *et al.* (2016), municipal solid waste generated from households, shops, institutions, and businesses can be broadly classified into three categories: readily biodegradable, slowly biodegradable, and non-degradable based on its composition and degradation potential. Their study in Thirukkivil Pradeshiya Sabha, Ampara District, provided baseline data on waste generation and characterization that is relevant to the broader Eastern Province context, including Maruthamunai. The study found that organic waste constituted a significant proportion of the waste stream, similar to the findings of the present study. However, waste collection and disposal services are limited, and harmful practices such as open dumping and burning are still common, leading to environmental and health risks (Guerrero *et al.*, 2013). Sri Lanka produces an estimated 7,500 tons of municipal solid waste daily, of which only 2,500-3,500 tons are collected by local authorities, while the remainder is often openly burned or dumped without regulation (Bandara *et al.*, 2007). Kumar and Samadder (2017) developed an empirical model for predicting household solid waste generation rates based on a case study in Dhanbad, India, and found that socio-economic factors such as income, family size, and education significantly influence waste generation patterns. Their findings have relevance for understanding household waste generation in Maruthamunai and similar South Asian communities. Research has shown that household waste management behaviors are influenced by a combination of environmental values, situational characteristics, and psychological factors (Barr, 2007). Barr's UK case study demonstrated that positive relationships exist between environmental attitudes and pro-environmental behaviors, including waste reduction, reuse, and recycling. Similarly, Mifodzyeva and Brandt (2013) conducted a meta-analysis of determinants influencing recycling behavior among householders, identifying key variables such as convenience, knowledge, and social norms that affect household participation in recycling programs. Zhang *et al.* (2020) investigated what prevents Chinese citizens from recycling and found that accessibility of recycling facilities was a critical factor influencing recycling behavior. Their research indicated that even when residents have positive attitudes toward recycling, the lack of convenient facilities can significantly reduce participation rates. Similarly, Zhuang *et al.* (2008) examined source separation of household waste in China and found that proper infrastructure, combined with effective public education, was essential for successful waste separation programs. Understanding community perceptions is essential because public attitudes, awareness, and behavioral practices directly influence the success and sustainability of waste management systems. As Tonglet *et al.* (2004) demonstrated using the Theory of Planned Behaviour, pro-recycling attitudes are the major contributor to recycling behavior, with moral norms and situational factors also playing significant roles in determining household waste management practices.

Research Objectives

The objectives of the study to evaluate current waste collection, transport, and disposal methods, their coverage, and the level of public satisfaction in SWM in Maruthamunai,

located within the Kalmunai divisional secretariat division (DSD), to assess how much the community knows about the environmental and health impacts of common waste disposal methods, to understand public perception, acceptance, and barriers to sustainable waste management solutions such as waste separation and composting, and to provide practical recommendations for waste management strategies that are effective, socially acceptable, and sustainable.

MATERIALS AND METHODS

Study Area and Data Collection

The study was conducted in the Maruthamunai area, which falls under the Kalmunai DSD in the Ampara district of Sri Lanka (Fig. 1). Maruthamunai is a densely populated town known for its commercial activity and residential communities. The sampling frame included all households located within the selected GN divisions of Maruthamunai in the Kalmunai DSD.

A multi-stage sampling method was adopted to ensure representativeness. First, six GN divisions were purposively selected to capture variation in residential and commercial areas. Second, households were chosen using simple random sampling based on official GN household lists. The sampling approach followed established methodologies in social research, as outlined by Bryman (2016), who emphasized the importance of probability sampling techniques for achieving representative samples in household surveys. The combination of purposive selection of GN divisions and random selection of households aligns with best practices for multi-stage sampling designs (Etikan and Bala, 2017). A total of 07 households from Maruthamunai - 01, 09 households from Maruthamunai - 02, 37 households from Maruthamunai - 03, 12 households from Maruthamunai - 04, 09 households from Maruthamunai - 05, and 26 households from Maruthamunai - 06.

This study used both primary and secondary data to complete this research. Primary data were collected using pre-tested closed-ended questionnaires consisting of sections on socio-

demographic characteristics, awareness, perceptions, attitudes, and waste management practices through interviewing them in their households. The questionnaire was pre-tested with 10 households in a neighboring GN division to ensure clarity and appropriateness of questions. Based on feedback, questions were revised for better comprehension. The final questionnaire included four sections:

- (i) socio-demographic characteristics,
- (ii) waste generation and composition,
- (iii) waste management practices and disposal methods, and
- (iv) awareness, attitudes, and satisfaction. Ethical protocols were followed, with informed consent obtained from all participants, and the purpose of the study clearly explained prior to interviews.

Also, secondary data were collected from research articles, books, conference proceedings, thesis or dissertations, online materials, and annual reports. In addition, some of the secondary data were collected from the Kalmunai Municipal Council and DS office.

Data Analysis

The collected data were coded, entered, and analyzed using SPSS Version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, summarized socio-demographic characteristics and general trends in public knowledge, attitudes, and practices. The analytical approach was informed by Kumar (2019), who provides comprehensive guidance on quantitative data analysis in social research, particularly the use of descriptive statistics for summarizing survey data.

RESULTS AND DISCUSSION

Socio-Demographic Information of Stakeholders

The survey sample consisted of 56% female and 44% male respondents, reflecting the key role of women in household waste management. Ages ranged from 18 to 69 years, with a mean of 43.5 years, indicating a predominance of middle-aged adults who often make household decisions regarding waste practices. Abushammala and Ghulam (2022) also reported that middle-aged adults often make critical decisions on acceptance or objection to creative-based waste management strategies. Educational levels were generally high, with 35% having completed secondary school, 31% A-Level, and 18% holding graduate degrees, suggesting a positive base for environmental awareness initiatives. Occupations varied, including government employees (18%), labourers (17%), fishermen (13%), students (14%), and housewives (13%). Monthly incomes ranged from below LKR 50,000 (10%) to above LKR 75,000 (53%), influencing consumption and waste generation patterns.

Waste Composition

The waste in Maruthamunai is dominated by organic materials, mainly garden soil, kitchen waste, and green leaves (Fig. 2), which contribute to odors, pests, and clogged drains. In the inorganic fraction, hazardous waste outweighs plastics and metals (Fig. 3), posing significant health and environmental risks. Plastics and metals, though less abundant, still require proper management. The other waste

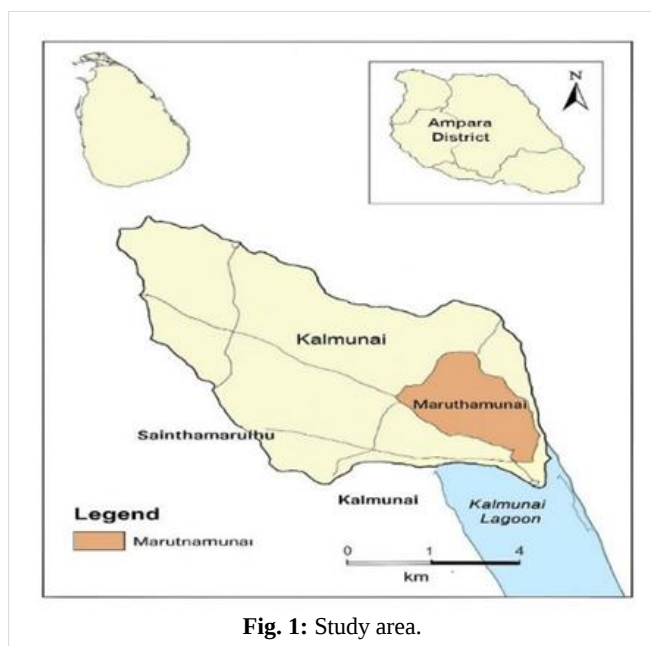


Fig. 1: Study area.

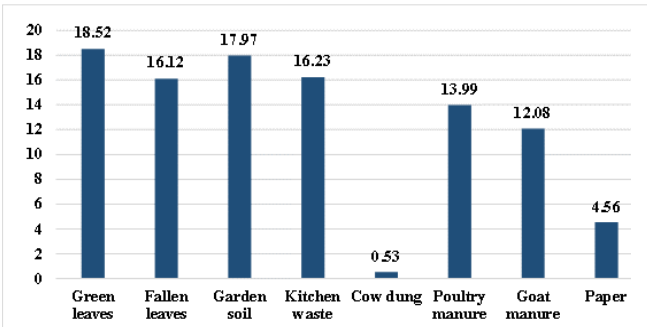


Fig. 2: Organic waste composition (in per centage).

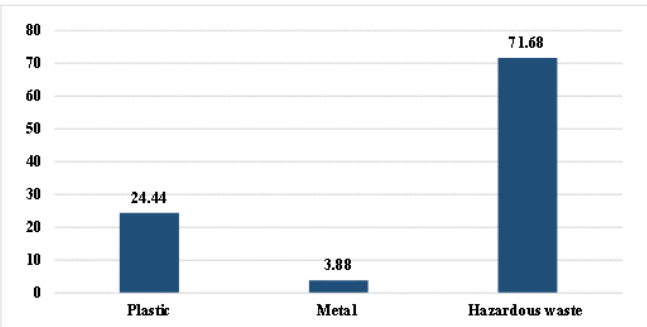


Fig. 3: Inorganic waste composition (in per centage).

category, present in 68% of samples with a mean mass of 1,184.24 grams, adds further complexity. Overall, the composition data validates public concerns and highlights the urgent need for targeted strategies to manage both organic and hazardous waste effectively. Alamgir and Ahsan (2007) found similar waste composition patterns in Bangladeshi cities, where organic waste dominated the municipal solid waste stream and presented significant opportunities for recovery through composting and recycling. Their study estimated that substantial economic benefits could be generated from waste recovery and composting, reinforcing the potential value of organic waste in Maruthamunai if properly managed.

Waste Collection and Disposal

The results demonstrate a heavy reliance on a formal municipal truck collection system, which serves the vast majority of respondents (87.0%). However, a notable minority still relies on open dumping (7.0%), an unsustainable and environmentally harmful practice, while a small fraction uses community bins (6.0%). This pattern reflects broader challenges in solid waste management in developing countries, where formal collection systems often fail to reach all households, and informal or unsafe disposal methods persist (Cointreau, 1982). Cointreau's project guide on environmental management of urban solid wastes in developing countries emphasized that collection coverage and service reliability are critical factors determining the success of municipal waste management systems.

Collection frequency

The data indicate that the most common collection schedule is twice a week, covering 70.0% of the sample. While 20.0% benefit from daily collection, a significant 10.0% experience

irregular services, which can lead to waste accumulation and public health concerns.

Disposal Method

Consistent with the collection system data, municipal collection is the predominant disposal method (76.0%). However, a combined 18.0% of waste is disposed of through environmentally detrimental methods such as burning (5.0%), burying (6.0%), and open dumping (7.0%). Only 6.0% of respondents practice composting, highlighting a missed opportunity for organic waste management. Composting, as described by Epstein (2002), offers a scientifically sound approach to transforming organic materials into stable, usable products. Epstein's comprehensive work on the science of composting details the microbiological and biochemical processes that convert waste into valuable soil amendments, demonstrating that composting can address both waste management and agricultural needs simultaneously.

Waste Segregation and Household Waste

Only 39% of respondents segregate their waste, while 61% do not. Main reasons for not segregating (Table 1) include lack of time (25%), knowledge (22%), facilities (18%), and the perception that it is unnecessary (19%). These findings align with research by Owusu *et al.* (2013), who examined the willingness of urban households in Ghana to accept economic incentives for waste source separation. Their study found that about 80% of households were willing to participate in source separation if provided with appropriate incentives, suggesting that both economic and non-economic factors influence segregation behavior. Similarly, Samarahewa (2019) investigated disposal methods of separated wastes in peri-urban household settings in Sri Lanka and found that awareness and facility availability were key determinants of household participation in waste separation. Average household daily waste generation is 4.46 kg, ranging from 1.0 to 7.9 kg. Higher education levels appear linked to better segregation practices, with postgraduates showing the highest proportion of waste segregation.

Municipal Service Satisfaction

Satisfaction with municipal waste services varies with collection frequency. Among households receiving twice-weekly collection (the most common schedule), 38.6% reported being dissatisfied or very dissatisfied. This suggests that collection frequency alone does not ensure satisfaction, as factors like reliability, cleanliness, and service quality also influence public perceptions.

Table 1: Barriers to waste segregation.

No Segregation Reason	Percent (%)
No facilities	18%
No knowledge	22%
No time	25%
Not needed	19%
Other	16%
Total	100%

Environmental and Public Health Impacts of Waste Management

Waste management in Maruthamunai causes significant environmental and health problems. Most respondents reported bad odors (79%) and air pollution (81%), while 72% believe waste leads to water contamination. Clogged drains were noted by 81%, creating breeding grounds for mosquitoes and increasing health risks. Overall, 83% reported health problems, including respiratory issues, skin infections, gastrointestinal problems, and vector-borne diseases, highlighting the serious impact of improper waste disposal on community well-being. Giusti (2009) also stated that respiratory problems from airborne particulates and pathogens, skin infections from direct contact with contaminated materials, gastrointestinal issues from waterborne pathogens due to contamination, and vector-borne diseases from pests like mosquitoes breeding in clogged drains and waste piles are found as waste-related health risks. The concept of environmental justice, as discussed by Agyeman (2007), is relevant here—disadvantaged communities often bear a disproportionate burden of environmental hazards, including improper waste disposal. Agyeman's work on the intersection of environmental justice and sustainability highlights the need for equitable approaches to waste management that consider the social and spatial dimensions of environmental risks.

Public Awareness, Attitudes, and Satisfaction with Waste Management

Slightly over half of respondents (56%) are aware of safe waste disposal methods, though knowledge of sustainable practices like composting and recycling remains low (17%). Most people (37%) see government and public bodies as primarily responsible for waste management, with only 9% feeling personally accountable. Disposal sites are fragmented and poorly maintained, and 70% have not participated in awareness programs. Willingness to compost or recycle increases with education, while attitudes toward segregation are deeply divided. Public satisfaction with municipal services is low, with 38% dissatisfied, reflecting infrastructural gaps, environmental nuisances, and poor site upkeep. Polarized attitudes and poor services create a cycle of reduced participation and frustration, highlighting the need for targeted education and service improvements. Vineeshiya and Mahees (2019) examined environmental attitudes and discourses of community participation in solid waste management in Sri Lanka and found that public perception of responsibility and trust in authorities significantly influenced participation levels. Their research emphasized that building community engagement requires not only awareness campaigns but also institutional mechanisms that foster shared accountability between citizens and local governments.

Comparison with Previous Studies

The dominance of organic waste (80%) in Maruthamunai is consistent with findings from other Sri Lankan urban areas. Wijerathna *et al.* (2012) reported that organic waste constitutes 60-75% of household waste in Sri Lankan cities, while Thivyatharsan *et al.* (2016) found similar proportions

in Thirukkivil, Ampara District. This consistency across the Eastern Province suggests that organic waste management should be a regional priority. However, the composting rate in Maruthamunai (6%) is notably lower than the 15-20% reported in some South Asian community-based composting initiatives (Alamgir and Ahsan, 2007), indicating a significant gap in sustainable waste management practices that needs to be addressed through targeted interventions.

The low rate of waste segregation (39%) observed in this study is comparable to findings from Ghana (Owusu *et al.*, 2013), where household source separation was limited despite positive attitudes toward recycling. This suggests that infrastructure and convenience, rather than awareness alone, are critical barriers to segregation behavior. The primary reasons cited for not segregating—lack of time (25%) and knowledge (22%)—reflect similar barriers identified in studies from China (Zhang *et al.*, 2020; Zhuang *et al.*, 2008), where accessibility of facilities and convenience were key determinants of participation in waste separation programs.

The reliance on municipal collection services (87%) in Maruthamunai is higher than in many other developing country contexts. For example, Guerrero *et al.* (2013) reported that collection coverage in many South Asian cities ranges from 50-80%, suggesting that the Kalmunai Municipal Council has achieved relatively good service coverage. However, the dissatisfaction rate (38.6%) among twice-weekly collection recipients indicates that service quality, reliability, and environmental nuisances are significant concerns that undermine public satisfaction despite reasonable collection frequency.

The health impacts reported by respondents—respiratory issues, skin infections, gastrointestinal problems, and vector-borne diseases—are consistent with the findings of Giusti (2009), who documented similar waste-related health risks in communities with inadequate waste management systems. The widespread reporting of bad odors (79%) and air pollution (81%) indicates that even where formal collection exists, the environmental quality of the living environment is compromised, highlighting the need for improved waste handling and disposal practices.

Implications for Policy and Practice

The findings highlight the need for multi-pronged interventions. First, the municipal collection system requires strengthening, particularly in addressing irregular collection and ensuring consistent service delivery that meets community expectations. Second, the low awareness of sustainable practices (17%) indicates that public education campaigns should be prioritized, targeting both school-aged children and adults through community-based programs. Third, the high organic waste content presents an opportunity for decentralized composting initiatives that could reduce municipal collection burdens while producing valuable soil amendments for local agriculture.

Study Limitations

This study has several limitations. First, the sample size of 100 households, while statistically adequate for descriptive analysis, may not capture the full diversity of waste

management practices in the area. Second, the study relied on self-reported data from household interviews, which may be subject to social desirability bias. Third, the study was limited to Maruthamunai within the Kalmunai DSD, and findings may not be generalizable to other regions of Sri Lanka without further research. Future studies should include larger sample sizes, employ objective waste measurement techniques, and expand the geographical scope to capture regional variations in waste management practices.

Recommendations

Based on the findings, the following recommendations are proposed:

- *Strengthening Municipal Services:* The Kalmunai Municipal Council should regularize collection schedules, expand service coverage to all households, ensure reliable waste transportation to designated disposal sites, and address public complaints regarding service quality. This includes improving the cleanliness of collection vehicles and waste storage areas to reduce odors and nuisance.
- *Promoting Home Composting:* Awareness campaigns should emphasize the simplicity and benefits of home composting, supported by practical demonstrations and provision of basic composting bins or training. Given that 80% of household waste is organic, even partial adoption of home composting could significantly reduce the burden on municipal collection and disposal systems.
- *Enhancing Waste Segregation:* The municipality should provide color-coded bins for different waste types and conduct door-to-door education to increase source separation rates. Addressing the barriers of "no knowledge" (22%) and "no facilities" (18%) through targeted awareness and infrastructure provision could substantially improve segregation practices.
- *Community Engagement:* Local organizations, religious institutions, and community-based groups should be mobilized to foster civic engagement and shared responsibility for waste management. Given that 37% of respondents perceive waste management as primarily the government's responsibility, initiatives that build community ownership and accountability are essential.
- *Enforcement and Incentives:* Policy measures, including incentives for segregation and composting, and penalties for open dumping and burning, should be considered to encourage sustainable practices. These measures should be accompanied by transparent and fair enforcement mechanisms to ensure community acceptance.

CONCLUSIONS

In conclusion, this study contributes empirical evidence on household solid waste management practices in a densely populated urban area of Sri Lanka's Eastern Province. The findings underscore that sustainable waste management requires an integrated approach combining service delivery improvements, targeted awareness programs, and active civic engagement. While the municipality plays a critical role in collection and disposal, the low rates of segregation (39%)

and composting (6%) highlight that behavioral change among residents is equally important for achieving sustainable outcomes.

The study in Maruthamunai reveals that organic waste dominates households, yet composting is uncommon, with most residents relying on municipal collection or unsafe disposal methods like open dumping and burning. Public attitudes toward waste segregation are divided, and education positively influences recycling and composting practices. Most residents perceive waste management as the government's responsibility, highlighting the need for shared accountability. Key challenges include irregular collection, insufficient bins, poorly maintained disposal sites, and associated environmental and health problems. Addressing these issues requires improved service delivery, targeted awareness programs, and active community participation.

Future strategies should leverage the high organic content of waste as an opportunity for resource recovery through composting and biogas generation, transforming waste from a burden into a community asset. By combining reliable infrastructure with education and cooperation, Maruthamunai can transform its waste into a manageable resource, enhancing public health, environmental safety, and sustainable community practices. With coordinated efforts between local authorities and communities, Maruthamunai can move toward a more sustainable and environmentally sound waste management system.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/ or falsification, double publication and/or submission, and redundancy, have been completely observed by the authors.

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