



IMPACT OF IMPROPER SOLID WASTE DISPOSAL PRACTICES ON ENVIRONMENTAL AND PUBLIC HEALTH IN THE URBAN FRINGE OF JAFFNA

C. C. Dishani^{1*} and S. Kayathri²

¹*Council Secretariat, Northern Province, Sri Lanka*

²*Department of Indigenous Medicine, Northern Province, Jaffna, Sri Lanka*

Solid waste disposal poses a major threat to the environment and public health in developing countries, as most waste is directly dumped in open areas. In the urban fringe of Jaffna, Sri Lanka, rapid population growth and changing lifestyles have led to a sharp increase in domestic waste generation. This study investigates the impacts of improper solid waste disposal practices in the Nallur Pradeshiya Sabha area, located on Jaffna's urban-rural boundary. A descriptive statistical method was applied, with primary data collected through 50 household surveys using simple random sampling, field observations, photography, and interviews with local officials and public health inspectors. Improper disposal locations were identified using GPS technology and mapped with Google Earth Pro. Secondary data, including health records from the Medical Officer of Health (MOH), were also analyzed. Data analysis in MS Excel (2021) generated descriptive statistics, percentages, charts, and graphs, while qualitative findings were systematically coded and integrated with quantitative results. Results, presented through descriptive statistics, graphical illustrations, and GPS-based maps, indicate that common disposal practices dumping in public places, backyard burning, and discarding waste on streets or into inland water bodies persist despite regulations. Twenty-nine major improper disposal sites were identified, and most households generate considerable unmanaged waste. These practices have caused serious environmental consequences, including soil contamination, air pollution from burning plastics, and water pollution from blocked drains and seasonal pond dumping. Health impacts include increased cases of dengue, respiratory illnesses, and waterborne diseases. Institutional challenges, such as an overburdened composting facility, insufficient manpower, and transportation constraints, further hinder effective waste management. The study recommends improving collection services, promoting household-level segregation and composting, upgrading existing facilities, enhancing community awareness, enforcing stricter regulations, and strengthening inter-governmental coordination. By providing evidence-based insights, this research contributes to sustainable, community-driven waste management strategies for Jaffna's urban fringe and offers a model for other developing urban regions facing similar challenges.

Keywords: urban fringe, solid waste, household, impact, awareness, waste management

**Corresponding Author: abinessulaxan2017@gmail.com*

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INTRODUCTION

Solid waste disposal is a major environmental and health concern in Jaffna's urban fringe, especially under the Nallur Pradeshiya Sabha. Rapid urban growth has increased waste beyond the area's limited management capacity. Open dumping, burning, and waste discharge into water bodies contribute to pollution and health risks. Densely populated areas like Nallur, home to institutions like the University of Jaffna, face greater pressure. Poor regulation, low public awareness, limited collection, and weak enforcement hinder effective waste management.

This study examines waste disposal practices, their environmental and health impacts, and suggests community-based solutions to improve waste management in Jaffna's urban fringe. For this study, the following objectives are outlined:

1. To Identify Current Solid Waste Disposal Practices and improper disposal sites.
2. To Analyze Environmental and Public Health Impacts
3. To Develop Recommendations for Improvement

METHODOLOGY

Study area

The study was conducted in the **24 Grama Niladhari (GN) Divisions** of the Nallur Pradeshiya Sabha, covering **20.59 km²** with a population of **42,825 (Nallur PS, 2024)**. This area lies close to the Jaffna Municipal Council boundary, near the coastal zone. With a high residential population and rising land values, residential use dominates, occupying about 40% of the total land. The time frame of data collection was **November 2024 to March 2025**.



Figure 19 – Location of Study area

Source: Developed by the researcher based on the database of Survey Department, 2021



Data Collection and Sampling Technique

A **purposive random sampling** method was used to select 50 households for the survey, ensuring representation from 24 different GN divisions. Primary data were gathered through household questionnaires, direct field observations, key informant interviews, and GPS mapping of disposal sites. Secondary data were obtained from the Nallur Pradeshiya Sabha, health reports from the MOH office, and previous research studies.

Data Analysis

Data were analyzed using **MS Excel (2021)** to generate descriptive statistics, percentages, charts, and graphs. Qualitative findings were systematically coded and integrated with quantitative results.

RESULTS AND DISCUSSION

Current Solid Waste Disposal Practices in the Urban Fringe

The survey results (Table 1; Figures 2) show that while 50% of households depend on Pradeshiya Sabha vehicles for waste disposal, the remaining half rely on unsustainable practices such as open dumping (25%), burning (16%), burying (36%), roadside or near-home disposal (11%), and use of public bins or containers (8%). These methods contribute to visual pollution, disease vector breeding, soil and water contamination, and air pollution from burning. Plastic waste, being the dominant component, further aggravates environmental risks due to its non-biodegradable nature, while the absence of household-level segregation reflects poor awareness and inadequate infrastructure. Overall, the findings highlight both service gaps and behavioral issues, emphasizing the need for wider collection coverage, community awareness, and source-level segregation initiatives. These findings align with Sampath et al. (2013), who reported similar challenges in other Sri Lankan urban areas.

Table 12. Solid Waste Disposal Methods Reported By Households

Disposal Methods	Percent
Pradesa saba vechile	50
Nearby container	5
Open spaces	25
Near home	6
In a hole in own compound	6
By the road or street side	5
In the public bin	3
Total	100

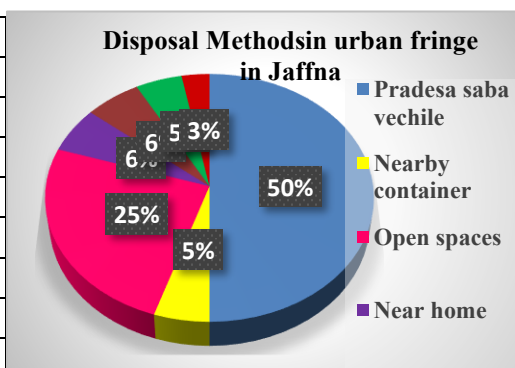


Figure 2- Disposal Methods in Urban Fringe of Jaffna

Source: Field Survey 2025



Figure 3 - Improper disposal practices (Source: Field Survey 2025)

Identified Improper Disposal Sites

Table 2 – Identified Improper disposal Sites in the urban fringe of Jaffna

No	Identified Place Name	Geographical Coordinates	No	Identified Place Name	Geographical Coordinates
1	Naduthuru Lane	9.66126 °N, 80.04413 ° E	16	Thalankavil Pillayar kovil Road	9.68416 °N, 80.02904 ° E
2	Kandy Jaffna road	9.66052 °N, 80.05305 ° E	17	Thalankavil Pillayar kovil Road	9.68430 °N, 80.02868 ° E
3	Kandy Jaffna road	9.66032 °N, 80.05439 ° E	18	Thalankavil Pillayar kovil Road	9.68414 °N, 80.02896 ° E
4	Kandy Jaffna road	9.66051 °N, 80.05567 ° E	19	Thalankavil Pillayar kovil Road	9.68674 °N, 80.03076 ° E
5	Kandy Jaffna road	9.66068 °N, 80.05872 ° E	20	Aadiyapatham Road	9.68838 °N, 80.02957 ° E
6	Sangilitoppu - Chemmani Road	9.66514 °N, 80.05890 ° E	21	Jaffna-Palay Road	9.69212 °N, 80.02932 ° E
7	Aadiyapatham Road	9.67477 °N, 80.04411 ° E	22	Kondavil Irupalai Road	9.70557 °N, 80.02942 ° E
8	Aadiyapatham Road	9.67481 °N, 80.04409 ° E	23	MOH nallur	9.70572 °N, 80.02993 ° E
9	Aadiyapatham Road	9.67498 °N, 80.04396 ° E	24	Kondavil Irupalai Road	9.70593 °N, 80.02516 ° E
10	Aadiyapatham Road	9.67711 °N, 80.04077 ° E	25	Karaikal Sivan kovil Lane	9.71540 °N, 80.02831 ° E
11	Aadiyapatham Road	9.68289 °N, 80.03792 ° E	26	Jaffna-Kankesanthurai Road	9.70521 °N, 80.01794 ° E
12	Karuwepulam Road	9.69789 °N, 80.02783 ° E	27	Jaffna-Kankesanthurai Road	9.70175 °N, 80.01691 ° E
13	Karuwepulam Road	9.69794 °N, 80.02776 ° E	28	Jaffna- Kulapiddy Road	9.69974 °N, 80.01005 ° E
14	Kovil Road	9.68250 °N, 80.03098 ° E	29	Sivapragasam Road-Vannarpannai	9.68731 °N, 80.00895 ° E
15	Kovil Road	9.68383 °N, 80.02890 ° E			



Figure 4 – Identified improper dumping sites
Source: Developed by Researcher based on GPS Coordinates

Field observations and GPS mapping identified 29 illegal dumping sites across Jaffna's urban fringe, mainly along major roads like Kandy Jaffna Road, Aadiyapatham Road, and Jaffna - Kankesanthurai Road. Many are near homes and public facilities, including the MOH Nallur office, posing risks of pollution and disease. Their clustering along busy roads reflects poor waste services, weak enforcement, and low public awareness - highlighting key challenges in waste management.

The map (Figure: 4) clearly shows a scattered distribution of illegal disposal points, particularly concentrated along main roads and residential lanes.

Environmental Impacts of Improper Solid Waste Disposal

In the Nallur urban fringe, improper waste disposal has caused significant environmental harm:

- **Soil Degradation:** 40% of locals reported soil contamination from dumping plastics, food waste, and clothes in residential and vacant areas.
- **Air Pollution:** 25% noted harmful air pollution from burning waste, especially plastics, causing respiratory problems.
- **Water Contamination:** 20% observed water pollution in ponds and canals, leading to blocked drainage and flood risks near Kondavil.
- **Visual and Odor Pollution:** 15% raised concerns about waste piles and odors degrading aesthetics and property values along major roads.

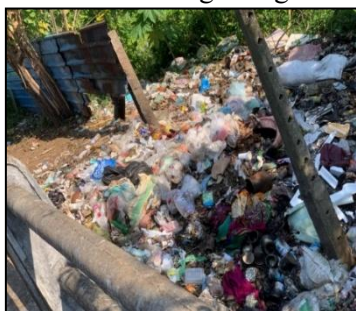




Figure 5 – Identified environmental impacts (Source: Field Survey 2025)

Health Impacts of Improper Solid Waste Disposal

Analysis of MOH records (2021–March 2025) **Figure - 6** shows significant waste-related diseases:

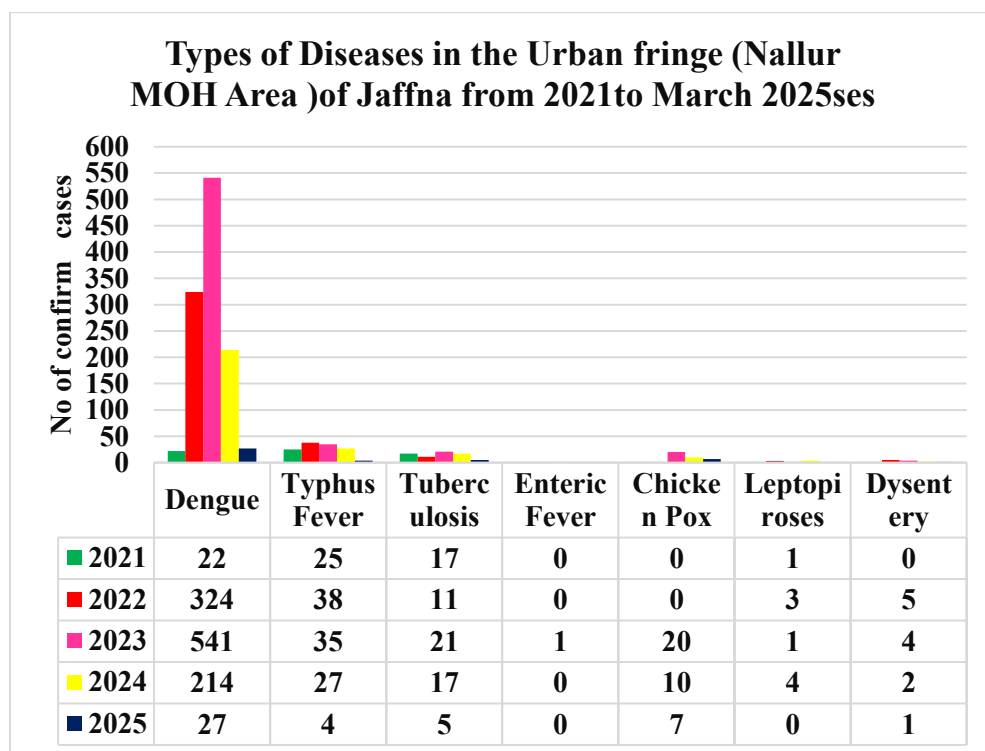


Figure 6: Types of Diseases in the urban fringe
Source: developed by researcher based on data from MOH Office, Nallur

- **Dengue fever** cases peaked at 541 in 2023, linked to stagnant water in waste sites.
- **Respiratory diseases** such as asthma and chronic cough were associated with burning plastics.
- **Waterborne diseases** like typhoid, dysentery, and diarrhea persisted in areas near dumping sites.

These findings are consistent with Fernando et al. (2019), who emphasized the psychosocial and health burdens of poor waste management in Sri Lanka.

Challenges in Solid Waste Disposal

Solid waste management in Nallur faces multiple challenges. Household-level waste segregation is poor, with many residents disposing of waste improperly. Waste

collection services are inconsistent, as the current fleet of eight tractors and one compactor cannot fully cover the area. The Karaikal composting facility is severely overburdened, handling 12 times its intended capacity, with only 10-15% of waste properly composted. This leads to foul odours and health risks, including dengue and other communicable diseases. There is also a critical shortage of manpower; only 40 outsourced workers are available, further limiting effective waste handling. Additionally, the sudden discontinuation of the waste disposal partnership with Manipay has disrupted disposal routines. Increased transport costs and long travel distances to Karaveddy have further strained resources. Though a new site at Karai Mudanku is being developed, it awaits CEA approval before operations can commence.



Figure 7- Karaikal Composting Plant at Inuvil (Source: Field Survey 2025)



Figure 8-Newly proposed compost yard at Ariyalai – Karaimudanku (Source: developed by Researcher based on GPS coordinates)

DISCUSSION

The findings highlight a direct relationship between poor waste disposal practices and public health risks. Comparisons with national studies (bandara, 2011; wikramanayake & corea, 2003) confirm that similar trends exist across Sri Lanka, but Jaffna's urban fringe faces additional challenges due to limited land availability. Strengthening household segregation and decentralized composting systems could significantly reduce environmental and health risks.



CONCLUSIONS

Improper solid waste disposal is a major issue in Jaffna's urban fringe, especially in areas under Nallur Pradeshiya Sabha. Poor waste segregation, irregular collection, and overloaded composting sites have led to pollution and health risks. The study found 29 major dumping sites and highlighted weaknesses in the current system. Solutions include promoting household waste separation, providing compost bins, improving collection services, hiring more workers, and upgrading composting facilities. Fast-tracking approval for the new Karai Mudanku site and setting up smaller waste centers are also essential.

With community participation and strong support from local authorities, Jaffna can achieve cleaner and safer waste management.

RECOMMENDATIONS

To overcome these issues, key actions are recommended:

- Strengthen household segregation and recycling through awareness campaigns, color-coded bins, and enforcement of disposal regulations.
- Promote home composting with compost bin distribution and public education.
- Improve waste collection by expanding the fleet, adding staff, and introducing street-level monitoring.
- Upgrade the Karaikal facility by limiting it to biodegradable waste, cleaning existing backlogs, and installing odour control measures.
- Enhance workforce capacity by recruiting more permanent staff and resolving cadre issues.
- Rebuild disposal partnerships and attract private-sector participation.
- Reduce transport burden through decentralized sorting centers and better logistics.
- Accelerate approval for the Karai Mudanku site, ensuring its proper and transparent operation.

Together these interventions can lead to a more sustainable and health-conscious waste management system in Nallur.

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