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Waste collection reliability and service gaps in Sonipat city, Haryana

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ABSTRACT

Reliable waste collection is essential for maintaining clean and manageable urban neighbourhoods. Waste collection services in Sonipat City, Haryana, were assessed through a 2025 survey covering 600 households, 60 sanitation workers and 20 municipal officers across 20 wards. Regular collection was reported by 55.50% of households, while 26.67% experienced irregular service and 17.83% reported no collection service. Among households receiving collection, 49.90% had daily pickup, whereas only 31.24% reported consistently fixed collection timing. Considerable differences appeared across wards, with regular collection ranging from 6.67% to 93.33%. Sanitation workers reported staff shortages, public non-cooperation, narrow streets, excessive workload and vehicle problems. Complaint handling also remained incomplete, as only 27.46% of 142 complainants reported full resolution. Better route management, predictable collection schedules, suitable vehicles and stronger complaint follow-up are required.

Keywords: Waste collection, Service reliability, Ward disparities, Sanitation workers, Sonipat

1. Introduction

A waste service is experienced through repeated visits, not through a coverage entry alone. Residents need to know whether a collector will arrive, how frequently pickup occurs and what happens when the visit is missed. Comparative research across cities treats collection as one part of a wider system that also depends on institutions and everyday service delivery (Wilson *et al.*, 2012) [1].

This distinction matters when evaluating performance. The Waste Wise Cities Tool separates waste generated, collected and managed in controlled facilities. India's service-benchmarking handbook also distinguishes coverage, efficiency and other service indicators. (UN-Habitat, 2021).

Studies in developing countries describe operational difficulty as a combination of finance, staffing, equipment and coordination. A Kenyan case study examines these municipal challenges, while broader work by Guerrero and colleagues considers the actors and conditions affecting waste-management performance. Such research cautions against treating an additional vehicle as a complete solution when the supporting organisation remains weak (Guerrero *et al.*, 2013) [2].

Collection also has a physical geography. Routes pass through streets of different widths and serve premises with different access conditions. Guidance for developing countries stresses choosing collection arrangements suited to local conditions. Research in Yaoundé likewise places waste services within the city's practical and livelihood setting. These perspectives encourage attention to who can reach a collection point and who must make an extra effort to use it (Parrot *et al.*, 2009) [3].

South Asian evidence gives particular importance to timing. A choice experiment in Bharatpur identified collection frequency, pickup timing and street cleanliness as valued service attributes. These are understandable household concerns because a nominal route is of limited use when residents cannot predict its arrival. The implication for survey design is to ask about availability, frequency and timing separately (Rai *et al.*, 2019) [4].

Indian research connects weak collection with the wider difficulties of transport, treatment and disposal. Haryana's 2025 audit publication examined municipal waste management over an earlier audit period and raised planning and implementation concerns. That audit provides institutional context faced by every surveyed Sonipat household in 2025 (CAG, 2025) [5].

2. Objective

1. To assess the reliability and ward-wise distribution of waste collection services in Sonipat City.

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3. Study area

The survey municipality lies in Sonipat district, Haryana, within the Delhi-linked urban region. Research on Sonipat–Kundli describes outward expansion and land transformation, creating a wider setting of established urban areas and growing peripheral development. The district's plain terrain and seasonal climate form the regional background, but neither district area nor the wider planning region is used as the denominator for this municipal survey (Verma *et al.*, 2024) [6]. All results retain the 20-ward structure used at the administrative reference. Thirty households were covered in each ward. Ward numbers identify the comparison units. Figure 1 shows the survey location and its ward framework.

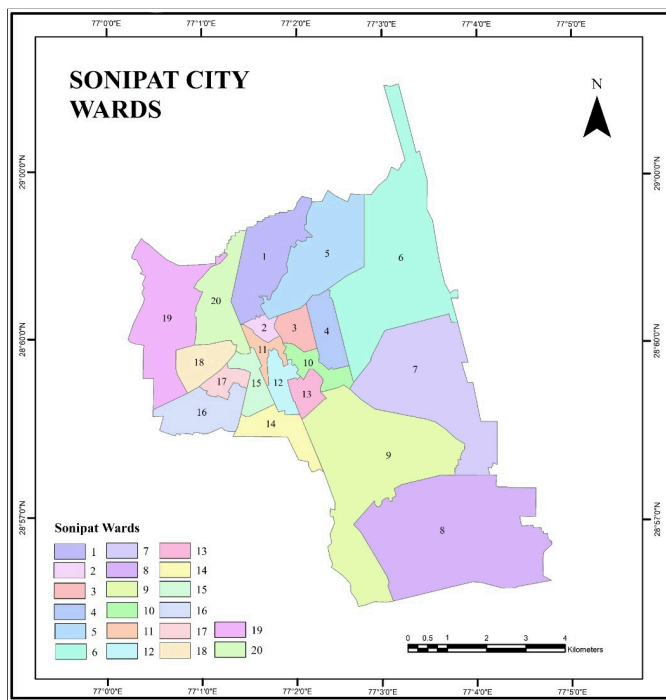


Figure 1. Sonipat City and the 20-ward survey framework

Source: City panel from the researcher's study-area cartography, prepared in ArcGIS, 2024.

4. Methodology

The investigation used three separate schedules in a cross-sectional survey. Households were selected through a ward-stratified, multi-stage procedure: three residential clusters per ward and ten systematically selected households per cluster. An eligible adult familiar with waste disposal answered the household schedule. The worker sample comprised 20 sweepers, 20 door-to-door collectors, ten drivers or helpers and ten bin, transfer or disposal workers. Workers were selected through geographical and functional lists. Twenty officers or responsible functionaries were selected purposively by role.

The analysis covered reported collection availability, frequency, timing, ward distribution, selected operational problems, route administration and complaint outcomes. Household denominators were 600 overall, 493 where collection existed and 142 among those who had complained. Worker and officer answers used denominators of 60 and 20.

Percentages were recalculated from counts, and ward values used 30 households each. Multiple-response worker problems describe over-

lapping experiences. The analysis is descriptive. Reporting states the study setting, sample, definitions and limitations explicitly, consistent with the transparency principles of observational-study reporting (von Elm *et al.*, 2007) [7].

5. Results

5.1 Availability, frequency and timing

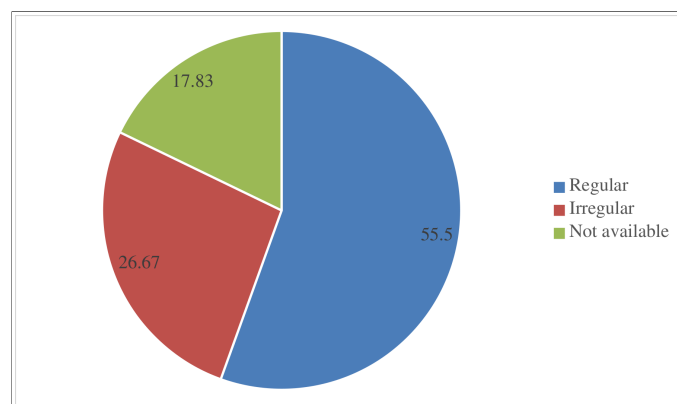


Figure 2. Availability of Door-to-Door Waste Collection Service

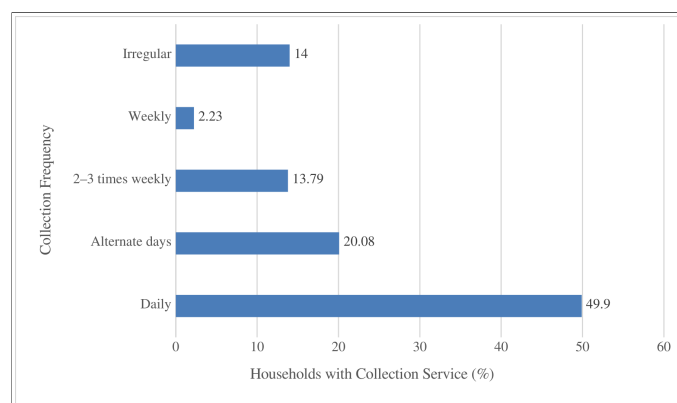


Figure 3. Frequency of Door-to-Door Waste Collection

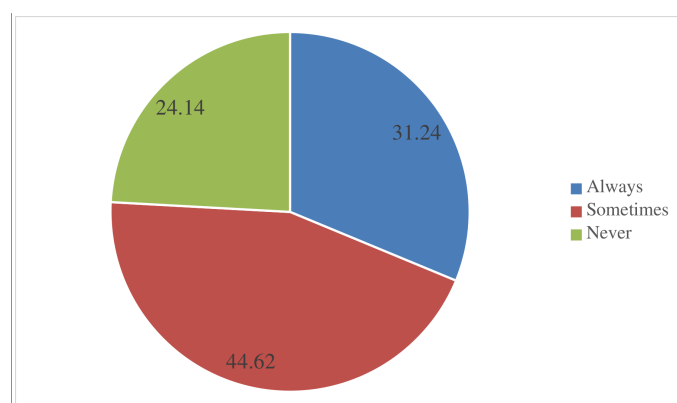


Figure 4. Regularity of Fixed Door-to-Door Collection Time

Collection was available to 493 households, but only 333 described it as regular. Irregular or unavailable service affected 267 households, or 44.50% of the full sample. Availability therefore gave a more favourable picture than reliability. (Table 1).

Table 1. Household experience of collection availability, frequency and timing

Indicator	Response	n	Base N	Percentage
Availability	Regular	333	600	55.50
Availability	Irregular	160	600	26.67

(continued on next page)

Indicator	Response	n	Base N	Percentage
Availability	Not available	107	600	17.83
Frequency	Daily	246	493	49.90
Frequency	Alternate days	99	493	20.08
Frequency	2–3 times weekly	68	493	13.79
Frequency	Weekly	11	493	2.23
Frequency	Irregular	69	493	14.00
Timing	Always fixed	154	493	31.24
Timing	Sometimes fixed	220	493	44.62
Timing	Never fixed	119	493	24.14

Source: Household field survey, 2025; author's calculations.

Daily pickup reached 246 households: 49.90% of those with a service, but 41.00% of all 600 households. Among served households, 339 did not report timing as always fixed. That represents 68.76% of the applicable group. Frequency tells how often collection occurs; timing tells how predictable the visit is.

5.2 Ward differences in collection

Regular collection ranged from 6.67% in Ward 16 to 93.33% in Wards 6, 7 and 14. Ward 19 also had a low count, with four households reporting regular collection. Ward 9 showed the highest daily pickup count, at 26 households, while none of the 30 households in Ward 16 reported daily pickup (Table 2).

The contrast is operationally important, but its precision should not be exaggerated. One household changes a ward percentage by 3.33

points.

Some wards also illustrate why the indicators should remain separate. In Ward 3, 23 households described collection as regular, but only 14 reported daily pickup. Regular service may follow a dependable schedule that is not daily. Ward 17 had six households in each category.

5.3 Worker constraints and route administration

Staff shortage and public non-cooperation were each reported by 28 workers. Narrow streets affected 22, while 20 identified excessive workload. Vehicle shortages or damage and spillage were each selected by 17.

Table 2. Regular and daily collection across the 20 survey wards

Ward	Local Reference	Households	Regular collection, n (%)	Daily collection, n (%)
1	Rishi Colony / Jatwara	30	14 (46.67)	11 (36.67)
2	Lal Bus Stand / Bara Bazaar	30	6 (20.00)	3 (10.00)
3	Sector 14 / Khanna Colony	30	23 (76.67)	14 (46.67)
4	Sector 15 / Rajeev Colony	30	10 (33.33)	7 (23.33)
5	Shiv Colony / New Subzi Mandi	30	20 (66.67)	11 (36.67)
6	Garh Shahjanpur / DCRUST	30	28 (93.33)	23 (76.67)
7	Bahalgarh / Liwaspur	30	28 (93.33)	23 (76.67)
8	Rai / Education City	30	24 (80.00)	17 (56.67)
9	Gandhi Colony / Badmalik	30	27 (90.00)	26 (86.67)
10	Sector 13 / Shri Nagar	30	23 (76.67)	16 (53.33)
11	Model Town / Atlas Road	30	26 (86.67)	21 (70.00)
12	Panchsheel Colony / Kabirpur	30	10 (33.33)	6 (20.00)
13	Vikas Puri / Jiwan Nagar	30	18 (60.00)	11 (36.67)
14	Govind Nagar / New Anaj Mandi	30	28 (93.33)	24 (80.00)
15	Agar Sain Nagar / Old Industrial Area	30	10 (33.33)	7 (23.33)
16	Dahiya Colony / Kalupur	30	2 (6.67)	0 (0.00)
17	West Ram Nagar / Jawahar Nagar	30	6 (20.00)	6 (20.00)
18	Sector 23 / Malviya Nagar	30	12 (40.00)	8 (26.67)
19	Indian Colony / Garhi Brahmanan	30	4 (13.33)	3 (10.00)
20	Chhotu Ram Colony / Garhi Ghasita	30	14 (46.67)	9 (30.00)
Total		600	333 (55.50)	246 (41.00)

Source: Ward-wise household field tabulation, 2025; counts recovered from the reported percentages using 30 households per ward, and percentages recalculated.

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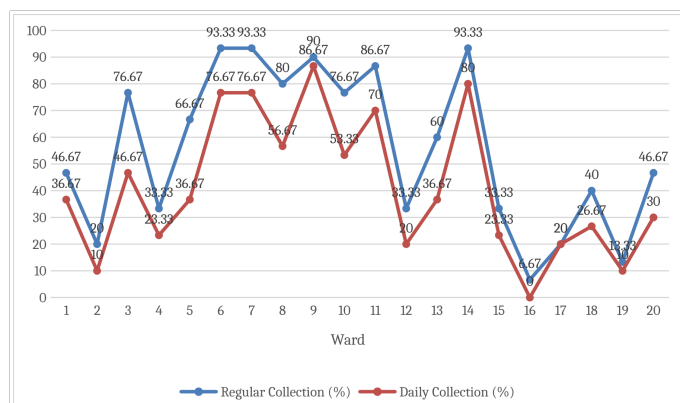


Figure 5. Locality-Wise Door-to-Door Collection and Schedule Status

The workload schedule provides context. The 20 door-to-door collectors reported serving an average of 417.90 households per day, with a standard deviation of 117.13. Their average was 2.55 trips daily.

Table 3. Collection-related operational problems reported by workers

Reported problem	Workers	Percentage
Insufficient workers	28	46.67
Public non-cooperation	28	46.67
Narrow streets	22	36.67
Excessive workload	20	33.33
Insufficient or damaged vehicles	17	28.33

Reported problem	Workers	Percentage
Waste spillage	17	28.33
Irregular routes	10	16.67
Delayed unloading	8	13.33

Source: Sanitation-worker field survey, 2025; author's calculations. $N = 60$; multiple responses.

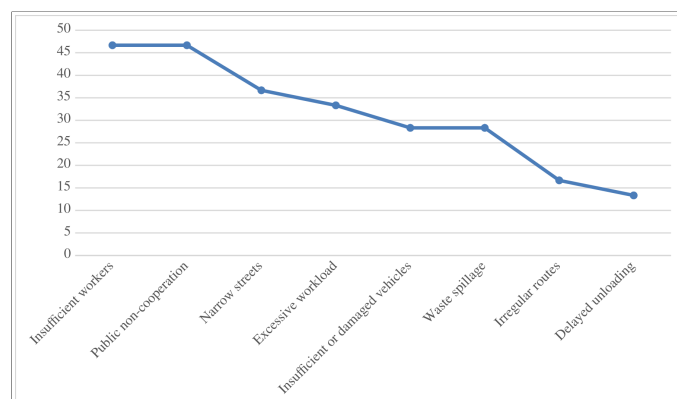


Figure 3. Collection-Related Operational Problems Reported by Workers

Worker reports also help frame the next stage of investigation. Narrow approaches call for checking vehicle suitability; delayed unloading calls for examining the receiving point; and reports of insufficient staff call for checking attendance and route allocation.

Table 4. Officer assessments of fixed routes and route records

Indicator	Assessment	Officers	Percentage
Fixed ward routes	Fully operational	5	25.00
Fixed ward routes	Partly operational	13	65.00
Fixed ward routes	Not operational	2	10.00
Route records	Fully available	5	25.00
Route records	Partly available	9	45.00
Route records	Not available	6	30.00

Source: Officer field schedule, 2025; author's calculations. $N = 20$ for each indicator.

Only five officers described fixed routes as fully operational; thirteen considered them partly operational. Full availability of route records was also reported by five officers. Together, these responses indicate a need to check the connection between planned routes, actual visits and accessible records.

5.4 Complaint outcomes

Table 5. Outcomes among households that submitted a complaint

Outcome	Households	Percentage
Fully resolved	39	27.46
Partly resolved	66	46.48
Not resolved	37	26.06
Total complainants	142	100.00

Source: Household field survey, 2025; author's calculations. Applicable $N = 142$ complaint submitters;

Among 142 complainants, 39 reported full resolution, 66 partial resolution and 37 no resolution. Full resolution therefore covered 27.46%,

not the 73.94% obtained by combining full and partial outcomes. Elsewhere in the same question, 96 of all 600 households did not know where to complain. These results distinguish access to a channel, receipt of some action and complete resolution (Table 5).

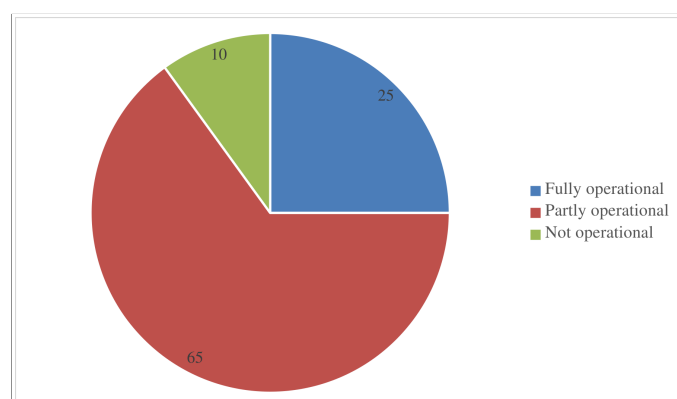


Figure 6. Operational Status of Fixed Ward-Wise Collection Routes

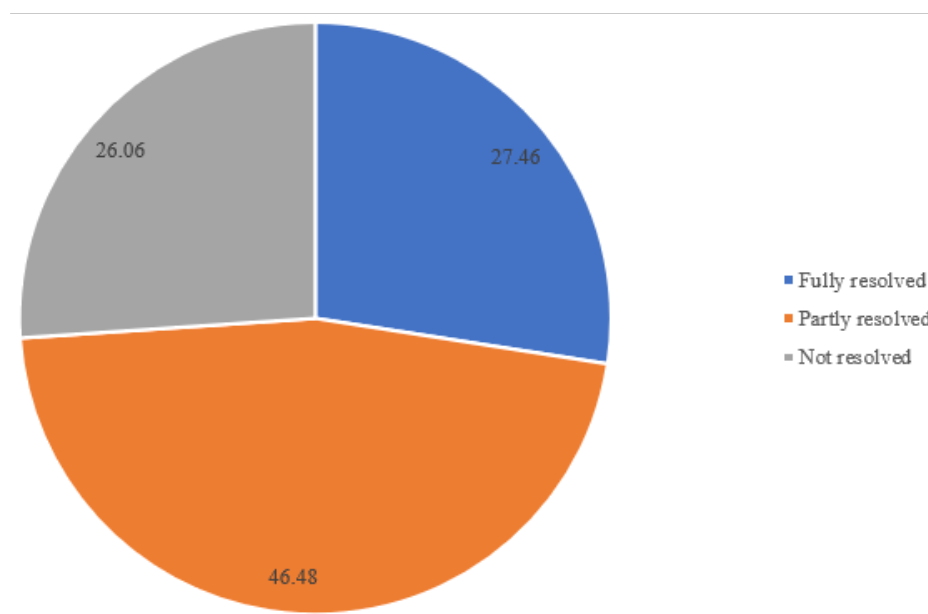


Figure 7. Outcome among Households that Submitted a Complaint

6. Discussion and service priorities

The survey points to a gap between being included in a service and receiving it predictably. This distinction fits the service attributes identified in Bharatpur and the performance-indicator approach examined by Teixeira and colleagues. For Sonipat, regularity, daily frequency and pickup timing should be tracked separately, using clearly stated denominators and a consistent recall period (Rai *et al.*, 2019; Teixeira *et al.*, 2014) [4, 8].

GIS studies in Ipoh and fuel-oriented routing research demonstrate ways to examine collection networks, but their savings cannot be transferred directly to Sonipat. A local assessment would first need street access, actual stops, travel times, unloading delays and vehicle capacity. No claim of optimal routing is made from the present household responses (Malakahmad *et al.*, 2014) [9].

Scheduling improvements also require reliable information. Johansson's modelling work examines how dynamic scheduling and routing can improve operations when suitable information is available. In Sonipat, a more immediate proposal is to connect each route with a named crew, an expected pickup window, a completion record and a procedure for missed visits. Advanced monitoring should follow, not replace, dependable basic records (Johansson, 2006) [10].

Worker and household cooperation deserve a place in that system. Experimental evidence from Nepal found benefits from combining information with inexpensive street bins, including improved disposal through collectors. This supports testing modest local changes. Trials in difficult routes should be evaluated with repeated observations. (Nepal *et al.*, 2023) [11].

7. Conclusion

Collection gaps in Sonipat were visible in reliability, timing, ward differences and complaint completion. Regular service reached 55.50% of sampled households, and fewer than one-third of served households reported consistently fixed timing. The weakest ward results warrant direct route verification, while worker and officer responses identify staffing, access, vehicles and records as practical areas for review. A clear pickup window, suitable equipment and verified complaint resolution offer specific priorities. Improvement must be demonstrated through repeated service checks rather than inferred from nominal coverage.

References

1. Wilson DC, Rodic L, Scheinberg A, Velis CA, Alabaster G. Comparative analysis of solid waste management in 20 cities. *Waste Management & Research*. 2012;30(3):237–254.
2. Guerrero LA, Maas G, Hogland W. Solid waste management challenges for cities in developing countries. *Waste Management*. 2013;33(1):220–232.
3. Parrot L, Sotamenou J, Dia BK. Municipal solid waste management in Africa: Strategies and livelihoods in Yaoundé, Cameroon. *Waste Management*. 2009;29(2):986–995.
4. Rai RK, Nepal M, Khadayat MS, Bhardwaj B. Improving municipal solid waste collection services in developing countries: A case of Bharatpur Metropolitan City, Nepal. *Sustainability*. 2019;11(11):3010.
5. Comptroller and Auditor General of India. Performance audit on solid waste management in urban local bodies. In *Composite Audit Report—Civil and PSUs, Government of Haryana (Report No. 2 of 2025, Chapter 2)*; 2025.
6. Verma P, Jangra R, Kaushik SP. Geospatial measurement of urban sprawl and land transformation using multi-temporal datasets: A case study of Sonipat-Kundli urban agglomeration. *Sustainable Environment*. 2024;10(1):2366556.
7. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *PLoS Medicine*. 2007;4(10):e296.
8. Teixeira CA, Avelino C, Ferreira F, Bentes I. Statistical analysis in MSW collection performance assessment. *Waste Management*. 2014;34(9):1584–1594.
9. Malakahmad A, Bakri PM, Mokhtar MRM, Khalil N. Solid waste collection routes optimization via GIS techniques in Ipoh City, Malaysia. *Procedia Engineering*. 2014;77:20–27.
10. Johansson OM. The effect of dynamic scheduling and routing in a solid waste management system. *Waste Management*. 2006;26(8):875–885.
11. Nepal M, Karki Nepal A, Khadayat MS, Rai RK, Shyamsundar P, Somanathan E. Low-cost strategies to improve municipal solid waste management in developing countries: Experimental evidence from Nepal. *Environmental and Resource Economics*. 2023;84(3):729–752.
12. Central Public Health and Environmental Engineering Organisation. *Municipal solid waste management manual: Part I—An overview*. Ministry of Urban Development, Government of India; 2016.
13. Coffey M, Coad A. *Collection of municipal solid waste in developing countries*. UN-Habitat; 2010.

14. District Administration Sonipat. About district. Government of Haryana.
15. Henry RK, Yongsheng Z, Jun D. Municipal solid waste management challenges in developing countries—Kenyan case study. *Waste Management*. 2006;26(1):92–100.
16. Kumar S, Smith SR, Fowler G, Velis C, Kumar SJ, Arya S, Rena Kumar R, Cheeseman C. Challenges and opportunities associated with waste management in India. *Royal Society Open Science*. 2017;4(3):160764.
17. Ministry of Urban Development. Handbook of service level benchmarking. Government of India.
18. Tavares G, Zsigraiova Z, Semiao V, Carvalho MG. Optimisation of MSW collection routes for minimum fuel consumption using 3D GIS modelling. *Waste Management*. 2009;29(3):1176–1185.
19. United Nations Environment Programme. Global Waste Management Outlook 2024: Beyond an age of waste—Turning rubbish into a resource. 2024.
20. United Nations Human Settlements Programme. Waste Wise Cities Tool: Step by step guide to assess a city's municipal solid waste management performance through SDG indicator 11.6.1 monitoring. 2021.

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