

# Household Waste Practices and Governance Gaps: An Analysis of Municipal Solid Waste Management in Srinagar City

Junaid Khan

Department of Public Administration, Maulana Azad National Urdu University, Hyderabad, India

\*Corresponding author: junaid.khan@manuu.edu.in

Received: 24-09-2025

Revised: 30-11-2025

Accepted: 07-12-2025

## ABSTRACT

Municipal solid waste management (MSWM) has emerged as one of the most pressing challenges of urban governance in India. This problem is particularly severe in regions that are rapidly urbanizing and ecologically fragile. Srinagar city, the summer capital of Jammu and Kashmir, is struggling with municipal waste management. The problems include poor infrastructure, irregular collection services, and heavy reliance on the already overburdened Achan landfill. This study examines the household waste generation and management practices across 384 households in the 64 municipal wards of Srinagar city. The findings reveal that the food waste dominates household streams (73%), while storage relies primarily on old buckets (44%) and plastic bags (37%). Although 55% of households practice segregation, 73% report the absence of separate bins from the Srinagar Municipal Corporation (SMC). Disposal is largely dependent on the Ghanta Gadi (pick up truck) vehicles (51%), yet 40% of households face irregular clearance, and 51% lack nearby public containers. The study shows a paradox. While 91% of citizens know the waste management rules and 93% support recycling, weak municipal systems prevent these practices from being effective. The paper argues that Srinagar needs to bridge its governance gap in waste management. This can be achieved by improving infrastructure, ensuring regular services, promoting decentralized composting, and running targeted awareness campaigns. Such measures are essential for moving the city towards a sustainable waste management system, in line with the Swachh Bharat Mission 2.0, the G-25 Action Plan, and Sustainable Development Goal 11.

**Keywords:** Solid waste management, Household practices, Urban governance, Srinagar, Segregation, Municipal services

Rapid urbanization, changing consumption patterns, and inadequate governance structures have made municipal solid waste management (MSWM) a critical challenge in developing countries. Globally the urban centers generate over two billion tonnes of waste annually, with projections of 3.4 billion tonnes by the year 2050 (UNEP, 2021). While developed countries have advanced in recycling and resource recovery, many cities in the Global South struggle with weak collection, unscientific disposal, and limited citizen participation (Zurbrugg, 2003; Da Zhu *et al.* 2008).

According to the CPCB Annual Report (2020-21), urban India generates about 160,038.9 tonnes

of municipal solid waste per day (58-60 million tonnes per year). Approximately 95% of this is collected (152,750 tonnes/day), while about 52% of what is collected is treated. Around 18-19% goes to the landfills and roughly 32% remains unaccounted for, often disposed of unsafely. The Solid Waste Management Rules (2016) and Swachh Bharat Mission (SBM) sought to mainstream segregation at source, decentralized processing, and community participation. However, the reality

**How to cite this article:** Khan, J. (2025). Household Waste Practices and Governance Gaps: An Analysis of Municipal Solid Waste Management in Srinagar City. *Educational Quest: An Int. J. Edu. Appl. Soc. Sci.*, 16(03): 295-305.

**Source of Support:** None; **Conflict of Interest:** None



in most Indian cities continues to reflect poor segregation, overdependence on landfills, and insufficient treatment capacity (Kumar & Ghosh, 2019). Case studies from the cities like Indore, Pune, and Navi Mumbai demonstrate that successful waste governance requires a combination of infrastructure, monitoring, and citizen involvement (Mani & Thakur, 2021).

Srinagar city presents a particularly fragile context for MSWM. The population of the city increased from 1.02 million in 2001 to 1.27 million in 2011, with projections of 1.7 million by the year 2031 (Census of India, 2011). The city generates between 400–520 tonnes of waste per day, 62% of which is biodegradable (SMC, 2021). Yet, the waste management system relies almost entirely on the Achan landfill, which is overburdened and environmentally unsustainable. Studies highlight systemic issues such as irregular clearance, inadequate bin distribution, and poor container maintenance. Political instability, topographical constraints, and rapid urban growth further aggravate the problem (Ahmad & Ahmad, 2013; Bhat *et al.* 2017; Mushtaq *et al.* 2020).

This paper studies household waste practices in the Srinagar city, focusing on generation, storage, segregation, and disposal. It also examines the role of the municipal service delivery in shaping these practices.. The study focuses on 384 households across the 64 wards of the city. It highlights the gap between citizens who want to follow waste rules and the weak municipal systems that makes it difficult for them. The paper seeks to identify actionable governance reforms to strengthen MSWM in alignment with SBM 2.0 (MoHUA, 2021), the G-25 Action Plan (G-25, 2020), and Sustainable Development Goal 11 (United Nations, 2015).

## Objectives of the Study

This study was undertaken with the following objectives:

1. To examine the types, forms, and composition of household waste generated in the Srinagar city.
2. To analyze the household level practices of waste storage, segregation, and disposal.
3. To assess the accessibility, frequency, and quality of municipal collection services,

including Ghanta Gadi vehicles and public containers.

4. To compare primary household data with secondary sources (SMC and CPCB reports) to identify gaps in service delivery and governance.
5. To propose policy recommendations for strengthening municipal solid waste management in Srinagar city in alignment with the Swachh Bharat Mission 2.0, the G-25 Action Plan, and the Sustainable Development Goal 11.

## Literature Review

### *Global Context of Urban Waste Governance*

Municipal solid waste management (MSWM) has emerged as a critical governance challenge worldwide, especially in developing countries where rapid urbanization outpaces service delivery. Studies highlight that inadequate institutional capacity, limited decentralization, and poor public participation often leads to unsustainable outcomes (UNEP, 2021; Zurbrugg, 2003). Da Zhu *et al.* (2008) emphasize that even technologically advanced systems fail without community involvement and integration of informal waste workers. Similarly Miezah *et al.* (2015) note that the absence of decentralized processing and weak characterization data hinder effective waste management in the African contexts. These findings underline the need for governance models that combine technical capacity with the participatory approaches.

### *Solid Waste Management in India*

In India, the Solid Waste Management Rules, 2016 provide the legal framework for waste management, yet the enforcement remains weak. The CPCB (2020) consistently reports gaps in segregation, collection, and processing, with most cities relying heavily on open dumping. Bhada-Tata and Hoornweg (2011) warned early about India's looming waste crisis, while more recent studies (Kumar & Ghosh, 2019) show that the urban local bodies focus disproportionately on collection rather than treatment and resource recovery. Ahmad and Lone (2018) similarly argue that the implementation remains highly centralized, undermining SBM's emphasis on decentralization. By contrast, the

models such as the zero-waste strategy of Indore city and SWaCH cooperative of Pune city illustrate how community led initiatives and rag picker integration can dramatically improve the outcomes (Mani & Thakur, 2021).

### ***Governance Fragility and Institutional Gaps in Srinagar city***

Srinagar city presents a particularly fragile case, where geographical, political, and institutional constraints amplify the waste management challenges. Ahmad and Ahmad (2013) and Bhat *et al.* (2017) highlight how conflict related disruptions and rapid urban expansion have overwhelmed the municipal capacity. Studies indicate that only 10–15% of the waste is segregated at source, while 30–35% remains uncollected (Forest, Ecology & Environment Department, 2022). While Mushtaq, Dar, and Ahsan (2020) forecast a 30% rise in per capita waste generation by 2030 if systemic reforms are not introduced. Despite the policy frameworks, Srinagar city continues to face the implementation paralysis due to under-staffing, insufficient equipment, and limited citizen engagement (Sharma & Bhat, 2021).

### ***Urbanization and Waste Generation Dynamics***

Rapid urbanization has been a key driver of waste growth in the Himalayan cities. Between 2001 and 2011, population of Srinagar city grew from 1.02 million to 1.27 million, with the projections of 1.7 million by the year 2031 (Census of India, 2011; City Mayors Statistics, 2011). Srinagar city generates approximately 400–520 TPD of waste, dominated by organic content (62%), with plastics around 7% (SMC, 2021; CPCB, 2020). Similar to other Indian cities, the households contribute the majority of waste, with commercial and institutional sources adding substantial volumes (Nagabooshnam, 2011). This rapid increase in waste, coupled with the limited landfill capacity at the Achan landfill, threatens to overwhelm the ecological and infrastructural carrying capacity of the city.

The literature reveals three consistent themes. First, the global and national experiences show that the infrastructure alone is insufficient without the citizen participation and decentralization. Second, Indian cities often under-perform due to the weak segregation and treatment systems, despite the

ambitious policies. Third, Srinagar city exemplifies a fragile governance environment where citizen willingness is high, but municipal performance is constrained by the systemic weaknesses. These insights justify the focus of the present study on household practices as the micro-level behaviors which both reflect, and are shaped by the larger governance dynamics.

## **Methodology**

### ***Study Area and Context***

The study was conducted within the jurisdiction of the Srinagar Municipal Corporation (SMC), which administers 75 wards across the city. Srinagar, the summer capital of Jammu and Kashmir, lies in the ecologically sensitive Kashmir Valley at an altitude of 1,585 meters above sea level, along the banks of the River Jhelum. The city is characterized by a unique Himalayan topography, fragile wetlands, and climatic variations that influence waste generation and disposal patterns.

According to the Census of India (2011), the population of Srinagar city grew from 1.02 million in the year 2001 to 1.27 million in the year 2011, with the projections of nearly 1.7 million by the year 2031. This rapid urban growth, combined with the rising tourism and seasonal influxes of population, has placed severe pressure on the municipal services. Solid waste generation in the city is estimated between 400–520 tonnes per day, with more than 60% of this being biodegradable.

Despite these challenges, the waste management system of the city remains overwhelmingly dependent on the Achan landfill site, which is already operating beyond its capacity. The Infrastructural constraints such as irregular door-to-door collection, inadequate public container distribution, and limited treatment or recycling facilities exacerbate the problem. These issues are further compounded by the institutional weaknesses, political instability, and financial limitations of the SMC. Together, these factors make Srinagar city a representative case of how the governance fragility, ecological vulnerability, and urban expansion converge to create a critical challenge for the sustainable municipal solid waste management.

### Sampling Design

To ensure adequate representation, the study employed a multi-stage sampling approach. Out of the 75 wards, 64 wards were selected as the survey universe. Within each ward, six households were chosen using simple random sampling, resulting in a final sample of 384 households. The sample size was determined following Krejcie and Morgan’s (1971) formula for finite populations, which recommends 384 respondents for populations above one million. This is consistent with statistical guidelines (Boomsma & Hoogland, 2001) ensuring a sufficient sample for generalization.

### Data Collection

Primary data was collected through a structured questionnaire survey, administered directly to the selected households. The questionnaire included both the close-ended and Semi-structured questions covering:

- ❑ The Types and forms of waste generated,
- ❑ The Household storage and segregation practices,
- ❑ The Waste disposal methods,
- ❑ Frequency and regularity of collection services,
- ❑ Accessibility and condition of public containers, and
- ❑ Perceptions of the municipal service delivery.

To ensure reliability, pre-testing was carried out before full-scale administration. The survey was conducted between March and May 2025, covering the households across 64 wards of the Srinagar Municipal Corporation. Ethical considerations were strictly observed, participation was voluntary, informed consent was obtained from all respondents, and confidentiality of the household information was maintained. No personal identifiers were recorded, ensuring complete anonymity.

### Data Analysis

The collected data was coded and tabulated. Descriptive statistics (frequency distributions and percentages) were used to summarize the household practices and service access. Tables and charts were prepared to present key findings in a clear and comparative format. Where relevant, the results were cross-referenced with the secondary

sources such as the Central Pollution Control Board (CPCB) reports, SMC reports and MoHUA’s *Swachh Survekshan* documents, and the existing literature on urban waste management.

### Limitations

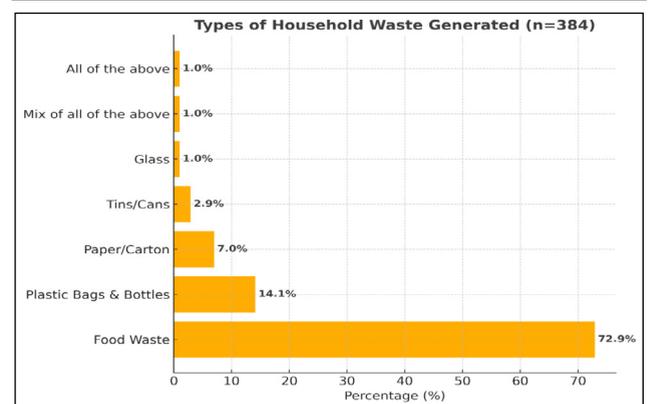
The study is subject to certain limitations. First, the analysis relies on self-reported data, which may carry respondent bias. Second, the survey focused exclusively on households, and therefore does not capture the practices of the commercial establishments, markets, or institutions that also contribute substantially to the urban waste. Finally, the study reflects the conditions prevailing during the survey period and may not fully account for seasonal variations in waste generation.

### Results & Analysis: Waste Generation Patterns and Household Practices

The analysis of primary data from the 384 households across the 64 municipal wards of Srinagar city provides a detailed picture of household-level waste generation patterns, collection methods, segregation practices, and disposal behaviors. The findings are presented thematically below, each supported by tables and figures.

**Table 1:** Types of Waste Generated

Waste Type	Frequency	Percentage
Food Waste	280	72.9
Paper/Carton	27	7.0
Plastic Bags and Bottles	54	14.1
Tins/Cans	11	2.9
Glass	4	1.0
Mix of all of the above	4	1.0
All of the above	4	1.0



*Source: Primary Survey, 2025*

**Fig. 1:** Types of Household Waste Generated (n=384)

**Table 1a:** Waste Composition in Srinagar: Primary vs Secondary Sources

Source	Organic/ Biodegradable (%)	Plastics (%)	Paper (%)	Other/ Inert (%)
Primary Survey (2025)	73	14	7	6
SMC Report (2021)	62	7	—	31
CPCB (2020, India average)	50–70	5–10	5–10	20–30

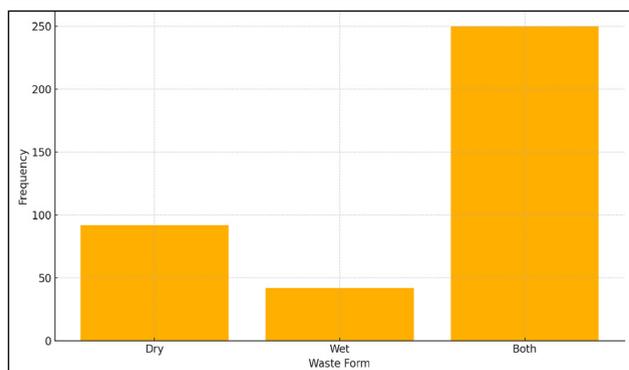
*Source:* Author’s Primary Survey (2025); SMC (2021); CPCB (2020).

These findings on the waste composition are consistent with the secondary sources. The Srinagar Municipal Corporation (SMC, 2021) estimates that approximately 62% of the city’s waste is biodegradable, while CPCB (2020) reports that 50–70% of the municipal waste in Indian cities is organic. The comparison underscores that the waste profile of Srinagar city aligns with the broader national patterns, with food waste remaining the dominant fraction.

The Food waste dominates household waste streams (73%), followed by plastics (14%), paper/carton (7%), and tins/cans (3%). Minor fractions include glass and mixed categories. This organic dominance suggests high potential for decentralized composting, but plastics remain a growing challenge.

**Table 2:** Form of Waste

Waste Form	Frequency	Percentage
Dry	92	24.0
Wet	42	10.9
Both	250	65.1



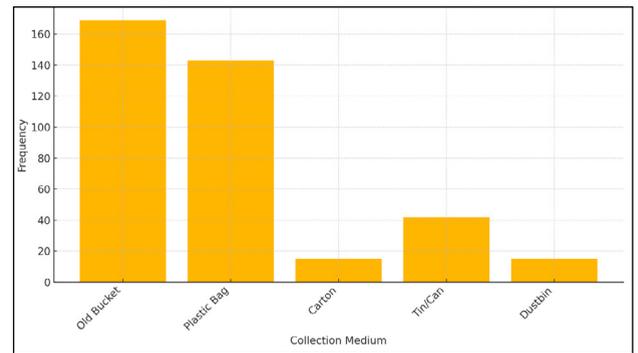
*Source:* Primary Survey, 2025

**Fig. 2:** Form of Household Waste (n=384)

Most households (65%) produce both wet and dry waste, highlighting the importance of the segregation at source. Without the proper infrastructure, these mixed streams limit the recycling and composting efficiency.

**Table 3:** Household Collection/Storage Practices

Collection Medium	Frequency	Percentage
Old Bucket	169	44.0
Plastic Bag	143	37.2
Carton	15	3.9
Tin/Can	42	10.9
Dustbin	15	3.9



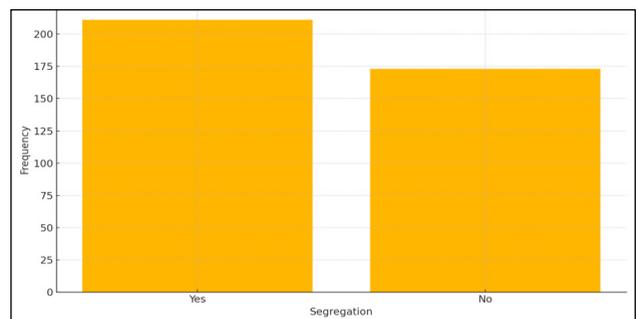
*Source:* Primary Survey, 2025

**Fig. 3:** Household Waste Collection Medium (n=384)

Old buckets (44%) and plastic bags (37%) are the most common storage media, while only 4% report using the dustbins. This reliance on improvised methods reflects inadequate supply of the standardized bins, creating hygiene and segregation challenges.

**Table 4:** Segregation Practices

Segregation	Frequency	Percentage
Yes	211	54.9
No	173	45.1



*Source:* Primary Survey, 2025

**Fig. 4:** Segregation at Source (n=384)

**Table 4a:** Waste Segregation in Srinagar: Primary vs Secondary Sources

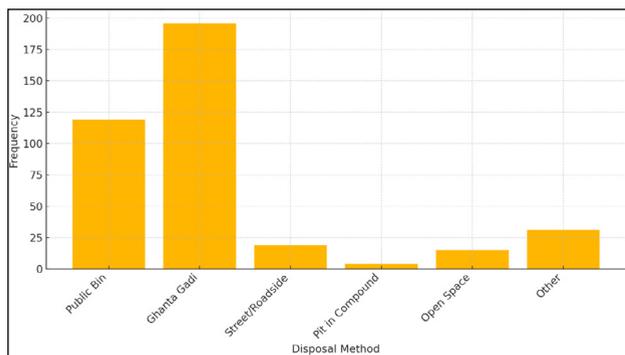
Source	Households Segregating Waste (%)	Notes
Primary Survey (2025)	55	Household-level self-reporting
SMC (2021)	15–20	Based on collection records
MoHUA (2023, Indore benchmark case)	>90	National best practice

**Source:** Author’s Primary Survey (2025); SMC (2021); MoHUA (2023).

While the primary survey indicates that 55% of households practice segregation, secondary data suggests a much lower level of systematic segregation in Srinagar. The SMC records place the segregation at only 15–20%, which reflects actual collection practices. By contrast, national leaders such as the Indore city have achieved above 90% segregation (MoHUA, 2023). This gap between the citizen self-reported behavior and municipal data highlights a major governance and implementation challenge. More than half of the households (55%) segregate their waste, but 73% report that the municipal corporation has not provided the separate bins. This shows that while willingness exists, lack of infrastructure undermines compliance.

**Table 5:** Disposal Methods

Disposal Method	Frequency	Percentage
Public Bin	119	31.0
Ghanta Gadi	196	51.0
Street/Roadside	19	4.9
Pit in Compound	4	1.0
Open Space	15	3.9
Other	31	8.1



**Source:** Primary Survey, 2025

**Fig. 5:** Household Waste Disposal Methods (n=384)

The reliance on the Ghanta Gadi observed in the survey is corroborated by SMC’s own estimates, which suggest 60–65% coverage of the households. Public bin usage remains similar in both datasets, while unsafe disposal practices, though reported by 10% of the respondents, appear somewhat lower in SMC records. This indicates that while the overall pattern is consistent, household perceptions may capture informal or unrecorded practices more accurately.

**Table 5a:** Waste Disposal and Collection in Srinagar: Primary vs Secondary Sources

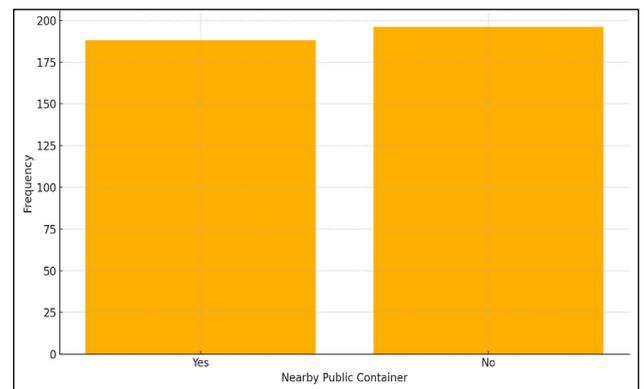
Source	Ghanta Gadi Coverage (%)	Public Bin Use (%)	Unsafe Disposal (%)
Primary Survey (2025)	51	31	10
SMC Report (2021)	60–65	~25	<15

**Source:** Author’s Primary Survey (2025); SMC (2021).

The Ghanta Gadi (bell vehicle) is the primary disposal mode (51%), followed by public bins (31%). However, unsafe practices persist, with 5% dumping on roadsides and 4% in open spaces, contributing to littering and environmental hazards.

**Frequency of Waste Clearance**

Emptying Frequency	Frequency	Percentage
Once a Day	230	59.9
Once in 2 Days	96	25.0
Once in 3 Days	42	10.9
Once a Week	16	4.2



**Source:** Primary Survey, 2025

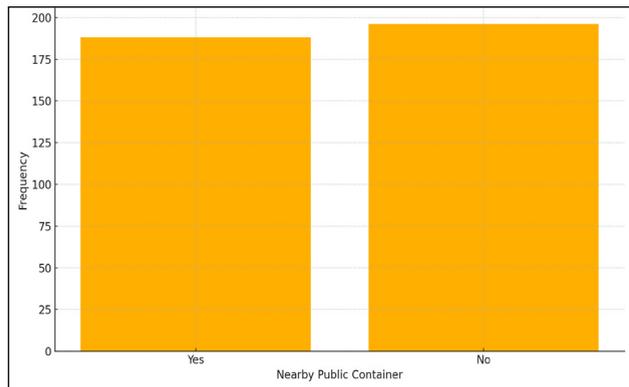
**Fig. 7:** Frequency of Waste Emptying (n=384)

While 60% report daily clearance, one-third faces irregular removal (every 2–3 days or weekly). This

irregularity leads to the accumulation, spillage, and ad-hoc dumping or burning.

**Access to Public Containers**

Nearby Public Container	Frequency	Percentage
Yes	188	49.0
No	196	51.0



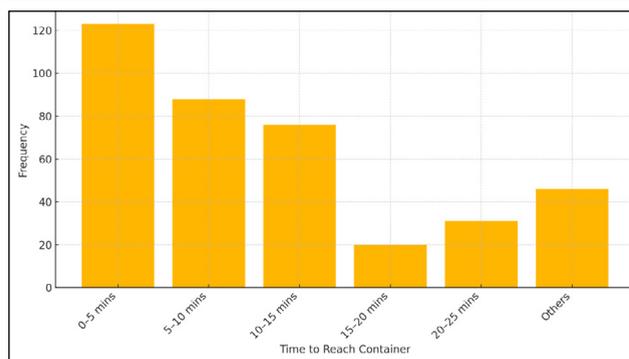
Source: Primary Survey, 2025

Fig. 8: Availability of Nearby Public Waste Container (n=384)

Half of households (51%) lack a nearby public container. Among those with access, some must walk over 15 minutes, raising the cost of responsible disposal and discouraging compliance.

Table 9: Distance to Public Containers

Time to Reach Container	Frequency	Percentage
0–5 mins	123	32.0
5–10 mins	88	22.9
10–15 mins	76	19.8
15–20 mins	20	5.2
20–25 mins	31	8.1
Others	46	12.0



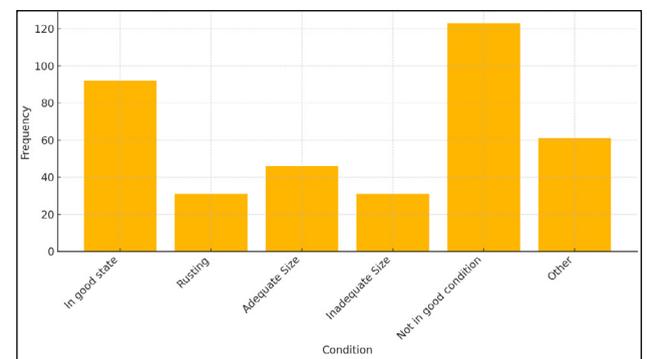
Source: Primary Survey, 2025

Fig. 9: Time to Reach Nearest Public Container (n=384)

Of the households with access, 32% reach within 5 minutes, but nearly 28% need 15 minutes or more. Longer distances make routine waste disposal burdensome, especially for women, children, and the elderly.

Table 10: Condition of Containers

Condition	Frequency	Percentage
In good state	92	24.0
Rusting	31	8.1
Adequate Size	46	12.0
Inadequate Size	31	8.1
Not in good condition	123	32.0
Other	61	15.9



Source: Primary Survey, 2025

Fig. 10: Condition of Public Waste Containers (n=384)

Only 24% report containers in good state, while 32% say they are in poor condition. Others report rusting, inadequate size, or unhygienic conditions. Poor maintenance further undermines scientific waste handling.

**Analysis and Discussion**

The household-level survey from Srinagar city provides important insights into the state of the municipal solid waste management (MSWM) in the city. Though descriptive in nature, the findings point to systemic service and infrastructure gaps that prevent the citizens from translating awareness and willingness into sustainable practices. This section discusses the results under thematic dimensions, situating them within the broader urban governance and policy contexts.

**1. Dominance of Organic Waste: Challenge and Opportunity**

Food waste constitutes nearly three-fourths (73%) of

the household waste, with plastics (14%) and paper (7%) forming smaller fractions. This composition is consistent with the national trends, where 50–70% of urban waste is biodegradable (Central Pollution Control Board [CPCB], 2022). For Srinagar city, the organic fraction represents both a challenge and an opportunity. If left unmanaged, it generates leachate, odors, and greenhouse gases but if harnessed, it can be processed through composting or biomethanation to produce manure and energy. The policy implication is clear that decentralized composting clusters at ward level could substantially reduce pressure on the Achan landfill.

### 2. Informal Household Storage Practices

The reliance on old buckets (44%) and plastic bags (37%) for waste storage, with only 4% of households using proper dustbins, reflects inadequate municipal provisioning of standardized bins. Such informal practices increase the risks of spillage, odor, and vector-borne diseases. Comparative evidence from the cities of Indore and Navi Mumbai shows that the distribution of color-coded bins was a turning point for segregation compliance (Ministry of Housing and Urban Affairs [MoHUA], 2023). The Srinagar Municipal Corporation (SMC) therefore needs to prioritize the household-level distribution of bins to enable hygienic and segregated storage.

### 3. Segregation Willingness versus the Infrastructure Deficit

A noteworthy finding is that 55% of the households practice segregation, despite 73% reporting that the SMC has not provided them with separate bins. This demonstrates strong citizen willingness, but inadequate infrastructure prevents systematic compliance. Supporting this, the survey data shows that 91% of households are aware of the SWM rules and 93% support recycling, indicating that the readiness exists but enabling facilities are missing. Similar contradictions have been observed in Delhi, where awareness was high but poor infrastructure discouraged segregation (Gupta, Krishna, & Prasad, 2015). The lesson is that the citizen behavior is not the bottleneck; rather, it is the municipal capacity and service design. Addressing this gap requires bin distribution, separate collection streams, and monitoring mechanisms to ensure that segregated waste is not remixed during the transportation.

### 4. Disposal Practices and Dependence on Ghanta Gadi

Over half of households (51%) rely on the Ghanta Gadi (bell vehicle) for disposal, while 31% use the public bins. However, unsafe practices persist, including roadside dumping (5%) and disposal in open spaces (4%). Though numerically small, these practices translate into thousands of kgs of unmanaged waste each day, creating litter and public health risks. The success of Indore city in eliminating open dumping illustrates the importance of reliable door-to-door collection supported by route optimization, strict monitoring, and citizen engagement (Dangi, Pretzsch, & Ahmad, 2019). Strengthening the Ghanta Gadi fleet through punctuality, expanded coverage, and digital tracking will be critical to eliminating unsafe disposal.

### 5. Irregular Waste Clearance and Service Dissatisfaction

While 60% of the households reported daily clearance, 40% face irregular removal (every two to three days, or weekly). This inconsistency creates the overflowing bins, scattered waste, and open burning which is identified as a health risk by 96% of respondents in earlier studies (Khan, 2014). It also contributes to the public dissatisfaction, reflected in the overall moderate satisfaction levels (mean = 3.0) reported in the survey (table 11). This indicates a moderate level of satisfaction, with a slight tilt towards dissatisfaction. Ensuring reliable daily clearance requires not only the vehicle and manpower augmentation but also accountability mechanisms within municipal operations.

**Table 11:** Citizen Satisfaction with MSWM Services (n = 384)

Satisfaction Level	Frequency	Percentage
Very Satisfied	34	8.9%
Satisfied	92	24.0%
Neutral	115	29.9%
Dissatisfied	95	24.7%
Very Dissatisfied	48	12.5%
Mean Score	—	3.0

Source: Author’s Primary Survey (2025).

### 6. Accessibility and Quality of Public Containers

Accessibility remains poor, with 51% of households

lacking a nearby public container and nearly 28% of those with access walking 15 minutes or more to reach one. Additionally, only 24% rated containers as being in good condition, while 32% described them as poor, citing rusting, undersized bins, and unhygienic conditions. Research elsewhere has shown that the citizen compliance declines sharply when disposal facilities are distant or poorly maintained (Al-Rashed, Almutairi, & Al-Humaidi, 2025). In Srinagar city, poorly maintained and distant containers not only reduce compliance but also reinforce perceptions of weak municipal performance.

### *Triangulation of Primary and Secondary Data*

A comparative review of the primary and secondary sources reveals both convergence and divergence in the waste management profile of the Srinagar city. The Household survey findings on the waste composition (73% organic) align closely with SMC's (2021) estimates of 62% biodegradable waste and CPCB's (2020) national average of 50–70%. Similarly, reliance on Ghanta Gadi services (51% in the survey) is broadly consistent with the municipal records of 60–65% coverage. However, notable discrepancies also emerge in segregation practices: while 55% of the households reported segregating waste, official data places effective segregation at only 15–20%. This gap suggests a mismatch between the citizen self-reported behavior and actual collection outcomes, likely due to inadequate infrastructure and monitoring. Together, these corroborations strengthen the validity of the primary data while exposing the systemic governance gaps that prevent citizen willingness from translating into measurable municipal performance.

### **Governance and Policy Implications**

Taken together, these findings suggest that the waste challenge in Srinagar city lies not in citizen apathy but in systemic governance deficits. Three insights emerge clearly:

- ❑ **Citizen readiness is evident:** more than half segregate waste, 91% are aware of waste rules, and 93% support recycling.
- ❑ **Infrastructure gaps block compliance:** 73% lack segregation bins, 51% lack nearby containers, and 40% face irregular clearance.

- ❑ **Organic waste dominance offers an opportunity:** decentralized composting could drastically reduce the volume sent to Achan landfill.

To address these challenges, the Srinagar Municipal Corporation (SMC) must align interventions with the G-25 Action Plan and Swachh Bharat Mission 2.0. Priority measures include:

1. **Distribution of color-coded bins** for source segregation.
2. **Strengthening Ghanta Gadi operations** with punctual scheduling, adequate fleet size, and GPS/GIS-enabled monitoring.
3. **Expansion and maintenance of public containers**, ensuring adequate capacity and hygiene.
4. **Ward-level decentralized composting clusters** for organic waste.
5. **Targeted IEC campaigns** through schools and social media to reinforce awareness and behavior change.

These measures address immediate service and infrastructure gaps. The broader governance dimensions of accountability, institutional design, and decentralization are considered in the conclusion.

### **Linking to Broader Frameworks**

From a governance perspective, the findings reveal a classic “willing citizens–weak systems” paradox. Citizens demonstrate readiness for sustainable practices, but the absence of enabling infrastructure creates non-compliance and dissatisfaction. This aligns with broader urban governance debates in India, where the effectiveness of municipal service delivery often lags behind the citizen awareness. Connecting the local reforms in Srinagar city to the SDG 11 (Sustainable Cities and Communities) is crucial, as improved waste governance not only protects the public health but also enhances the environmental sustainability and urban liveability.

In summary, the analysis demonstrates that the households in Srinagar city are neither unaware nor apathetic; rather, they are constrained by the municipal shortcomings in infrastructure and service delivery. The pathway to sustainable waste management lies in bridging this gap. By providing

the infrastructure, ensuring accountability in service delivery, and leveraging citizen willingness. Addressing these systemic barriers will enable the Srinagar city to transition from fragmented practices to a participatory model of urban waste governance.

## CONCLUSION

This study highlights the paradox of municipal solid waste management in Srinagar: citizens demonstrate readiness for sustainable practices, yet weak municipal systems prevent effective outcomes. Households segregate waste, support recycling, and rely on Ghanta Gadi vehicles, but irregular clearance, lack of bins, and poor container accessibility undermine these efforts.

From an urban governance perspective, three critical gaps emerge. First, accountability is weak, with little monitoring of clearance frequency, bin maintenance, or staff performance. Second, the institutional design of waste management is overly centralized, with over-dependence on the Achan landfill and limited capacity at ward level. Third, decentralization and citizen participation remain minimal, even though willingness exists.

Bridging these governance deficits is as important as providing infrastructure. Without accountability, institutional capacity, and participatory mechanisms, technical solutions will remain ineffective. Strengthening accountability mechanisms (GPS tracking, public scorecards), empowering ward-level institutions, and promoting participatory composting clusters are critical steps.

By aligning these governance reforms with the Swachh Bharat Mission 2.0, the G-25 Action Plan, and SDG 11 (Sustainable Cities and Communities), Srinagar can transition from fragmented, service-dependent waste management to a participatory, accountable, and sustainable model of urban governance.

## REFERENCES

Ahmad, F. and Ahmad, K. 2013. Municipal solid waste management in Srinagar city: Issues and challenges. *Journal of Environmental Research and Development*, 7(4): 1501–1508.

Ahmad, T. and Lone, R. 2018. Solid waste management in India: Issues and challenges. *International Journal of Innovative Studies in Sociology and Humanities*, 3(2): 17–22. <https://doi.org/10.20431/2456-4931.0302003>

Al-Rashed, M., Almutairi, N. and Al-Humaidi, H. 2025. Citizen perceptions and compliance with municipal solid waste services: Evidence from Middle Eastern cities. *Waste Management & Research*, 43(2): 215–229.

Bhada-Tata, P. and Hoorweg, D. 2011. *What a waste: A global review of solid waste management*. World Bank. <https://openknowledge.worldbank.org/handle/10986/17388>

Bhat, S.A., Dar, J.A. and Wani, N.A. 2017. Solid waste management in Srinagar city: A critical analysis. *International Journal of Environmental Sciences*, 7(3): 145–154.

Boomsma, A. and Hoogland, J.J. 2001. The robustness of LISREL modeling revisited. In R. Cudeck, S. du Toit and D. Sörbom (Eds.), *Structural equation modeling: Present and future* (pp. 139–168). Scientific Software International.

Central Pollution Control Board (CPCB). 2020. *Annual report on municipal solid waste management in India 2019–20*. Ministry of Environment, Forest and Climate Change, Government of India. <http://cpcb.nic.in>

Central Pollution Control Board (CPCB). 2022. *Annual report on municipal solid waste management in India 2021–22*. Ministry of Environment, Forest and Climate Change, Government of India. <http://cpcb.nic.in>

City Mayors Statistics. 2011. *The world's fastest growing cities and urban areas from 2006 to 2020*. <http://www.citymayors.com>

Dangi, M.B., Pretzsch, J. and Ahmad, S. 2019. Municipal solid waste management practices in urban India: Lessons from Indore. *Waste Management*, 85: 234–242.

Forest, Ecology & Environment Department. 2022. *Status report on municipal solid waste management in Jammu & Kashmir*. Government of Jammu & Kashmir.

Gupta, N., Krishna, M. and Prasad, R. 2015. Segregation and disposal of municipal solid waste in Delhi: Barriers and opportunities. *International Journal of Environment and Waste Management*, 16(3): 253–269.

Khan, J. 2014. Citizen satisfaction with municipal solid waste management services: A study of Srinagar city. *Journal of Environmental Management and Policy*, 2(1): 45–57.

Krejcie, R.V. and Morgan, D.W. 1971. Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3): 607–610.

Kumar, S. and Ghosh, S.K. 2019. Solid waste management in Indian cities: Status and emerging practices. *Environmental Development and Sustainability*, 21(6): 3179–3190.

Mani, S. and Thakur, J. 2021. Urban local governance and waste management: Lessons from Indore and Pune. *Urban India*, 41(2): 67–83.

Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B. and Mensah, M.Y. 2015. Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. *Waste Management*, 46: 15–27.

Ministry of Housing and Urban Affairs (MoHUA). 2023. *Swachh Survekshan 2023: Best practices and innovations in Indian cities*. Government of India. <https://mohua.gov.in>

- Mushtaq, R., Dar, B.A. and Ahsan, M. 2020. Waste generation and management practices in Srinagar city: Future challenges and opportunities. *International Journal of Waste Resources*, **10**(2): 1–6.
- Nagabooshnam, J.K. 2011. Solid waste generation and composition in Indian cities: A review. *International Journal of Environmental Sciences*, **1**(4): 591–606.
- Sharma, R. and Bhat, R. 2021. Urban governance and municipal service delivery in conflict-prone regions: The case of Srinagar. *Journal of Urban Management*, **10**(3): 211–222.
- United Nations Environment Programme (UNEP). 2021. *From pollution to solution: A global assessment of marine litter and plastic pollution*. UNEP. <https://www.unep.org>
- Zurbrugg, C. 2003. Solid waste management in developing countries. *SANDEC Report No. 8/03*. Swiss Federal Institute of Aquatic Science and Technology (EAWAG).

