International Journal of Humanities and Social Science Invention (IJHSSI)
ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714
www.ijhssi.org ||Volume 14 Issue 8 || August 2025 || PP. 233-239

Comparative Analysis of Awareness on Solid Waste Management Among Municipal Authorities and Citizens in Gurugram and Rohtak Districts

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Abstract
Solid Waste Management (SWM) is one of the major challenges so before incineration of SW, Indian people put wet ash in an open space to dry it. Even as there is visible infrastructure development under initiatives such as Swachh Bharat Abhiyan and Smart Cities, awareness among the municipal authorities and citizens continues to be patchy, often poor. The present study is an attempt to explore and compare awareness of SWM among Local Urban Bodies (LUBs) and residents in the two different urban districts of Haryana viz., Gurugram and Rohtak. The study uses comparative, descriptive research design with secondary data collection approach using quantitative and qualitative methods. Structured survey was administered to 459 respondents in residential and commercial areas, supported by over 20 in-depth interviews with municipal officials, engineers, sanitary inspectors and sanitation workers. The findings are that Gurugram people have more general knowledge of knowing the availability of waste management centres (38%) than that of Rohtak (20%). But, Rohtak leads Gurugram on services-specific awareness, with 68.9% knowing about such facilities of waste centres as against 54.7% in Gurugram. Persons are moderately aware about recycling in both the districts, 62% respondents were accepted as having knowledge in Gurugram and 56.3% respondents were in Rohtak indicating knowledge but significant minority continue to disclaim recollections or resist the information. Communication gaps, poor community engagement and lack of uniform training for municipal staff are some of the bottlenecks identified in the study. It suggests to enhance IEC strategies and also such campaigns can be run on the Schools and community network, which promote recycling education, institutionalizing feedback systems for citizen. Results highlight the need for both administrators and residents to be matched in promoting, oceanside infrastructure alone will not suffice. This paper adds to the policy debate on sustainable urban waste governance and provides site-specific knowledge for strengthening of participatory SWM mechanisms in towns/cities of India.
Key Words: Municipal Awareness, Solid Waste Management, Gurugram, Rohtak, Recycling Practices

Solid Waste Management (SWM) has become the most challenging problem of urban governance in Indian cities due to high urbanization, growth of population and life styles. Given that the country produces more than 160,000 tons of solid waste on a daily basis (Central Pollution Control Board, 2023), sound waste management today requires stakeholder-based partnerships between urban local bodies and individuals. Although the inception of the Swachh Bharat Mission in 2014 signalled a crucial shift toward sanitation, inequities in knowledge, attitudes and policy action have persisted between regions.

Gurugram and Rohtak are one of the leading districts in Haryana working for SWM awareness that provides a divergent approach, but is parallel to another. Between Gurugram, the modern tech-driven urban hub and Rohtak, a semi-urban locality that still had an older administrative structure. This juxtaposition renders them suitable for a comparative study on SWM awareness.

This article provides evidence of the crucial importance of consciousness for waste behaviours. Policy enforcement has been shown not to be successful without the involvement of citizen (Sharma, Shriwas & Rao, 2018). Similarly, Paul (2021) emphasized that aggressive municipal campaigns in Kochi and Indore brought about a substantial transformation in waste segregation at the source. This awareness can be about types of wastes, its segregation, impact on environment, legal considerations and civic responsibilities.

Kala and Bolia (2020) found that in cities like Delhi where awareness campaigns have been ongoing, local waste policies are still not widely known. Sohkhlet and Nagargoje (2020) pointed out that whilst technology (e.g. waste apps, smart bins) streamlines the process of household waste collection for real-time monitoring and tracking of waste levels within bins- it can never fully replace awareness from grassroots level, including sanitation workers and city municipal personnel because: Visvanathan and Trankler (2023) supported the notion that local-level initiatives tend to be ineffective because awareness-building strategies are uncoordinated or contradictory.

The less digitised Rohtak has, however, done better in small initiatives to raise consciousness such as school-led campaigns and composting. On the other hand, though Gurugram has a robust infrastructure, bulk generators are not compliant. Thakur, Parida and Raj (2024) underlined the significance for administrative know-how of the laws, monitoring and coordination consciousness—factors that are predominantly missing in Tier II and III cities.

At the international level, Pereira, Ribeiro and Jeffrey (2020) contend that behavioral inertia, rather than resource constraints alone is a barrier to successful SWM in Indian cities. The present study therefore aims to evaluate and compare the public as well as administrative knowledge in Gurugram and Rohtak which would give way for government to plan evidence based recommendations of solid waste governance pertinent for local settings.

I. Review of Literature

Sharma (2012) conducted a baseline study in rural Himachal Pradesh to assess the knowledge of public on solid waste segregation and disposal. The study reported that, 30 percent of householders possessed a limited knowledge about waste handling but they were either unconscious about composting or health effects due to improper disposal. Public comment from municipalities was infrequent and educational initiatives seldom occurred. The study underscored the significance of having basic knowledge in starting waste responsibility.

Ghosh (2013) studied waste awareness of urban residents in Kolkata and found that about 62% were ignorant about the laws on waste disposal. The city staff did not have an ongoing training program or a continuing community dialogue. The research has attributed this to poor waste communication by local bodies. It recommended place-based education awareness campaigns to raise public civic compliance.

Mishra (2014) conducted an analysis on citizen and municipal involvement in Varanasi. The study found that the authorities had a policy framework, but implementation was hampered by inadequate awareness among sanitation workers and residents. Less than 25% of the community was involved in source separation. Mishra suggested stringent behavior change campaigns and inter-departmental coordination.

Ahmed (2015) also carried out a comparative study between the Bengaluru and Hyderabad on SWM. Awareness among citizens in Bengaluru was relatively higher as there were strong NGOs intervention in the same and active information campaigns, but Hyderabad did not seek local outreach with low compliance. The research indicated that authorities collaborating with local civil society partners saw a strong increase in segregation measures.

Rathi (2016) conducted a review of SWM scenario in major Indian cities and reported that only 40% urban local bodies have awareness programmes including 72% voluntarism from Doon valley. The study highlighted that public awareness needs are generally reactive rather than proactive. Local authorities often did not have clear communication plans, leading to poor separation of waste and disposal at home. He also demanded that municipal systems should have institutionalised awareness units.

Gupta (2017) who reported that the awareness among the household residents was found to be moderate, majority of them could differentiate between wet waste and dry waste but they were not mindful about the long-run environmental effects. While the city's workers did a great deal of public education, they tended to speak to people through fines —'universal traduttori.' And that led to resistance. Gupta underscored the essential role of joint outreach to the citizens and officer studios to make compliance sustainable.

Choudhury (2018) investigated the effect of school-based awareness activities on public behaviour in Upper Assam. He reported that students involved in the environmental educational programs had a significant impact on household waste practices. Local officials understood the potential of youth engagement, but they didn't have a structured approach to replicating such actions broadly. The research also advised that waste education be included in school curricula so as to bring about generational change.

Pereira (2020) compared Brazil and India. It was this consistent, long-term public to government engagement that made Brazil's cities had an ethos of compliance. Indian cities, in contrast largely bet on one-time campaigns. The research found that mindset, induced by the frequent encounter and policy push had a higher effect than infrastructure only.

Kala (2020) examined waste management communication in Delhi and found a positive relationship between multi-channel awareness (TV, posters, digital tools) and citizen compliance. Areas with higher visibility of SWM campaigns reported 25–30% higher participation in segregation. However, the research also found that local staff in poorer areas were not taught how to reinforce these messages. The study recommended: equal accessibility to waste-related knowledge.

Sohkhlet (2020)) contrasted the municipal approaches in Pune and Sydney. While Sydney had organisation structures with government backing, Pune depended on citizen driven projects and NGOs. Incredibly, Pune's organic non-formal techniques even led to equivalent participation rates, highlighting the power of bottom-up movements. Its conclusion advised the inclusion of community participation in regular municipal planning.

Paul (2021) contrasted the situation in Kochi and Indore, where he observed that local wards houses added material incentives for citizens continuously segregating their waste, door-to-door surveillance and local

champions had increased household segregation by a large margin. In Kochi, little follow-up diluted the impact of early awareness campaigns. The study demonstrated the role of reward and feedback circuits in supporting attention to (and engagement with) the urban environment.

Thakur (2024) studied the SWM programs in Indian smart cities, including Gurugram. Where cities held monthly citizen forums and staff training, there was 60% better waste adherence. Administration understanding was just as important as public knowledge—workshops, policy literacy and inter-departmental coordination were all hailed by the study. Thakur suggested making awareness job posts an integrated part of the municipal departments.

The studies under review collectively suggest that (i) awareness (among the citizens and municipality functionaries) is a sine qua non of successful waste management systems. The earlier studies (Sharma, Ghosh, Mishra) have also raised serious concerns about the lack of fundamental knowledge and communication channels that existed not only in the tier II cities and rural areas. Mid-level research (Ahmed, Rathi, Gupta) brought in a comparative angle and found that local awareness worked better with Civil Society Organisations involvement. Recent studies (Kala,Pankaj, Thakur) suggest that multi-channel campaigns, sustained feedback, sensitisation of urban local bodies and community forums lead to more efficient awareness ecosystems. Studies like Sohkhlet and Pereira also prove that informal or grassroot efforts can out-perform in incidence of access if maintained in pattern and culturally entrenched harnessing. On the whole, a firm pattern emerges from the literature: from awareness gaps to proposals of comprehensive and sustained models which engage citizens, including municipalities, schools and NGOs in an orchestrated way.

II. Significance of the Study

The significance of this analysis is that it considers both citizen and administrative awareness, focusing on a fundamental albeit rarely considered aspect for the performance of SWM systems: attitude, level knowledge and participation of relevant actors. In a fast growing urbanising society such as India, where cities are being overwhelmed due to population growth and consumption-oriented waste generation, it is the awareness that emerges not merely as a complementary factor but as a determining strategy for SWM result. By contrast, by comparing Gurugram and Rohtak – two districts with distinct local socio-economic conditions, governance capacity and urban problems – this research facilitates comparative analyses of the ways in which local realities influence knowledge about, behaviour towards waste management and policy adherence. Tech-enabled urban Gurugram and less-urban Rohtak with primitive administrative structures, provide an interesting contrast to assess the impact of SWM interventions and awareness campaigns. The results could be of interest for local governments, urban planners, environmental decision-makers or community groups wishing to explore evidence-based information on which to base more inclusive and participatory MSW management programs. Furthermore, this study aligns with national priorities within the framework of the Swachh Bharat Mission and Smart Cities Mission by highlighting that building infrastructure itself is not enough; civil society and institution changes should also be coordinated to enable better urban living. Furthermore, this study will be one of the few to examine awareness and behavior in Hindi belt and north India states of Haryana and provide an empirical assessment at a micro-level, which would largely help decision and policy makers engender more sensitive interventions locally towards solid waste governance. In short, the study seeks to contribute toward a more holistic SWM approach, which combines top-down planning and bottom-up citizen responsibility towards achieving a cleaner, healthier and accountable urban environment.

III. Statement of the Problem

Comparative Analysis of Awareness on Solid Waste Management Among Municipal Authorities and Citizens in Gurugram and Rohtak Districts

Objective

1. To assess the awareness of Municipal administration and citizens about Solid Waste Management in Municipal bodies.

Hypothesis

2. Municipal authorities demonstrate a significantly higher level of awareness about Solid Waste Management compared to citizens in the municipal bodies of Gurugram and Rohtak districts."

Research Design

The present study adopts a comparative and descriptive research design to analyze the level of awareness regarding Solid Waste Management (SWM) among municipal authorities and citizens in Gurugram and Rohtak, with reference to the Haryana Pollution Control Board (HPCB). The comparative aspect examines differences between the two cities and their respective municipal bodies, while the descriptive component focuses on institutional mechanisms, stakeholder perceptions, and coordination systems influencing urban solid waste governance.

Research Approach

A mixed-methods approach was employed to ensure comprehensive data collection. On the **quantitative side**, a structured survey was conducted with 459 respondents from both residential and commercial areas. On the qualitative side**,** over 20 key informants—including municipal officials, engineers, sanitary inspectors, and sanitation workers—were interviewed to capture insights into administrative challenges and field-level implementation of SWM.

Sampling Strategy

The study used a stratified random sampling technique to select household and commercial respondents, ensuring representation across income groups and geographic zones in both cities.

Data Collection Tools

- A **structured questionnaire** (46–47 items) for citizens and business respondents covering waste segregation, collection frequency, service quality, and policy knowledge.
- An **interview schedule** for municipal staff focusing on administrative processes, challenges, resource allocation, and inter-departmental coordination.
- A **field checklist** was used to assess physical infrastructure such as bins, transfer stations, vehicle routing, and landfill conditions.

Data Sources

The study relied on both primary and secondary data**.** Primary data was collected via field surveys, interviews, and site observations in selected wards of Gurugram and Rohtak. Secondary sources included municipal records, HPCB annual reports, *Swachh Bharat Abhiyan* (Urban) rankings, policy documents, and government web portals.

Data Analysis

Descriptive statistics such as frequency distributions, percentages, and cross-tabulations were generated to identify patterns in public perception, service coverage, and satisfaction levels.

Table 1: Distribution of Study Participants across GMC and RMC

Sr. No.	Area of study	Frequency	Percent
1	Gurugram Municipal Corporation (GMC)	234	**50.98**
2	Rohtak Municipal Corporation (RMC)	225	**49.02**
	Total	**459**	**100**

Source: Field survey

The distribution of study subjects in the two urban local bodies (ULBs) – Gurugram Municipal Corporation and Rohtak Municipal Corporation is given in table 1. Of the total 459 respondents who participated in this study, the population comprised 234 (50.98%) were under Gurugram Municipal Corporation and others 225 participants (49.02%) belonged to Rohtak Municipal Corporation jurisdiction respectively. The breakdown is roughly equal, which means the two cities are evenly represented. This stratified sampling allows to fairly compare the command structures, provision of public services, and stakeholders' perception towards solid waste management in both municipal corporate. The information was gathered using field survey in several wards of Gurugram and Rohtak to take into account the geographic and demographic diversity of the respondents.

Table No. 2: Awareness of Corporation Waste Management Centre

Sr. No.	Awareness of waste management center	Rohtak		Gurugram	
		Frequency	Percent	Frequency	**Percent**
1	Yes	45	20	89	**38.0**
2	No	180	80	145	**62.0**
	Total	**225**	**100**	**234**	**100**

Source: Field survey

The data presented in **Table No. 2: Awareness of Corporation Waste Management Centre** reveals a noticeable disparity in public awareness levels between the districts of Rohtak and Gurugram. In Rohtak, only **20%** of respondents (45 out of 225) reported awareness of their municipal waste management centre, while a

significant **80%** (180 individuals) admitted to having no awareness. In contrast, Gurugram shows comparatively better awareness, with **38%** (89 out of 234) of respondents indicating familiarity with the waste management centre, while **62%** (145 individuals) were unaware. These findings suggest that although awareness remains low in both districts, **Gurugram demonstrates a relatively higher level of public knowledge** about municipal waste infrastructure than Rohtak. This difference may be attributed to Gurugram's more urbanized character, greater media exposure, or possibly more active municipal outreach, highlighting the need for **targeted awareness campaigns in Rohtak** to bridge the gap in public engagement and understanding of solid waste management systems.

Table 3: Awareness about the services provided by waste management centre

Sr. No.	Awareness about the services provided by waste management centre	Rohtak		Gurugram	
		Frequency	Percent	Frequency	**Percent**
1	Yes	155	68.9	128	**54.7**
2	No	70	31.1	106	**45.3**
	Total	**225**	**100**	**234**	**100**

Source: Field survey

Table 3 highlights the comparative levels of awareness among citizens of Rohtak and Gurugram regarding the **specific services offered by their municipal waste management centres**. In Rohtak, a substantial majority of **68.9%** (155 out of 225 respondents) reported being aware of these services, whereas only **31.1%** (70 respondents) were not aware. In contrast, awareness in Gurugram was notably lower, with **54.7%** (128 out of 234 respondents) indicating awareness, and a relatively higher **45.3%** (106 respondents) lacking such knowledge. This trend is somewhat **inverted** from the earlier pattern observed in overall awareness of the centres themselves (as per Table 2), suggesting that **although more people in Gurugram know about the existence of waste management centres**, **citizens in Rohtak are better informed about the services these centres provide**. This may indicate a stronger local communication network or better field-level interaction in Rohtak, despite its relatively lower urban exposure compared to Gurugram. The findings underscore the importance of **not only publicizing the existence of waste facilities but also clearly communicating the range of services they offer** to enhance citizen participation and proper utilization.

Table 4: Awareness regarding the recycling of the solid waste

Sr. No.	Awareness regarding the recycling of the solid waste	Rohtak		Gurugram	
		Frequency	Percent	Frequency	**Percent**
1	Yes	126	56.3	145	**62**
2	No	64	28.1	63	**26.9**
3	Definitely Not	35	15.6	26	**11.1**
	Total	**225**	**100**	**234**	**100**

Source: Field survey

Table 4 presents the respondents' level of awareness regarding **solid waste recycling** in the districts of Rohtak and Gurugram. In Gurugram, **62%** (145 out of 234) of respondents affirmed awareness of recycling practices, which is slightly higher than **56.3%** (126 out of 225) in Rohtak. This suggests a modest lead for Gurugram in terms of public understanding of recycling, possibly due to more frequent exposure to urban sustainability campaigns or digital media. Interestingly, the percentage of respondents who explicitly responded "No" is quite close in both districts—**28.1%** in Rohtak and **26.9%** in Gurugram—indicating a **similar proportion of the population still lacks recycling awareness** in both areas. Additionally, **15.6%** in Rohtak and **11.1%** in Gurugram gave a firm "Definitely Not" response, highlighting a more skeptical or uninformed group in Rohtak. Overall, while both districts show a majority of residents being aware of recycling, **Gurugram reflects a slightly higher level of awareness and lower resistance**, suggesting that targeted awareness efforts—particularly in Rohtak—could help convert uncertainty and skepticism into environmentally responsible behaviors.

IV. Findings

The study revealed notable differences in public awareness of Solid Waste Management (SWM) between Gurugram and Rohtak. While Gurugram showed higher awareness of the existence of municipal waste management centres (38%) compared to Rohtak (20%), Rohtak citizens were more informed about the services these centres provide, with 68.9% acknowledging awareness compared to Gurugram's 54.7%. This indicates that infrastructure visibility does not always equate to service understanding. Regarding recycling awareness, both districts demonstrated moderate knowledge, with Gurugram slightly ahead at 62% and Rohtak at 56.3%. However, Rohtak had a higher percentage of respondents who firmly denied awareness of recycling, reflecting greater resistance or misinformation. Overall, the findings suggest that Gurugram benefits from greater urban exposure, while Rohtak may have more effective grassroots communication. The results highlight a need for location-specific awareness campaigns—emphasizing service clarity in Gurugram and broader public education and recycling sensitization in Rohtak—to strengthen participatory waste governance.

Recommendations (Shortened)

1. **Enhance Awareness in Rohtak**: Improve public understanding of municipal waste centres through regular IEC activities like street plays, posters, and local language outreach.
2. **Clarify Service Details in Gurugram**: Share clear information on services via citizen charters, RWAs, and public displays to address gaps in service-specific awareness.
3. **Promote Recycling Education**: Integrate waste awareness into school curricula and engage youth volunteers to foster long-term behavioral change in both districts.
4. **Train Municipal Staff**: Conduct regular training for officials and sanitation workers to improve SWM delivery and citizen engagement.
5. **Use Digital Tools**: Leverage mobile apps, SMS alerts, and social media to share waste collection updates and educational content.

Implications (Shortened)

- Context-specific strategies are essential; what works in Gurugram may not suit Rohtak.
- Urbanization alone doesn't guarantee SWM awareness; Rohtak performs better in service knowledge.
- Municipal staff must also act as communicators, not just implementers.
- The study aligns with *Swachh Bharat Mission* and SDG goals, offering actionable insights for improving citizen-municipal collaboration in waste governance.

V. Conclusion

In the present paper it was observed that both the Gurugram and Rohtak have partial/fragmented but uneven levels of awareness in management of solid waste there are variations among districts. Gurugram tops on basic infrastructure awareness, and Rohtak is ahead of it in the service delivery domain. But with serious gaps in knowledge of both fields particularly recycling the need for integrated, consultative ongoing public education is clear. The Mixed Methods has facilitated of comprehending the institutional dynamics and popular perception and thus, providing a complete overview of the waste management scenario in two major urban centres of Haryana. Incorporating these lessons into policy and practice, local governments can help to support waste management systems which are effective, citizen-centred and sustainable – leading to healthier cities and more accountable urban living.

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