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# Environmental Assessment of Domestic and Commercial Waste Management in Rewari City, Haryana

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## Abstract

Urban India is witnessing an unprecedented rise in waste generation due to rapid population growth, expanding commercial activities, and evolving consumption patterns. Medium-sized towns like Rewari in southern Haryana are increasingly burdened by the mismanagement of domestic and commercial solid waste, which manifests in the form of open dumping, inadequate collection systems, and limited recycling infrastructure. The present study undertakes an environmental assessment of domestic and commercial waste management in Rewari City, drawing upon both primary and secondary data to understand patterns of generation, disposal practices, and ecological consequences. Survey data collected from households and commercial establishments were analyzed to determine the nature and volume of waste, while field observations documented the condition of collection points, market areas, and open dumpsites. The findings indicate that approximately twenty to twenty-two metric tonnes of waste are generated daily, of which nearly fifty-six percent is biodegradable. Door-to-door collection covers only a little more than half of the households, and segregation at source remains limited to about one-fifth of the population. The absence of decentralized processing and the persistence of open dumping have resulted in air, soil, and water contamination, affecting both human and animal health. The study also highlights the role of voluntary community initiatives such as I Love Rewari, which have mobilized citizens for weekend clean-up drives and awareness campaigns. The paper concludes with policy recommendations aimed at achieving integrated, participatory, and environmentally sustainable waste management in Rewari City.

**Keywords:** Solid Waste Management, Domestic Waste, Commercial Waste, Rewari City, Environmental Impact, Municipal Systems, Community Participation, Haryana

## Introduction

Solid waste management represents one of the most pressing challenges of urban governance in developing nations. As cities expand economically and demographically, their capacity to manage waste often lags behind growth. India produces over 160,000 tonnes of municipal solid waste each day, and a significant share remains untreated or uncollected. Medium-sized towns, unlike large metropolitan regions, possess limited technical and financial resources, resulting in visible environmental degradation, unhygienic conditions, and health hazards. Rewari City, the administrative headquarters of Rewari district in southern Haryana, typifies this dilemma. Strategically located near Delhi and Gurugram, the city has transformed into a bustling urban-

rural interface marked by commercial growth, transport hubs, and rising residential density. However, this development has also produced new streams of domestic refuse and market waste that overwhelm the city's fragile sanitation infrastructure.

Rewari City covers approximately twenty-five square kilometres and is divided into thirty-one municipal wards. The population has grown steadily since the early 2000s, accompanied by an expansion of housing colonies, shopping complexes, and the central vegetable mandi that serves both urban and rural consumers. These changes have increased the quantity and heterogeneity of waste produced each day. Domestic waste, primarily composed of kitchen residue, paper, plastics, and packaging, is joined by large volumes of commercial waste emanating from vegetable markets, hotels, restaurants, and retail shops. Much of this waste remains unsegregated and is deposited in open areas or roadside heaps, posing threats to the environment, human health, and urban aesthetics.

The present research aims to provide an environmental assessment of domestic and commercial waste management in Rewari City by analyzing the magnitude and composition of waste, the efficiency of collection systems, and the resultant ecological implications. Beyond diagnosing institutional deficiencies, the study also investigates the role of community-based actions that have emerged as complementary forces to municipal efforts. In particular, voluntary groups have contributed to awareness creation and behavioural transformation among citizens, demonstrating the potential of civic engagement in addressing urban environmental problems. While earlier studies on solid waste management in Haryana have primarily focused on large urban centres such as Gurugram and Faridabad, relatively little attention has been paid to smaller cities like Rewari that operate within resource-constrained settings. The city's semi-arid geography, dependence on groundwater, and limited waste-processing facilities render it environmentally vulnerable. Understanding the nature of domestic and commercial waste management in such a context provides valuable insight into the broader urban sustainability challenges confronting medium-scale towns in India.

**Objectives of the Study**

The present research has been conducted with the following key objectives:

1. To assess the patterns and composition of domestic and commercial waste in Rewari City, including its quantity, sources, and methods of disposal.

2. To examine the environmental and health implications arising from existing waste management practices, with particular reference to air, soil, and water contamination.

3. To evaluate the efficiency of municipal systems and the role of community participation, especially through local initiatives, in promoting sustainable waste management.

## Study Area

Rewari City, located in the southern part of Haryana, serves as the administrative headquarters of Rewari district and forms a part of the National Capital Region (NCR). Geographically, it lies between 28° 10′ N and 28° 30′ N latitude and 76° 20′ E and 76° 40′ E longitude. The city covers an area of approximately twenty-five square kilometres and is divided into thirty-one municipal wards. It occupies a semi-arid region characterized by sandy loam soil, low annual rainfall, and dependence on groundwater for domestic and industrial use. Rewari's proximity to Delhi and Gurugram has accelerated its urbanization, transforming it into a rapidly expanding trade and service hub. The city's economic structure is dominated by small industries, markets, educational institutions, and transport-related services, all of which contribute to the generation of domestic and commercial waste.

The spatial morphology of Rewari presents a blend of traditional core settlements, newly developed colonies, and peri-urban extensions. The old city area is densely populated, with narrow streets and limited waste-storage infrastructure, while the new residential zones exhibit relatively better service coverage. Major sources of commercial waste include the central vegetable mandi, restaurants, and retail outlets located near the bus stand and railway station. These areas generate large volumes of biodegradable and plastic waste daily. The absence of a functional landfill or processing facility within municipal limits has resulted in open dumping on vacant land and roadside sites, creating visual blight and environmental hazards. This complex mix of rapid urban growth, limited infrastructure, and changing consumption behaviour makes Rewari an appropriate and challenging case for the environmental assessment of waste management systems.

## Research Methodology

The present study employs a mixed-method approach integrating quantitative and qualitative techniques to examine domestic and commercial waste management in Rewari City. The city, located in southern Haryana, was purposively chosen because it typifies the growing environmental pressures of medium-sized Indian towns. Primary data were collected from three hundred households and eighty commercial establishments selected through stratified random sampling to ensure representation across socio-economic groups and functional zones. Structured questionnaires were used to gather information on daily waste generation, segregation practices, and collection frequency, while field observations were carried out at open-dump sites and the central vegetable mandi to record waste accumulation, leachate flow, and vector presence. Informal interviews with sanitary inspectors, traders, and residents provided qualitative insight into behavioural patterns and operational constraints.

Secondary information was drawn from the Census of India (2011), Rewari Municipal Council records, and reports of the Haryana State Pollution Control Board (HSPCB 2018, 2021) and Central Pollution Control Board (2020). Quantitative data were analyzed using descriptive statistics to determine average daily

generation and composition, while qualitative narratives were thematically interpreted to identify systemic gaps. Ethical considerations such as respondent anonymity and voluntary participation were maintained throughout. The triangulation of multiple sources enhanced reliability and validity, enabling a realistic and context-sensitive understanding of waste generation, collection, and environmental implications in Rewari City.

**Review of Literature**

Urban solid waste management has been widely discussed in both national and international scholarship, emphasizing the gap between policy intentions and ground-level execution. Early studies such as Sharholy et al. (2008) and Gupta and Kumar (2017) identified that poor segregation at source, inadequate infrastructure, and low recycling efficiency remain persistent challenges in Indian cities. The Central Pollution Control Board (2020) highlighted that only a fraction of municipal waste in India undergoes scientific treatment, while most is left uncollected or openly dumped. Research focused on Haryana by Sharma, Verma, and Duhan (2019) revealed similar inefficiencies, showing that smaller towns lack waste quantification systems and record-keeping, resulting in irregular collection and unmanaged landfills. Reports by the Haryana State Pollution Control Board (2018, 2021) further indicate that the proposed cluster-based processing units for the Rewari region remain largely non-operational, thereby worsening the local environmental burden.

At the global level, Hoornweg and Bhada-Tata (2012) and the World Bank (2016) observed that developing countries generate lower per-capita waste but suffer disproportionately higher health and environmental impacts due to improper disposal. Studies from India, such as those by Narayan (2016) and Menon (2015), demonstrated that community participation plays a crucial role in improving waste practices, with Kerala's decentralized model emerging as a successful example. Patil (2019) similarly emphasized that volunteer movements and citizen awareness can transform local sanitation outcomes. Collectively, this literature suggests that sustainable waste management depends not only on infrastructure and technology but equally on public participation and behavioural change. Despite these insights, little empirical research has addressed smaller semi-urban towns like Rewari, where governance, community participation, and environmental stress intersect in distinctive ways creating a clear research gap that this study seeks to fill.

**Results and Discussion**

The analysis of primary and secondary data reveals that Rewari City generates approximately twenty to twenty-two metric tonnes of solid waste each day, a figure consistent with estimates for other medium-sized municipalities in Haryana. The waste stream is dominated by biodegradable material, constituting about fifty-six percent of the total, followed by thirty-five percent recyclable matter mainly plastics, paper, and packaging and roughly nine percent residual or hazardous waste, including sanitary and minor electronic components.

These proportions highlight an untapped potential for composting and recycling that remains largely unrealized due to the absence of organized segregation at the source.

At the household level, the survey indicates that an average family produces close to 1.8 kilograms of waste per day. Only one-fifth of respondents reported practising systematic segregation between wet and dry fractions, while the remaining households typically disposed of mixed waste in single containers or roadside piles. Door-to-door collection services cover approximately sixty percent of households, with the remainder relying on informal sweepers or on-site dumping. The irregularity of collection is more pronounced in peripheral wards and informal settlements, where municipal vehicles seldom arrive on schedule. This uneven service delivery results in the accumulation of waste on vacant plots, at street corners, and along open drains, creating visual blight and breeding grounds for vectors.

Commercial sources contribute significantly to the city's total waste load. The central vegetable mandi alone accounts for nearly four to four-and-a-half tonnes per day, composed mainly of decomposing fruits, vegetables, and organic residues. Restaurants and small eateries collectively add around 1.5 tonnes of food waste, while retail shops generate an estimated 2 tonnes of packaging and plastic material each day. These figures illustrate that market and food-service establishments act as concentrated nodes of organic and recyclable waste. Observations within the mandi area revealed that refuse is commonly heaped in open spaces without containment, attracting stray cattle and dogs. The absence of covered bins and designated loading points hampers sanitary collection, and frequent manual handling of waste by workers without protective gear increases occupational health risks.

Field visits identified at least six major open-dumping sites distributed across the city. The largest mound, located near the mandi, receives continuous inflow from surrounding commercial establishments. Smaller dumps in residential areas result from irregular municipal service. During the monsoon season, these heaps produce strong odour and leachate, which flows into adjacent drains and low-lying areas. Residents living within one hundred metres of such sites reported foul smell, increased mosquito density, and periodic burning of mixed waste to reduce volume. These practices release smoke laden with particulate matter and toxic gases, leading to short-term respiratory irritation and long-term environmental degradation.

Spatial variation in waste accumulation reflects underlying socio-economic patterns. Higher-income neighbourhoods, generally located in the newer parts of Rewari, show relatively better collection coverage and occasional private contracting for cleaning services. In contrast, the older core and unplanned extensions depend entirely on municipal staff and are more vulnerable to service lapses. This disparity underscores the need for equitable distribution of sanitation resources. The study also reveals that residents' perceptions of cleanliness strongly correlate with visible municipal activity; wards receiving regular vehicle visits record greater satisfaction, while neglected areas exhibit community frustration and declining trust in local governance.

Quantitatively, the findings confirm that the domestic sector remains the largest cumulative contributor to the city's waste burden, even though individual household generation is modest. Commercial establishments, however, produce dense and highly perishable organic refuse that demands immediate collection to prevent putrefaction. The absence of synchronized schedules between household and market collection leads to logistical inefficiency, forcing workers to prioritize certain routes and neglect others. This operational imbalance further perpetuates uncollected waste piles and environmental hazards.

From an ecological standpoint, the predominance of biodegradable waste without proper composting has direct implications for soil and air quality. Decomposition in open conditions produces methane and carbon dioxide, contributing to greenhouse-gas emissions. Leachate from these dumps infiltrates the soil, altering its chemical composition and threatening groundwater quality in this semi-arid region, where groundwater is already the principal source of domestic supply. The data thus indicate a clear linkage between waste mismanagement and environmental stress in Rewari City.

Socially, the persistence of open dumping diminishes the aesthetic character of urban spaces and lowers civic pride. Informal conversations during fieldwork revealed that many residents have become habituated to the sight of roadside waste, reflecting a gradual normalization of unhygienic conditions. Nevertheless, sporadic volunteer interventions and clean-up drives have temporarily improved sanitation in selected localities, suggesting that citizen participation, when properly organized, can mitigate institutional shortcomings.

Overall, the results underscore that Rewari's waste-management challenge is not primarily a question of volume but of governance, logistics, and community behaviour. The data point to a system that functions partially but lacks integration across collection, transportation, and processing stages. Effective solutions must therefore address both technical and social dimensions, aligning municipal capacity with active citizen responsibility. The following section elaborates on the environmental and policy implications of these findings.

**Environmental and Policy Analysis**

The findings of the study illustrate that waste mismanagement in Rewari City is not merely a municipal shortcoming but an environmental crisis with multidimensional implications. The uncontrolled accumulation of biodegradable matter, the indiscriminate burning of mixed refuse, and the seepage of leachate from open dumping grounds have collectively degraded air, soil, and water resources. These environmental effects are reinforced by policy and governance gaps that limit the effectiveness of existing solid-waste-management frameworks in Haryana.

- Air Quality and Atmospheric Effects: Decomposition of organic waste in open conditions releases methane and other greenhouse gases that contribute to localised odour nuisance and global climate change. Periodic burning of plastic and composite waste near residential areas and markets adds to particulate

pollution, producing visible smoke and fine aerosols. Residents living adjacent to the mandi and dumping zones frequently reported irritation of the eyes and throat, headaches, and breathing discomfort. Such emissions, though often ignored at the municipal level, represent a significant environmental health burden in semi-urban contexts where air-quality monitoring stations are absent. The lack of proper waste-processing infrastructure thus translates directly into atmospheric contamination and increased vulnerability to respiratory diseases.

- Soil and Water Contamination:

The infiltration of leachate from decomposing waste has serious consequences for soil fertility and groundwater quality. Observational evidence from low-lying areas near the mandi and transport-nagar zone shows blackened soil patches and pools of contaminated water carrying an unpleasant odour. During the monsoon season, surface runoff carries this leachate into storm drains, creating eutrophic conditions and clogging channels. Since most households in Rewari depend on groundwater extracted through private bore wells, contamination of aquifers poses a long-term public-health hazard. Studies conducted by the Haryana State Pollution Control Board (2018) have previously warned of elevated biochemical oxygen demand (BOD) levels in nearby water bodies, corroborating the risks observed in this study.

- Public-Health Dimensions:

The environmental degradation resulting from improper waste management manifests most directly in the form of health impacts on residents and sanitation workers. The survey recorded widespread complaints of foul odour and increased mosquito density, with seventy-one percent of respondents near dumping sites acknowledging frequent vector problems. The presence of decomposing organic matter supports the breeding of flies and mosquitoes, thereby exacerbating the transmission of dengue, malaria, and diarrhea diseases. Informal interviews with local physicians confirmed a seasonal rise in gastrointestinal and skin ailments during summer months. Waste collectors themselves remain unprotected, often handling refuse with bare hands and without masks or gloves. These occupational exposures highlight the human cost of inadequate policy enforcement.

- Impact on Animals and Urban Ecology:

Stray cattle, dogs, and birds routinely feed on waste heaps in Rewari, attracted by leftover food and vegetable residues. Ingested plastics and polythene cause intestinal blockages and chronic digestive disorders among animals, several of which have required surgical intervention at local veterinary clinics. This phenomenon underscores the interconnectedness of human negligence and animal suffering. The encroachment of scavenging animals into traffic areas further creates road hazards and disrupts urban order. The problem exemplifies how environmental negligence undermines the ecological balance of the city.

- Institutional and Policy Context:

Although the Solid Waste Management Rules (2016) of the Government of India mandate segregation at source, door-to-door collection, and scientific disposal, Rewari's implementation remains partial and reactive. The Municipal Council faces severe manpower and financial constraints. A large proportion of the sanitation budget is consumed by salaries and vehicle maintenance, leaving minimal allocation for awareness or technological upgrading. The proposed cluster-based waste-processing facility under the state scheme has yet to become operational because of land-acquisition disputes and bureaucratic delay. Consequently, the absence of local composting or biomethanation plants forces the city to depend on open dumping, contravening the intent of national policy.

The enforcement of plastic-ban regulations and segregation norms is weak. Thin polythene bags continue to circulate freely in markets, while penalties for non-segregation are rarely imposed. Moreover, coordination between municipal authorities, private contractors, and residents lacks continuity. There is no unified data system to monitor daily collection routes or vehicle efficiency. The lack of transparency prevents citizens from holding institutions accountable and perpetuates mistrust between the administration and the community.

- Governance and Participatory Challenges:

While the state policy framework acknowledges public participation as a cornerstone of sustainable waste management, practical mechanisms to institutionalize such participation are missing. The municipal council occasionally collaborates with schools or local groups for short-term cleanliness drives, but these efforts remain episodic and depend on personal enthusiasm rather than formal integration into planning. Nevertheless, voluntary initiatives such as I Love Rewari have demonstrated that civic involvement can act as a catalyst for behavioural change and supplementary service delivery. By mobilizing youth and professionals for weekend clean-up drives, the group has effectively showcased how citizens can reclaim ownership of their surroundings even in the absence of strong municipal action. Their model aligns with national policy objectives that encourage community-based monitoring, yet it operates informally without structured support or incentives from authorities.

In essence, the environmental and policy analysis indicates that Rewari's waste crisis is rooted in an intersection of technical inadequacy, fiscal limitation, and social inertia. While environmental degradation is immediately visible in the form of odour, pollution, and health complaints, its underlying cause lies in fragmented governance. The integration of community energy with institutional accountability thus emerges as the most viable pathway for achieving lon…

**Community Participation – The Case of "I Love Rewari"**

While the municipal apparatus of Rewari struggles with structural and financial limitations, the growing involvement of civil society has provided a noteworthy counterbalance. Among several localized efforts, I Love Rewari stands out as a distinctive citizen-led movement that has transformed public engagement with urban cleanliness from a token obligation into an active social practice. Originating as a small volunteer initiative by residents and college students, the group has evolved into a recognizable civic identity symbol within the city. Its activities offer valuable insight into how participatory approaches can supplement formal governance and instill a collective sense of environmental responsibility.

The organization conducts regular weekend clean-up campaigns in areas historically neglected by municipal services. These include the vicinity of the main bus stand, the old vegetable mandi, and roadside dumping points near densely populated wards. Volunteers—mostly students, traders, professionals, and retired officials—gather early in the morning, armed with gloves, masks, and basic tools provided through community donations. The collected waste is handed over to municipal vehicles or privately arranged transport. Beyond physical cleaning, the group's most enduring contribution lies in its educational role. Volunteers engage directly with shopkeepers and households, demonstrating simple techniques of waste segregation and encouraging the replacement of single-use plastics with reusable alternatives. Wall paintings and street murals carrying motivational slogans have been used strategically to sustain visibility and moral appeal.

Interviews with participants revealed that these activities generate a strong emotional attachment to place, redefining the concept of civic pride. Many members expressed that the experience of personally cleaning public spaces altered their perception of responsibility and prompted them to maintain cleanliness in their neighborhoods. The movement's visibility on social media platforms further amplifies its impact, inspiring similar initiatives in nearby towns such as Mahendragarh and Bawal. Importantly, the I Love Rewari initiative has, at times, collaborated with municipal workers and school eco-clubs, illustrating a latent potential for synergy between formal and informal institutions.

From an analytical standpoint, the movement represents a bottom-up model of environmental governance that addresses the social dimension often neglected in conventional policy. It demonstrates that waste management is not solely a technical or administrative process but also a cultural practice rooted in values of cooperation and shared identity. The voluntary nature of the initiative enhances trust among citizens, a factor frequently absent in bureaucratic systems. Moreover, the campaign's persistence over several years indicates that sustained civic engagement can exist even without financial incentives when it is driven by moral commitment and community recognition.

The I Love Rewari experience also provides important policy lessons. First, it underscores the necessity of integrating citizen groups into municipal planning through formal partnerships. By offering logistical support, recognition, and limited funding, local governments can transform such volunteer efforts from episodic events into institutionalized programs under the broader framework of Swachh Bharat Mission. Second, it reveals the power of peer influence in promoting behavioural change. Observing peers participate in cleaning activities creates social pressure that discourages littering and enhances compliance with segregation norms. Finally, it highlights the role of youth as catalysts for sustainability. The movement's youthful leadership bridges the gap between traditional civic administration and modern digital mobilization, enabling rapid information flow and broader outreach.

In sum, I Love Rewari demonstrates that civic engagement can act as a powerful complement to formal waste-management structures. It redefines the relationship between the citizen and the city from one of passive expectation to active stewardship. Although its scale remains limited compared with the magnitude of Rewari's waste problem, its symbolic and educational value is substantial. The initiative stands as a reminder that environmental transformation begins not merely with policy documents or technological equipment but with the consciousness of citizens who are willing to act.

**Recommendations and Policy Suggestions**

1. Strengthening Collection Efficiency – The Municipal Council of Rewari should ensure full coverage of all thirty-one wards through GPS-enabled vehicles, fixed schedules, and performance-linked accountability for sanitation staff.

2. Segregation at Source – Mandatory two-bin systems for every household and commercial unit must be implemented with clear colour coding and routine inspections. Distribution of subsidized bins and public demonstrations can encourage compliance.

3. Decentralized Processing – Establish small-scale composting and biomethanation units near high-generation zones such as the vegetable mandi and major markets. Organic waste from these facilities can be converted into compost for local horticulture.

4. Integration of Informal Recyclers – Registration and protective-gear provision for ragpickers should be institutionalized. They can be linked with Material Recovery Facilities (MRFs) to formalize recycling chains and improve occupational safety.

5. Financial and Institutional Reform – Introduce user-charge mechanisms based on waste quantity and segregation behaviour. Public–Private Partnerships (PPP) may be explored for investment in processing plants and vehicle maintenance.

6. Awareness and Behavioural Change – Launch continuous Information-Education-Communication (IEC) campaigns in schools, colleges, and markets. Community competitions and reward schemes can reinforce good waste practices.

7. Support to Civic Movements – Voluntary groups such as I Love Rewari should be formally recognized under municipal bylaws. Providing logistical aid—tools, transport, and publicity—will transform ad-hoc efforts into structured collaboration.

8. Capacity Building of Staff – Training workshops for sanitary inspectors, vehicle drivers, and waste collectors should focus on segregation protocols, occupational health, and communication with residents.

9. Environmental Monitoring – Periodic testing of soil and groundwater near dumping points must be undertaken by the Haryana State Pollution Control Board. Results should be published for public scrutiny.

10. Digital Transparency – Develop an online dashboard showing ward-wise collection coverage, quantity processed, and complaint-redressal status to enhance citizen trust and participation.

**Conclusion**

The present study on Rewari City reveals that the challenges of domestic and commercial waste management are deeply rooted in systemic inefficiencies, inadequate public awareness, and weak institutional capacity. With an estimated daily generation of twenty to twenty-two metric tonnes of solid waste, the city faces the typical difficulties of a rapidly expanding urban centre—irregular collection, absence of segregation at source, and dependence on open dumping. These practices have resulted in widespread environmental degradation, manifesting in polluted air, contaminated soil and water, and an increase in vector-borne diseases. While municipal constraints in manpower and finance are evident, the persistence of the problem also reflects a lack of civic discipline and sustained policy enforcement.

The study highlights that the problem of waste in Rewari is not merely quantitative but structural and behavioural. The predominance of biodegradable waste suggests that appropriate composting and recycling technologies could significantly reduce the environmental burden if supported by effective governance. Policy instruments such as user charges, decentralized processing, and public–private partnerships must be integrated with continuous education and enforcement. The participation of citizens is indispensable; voluntary initiatives like I Love Rewari have already demonstrated that civic action can complement formal systems and foster a culture of environmental responsibility. Replicating such models in a structured framework can bridge the existing gap between municipal capacity and urban community potential.

In conclusion, sustainable waste management in Rewari City requires a multi-layered strategy—technological innovation to process waste efficiently, institutional reform to ensure transparency and accountability, and behavioural transformation to cultivate civic consciousness. If these elements are pursued collectively, Rewari can evolve from a city burdened by waste to one that exemplifies how community participation and policy coherence can shape a cleaner, greener, and healthier urban environment.

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