ZERO WASTE TO LANDFILL

EVIDENCE, GAPS AND ACTION IN DECENTRALISED WASTE MANAGEMENT IN DELHI

2026

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Decentralised Waste Management in Delhi
Evidence, Gaps and Action
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About Chintan:
Chintan is a non-profit Circular Society Do-Tank that improves the lives, livelihoods and leadership of the people who contribute the least to environmental pollution and climate change while combating the excessive and inequitable consumption that causes it.

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GLOSSARY

Aerobin: A modular, enclosed aerobic composting bin designed to process organic waste using controlled airflow. Widely deployed in Delhi's residential colonies through CSR initiatives.

Biodegradable Waste / Wet Waste: Organic material that can be broken down by micro-organisms, including kitchen waste, food scraps, vegetable peels, cooked food, and garden trimmings.

Bulk Waste Generator (BWG): As defined under the Solid Waste Management Rules, 2016 and 2026, any establishment generating more than 100 kg of waste per day, including large residential colonies, institutions, and commercial complexes.

Carbon-to-Nitrogen (C:N) Ratio: The ratio of carbon-rich (dry/brown) to nitrogen-rich (wet/green) materials in a compost pile. An ideal C:N ratio of approximately 25–30:1 ensures efficient aerobic decomposition and prevents odour.

Composting: A biological process in which micro-organisms break down organic waste into stable, nutrient-rich compost under aerobic (oxygen-rich) conditions.

Decentralised Waste Management: The treatment and processing of waste at or near its point of generation, within residential colonies or neighbourhoods, rather than transporting it to centralised facilities or landfills.

Dry Waste: Non-biodegradable or recyclable material including paper, cardboard, plastic, glass, metal, and packaging. Also referred to as recyclable or non-biodegradable waste.

Extended Producer Responsibility (EPR): A policy approach that makes producers responsible for the end-of-life management of their products and packaging, including collection and recycling.

Harit Mitra: A Municipal Corporation of Delhi initiative under which trained green volunteers support waste segregation and composting in residential colonies.

Leachate: Liquid produced when water percolates through decomposing organic waste, typically collected and managed in properly designed composting systems.

MCD : Municipal Corporation of Delhi

Material Recovery Facility (MRF) / RRR Centre: A designated space where dry waste is aggregated, sorted, and channelled into appropriate recycling streams. Also referred to as a Reduce–Reuse–Recycle (RRR) Centre under MCD's framework.

Organic Waste Converter (OWC): A semi-automated or mechanised composting machine that shreds, mixes, and accelerates the composting of organic waste, suitable for larger waste volumes.

Pit Composting: A low-cost, in-ground composting method where segregated organic waste is layered into masonry or earthen pits and decomposed through periodic turning and moisture management.

Resident Welfare Association (RWA): A registered body representing residents of a housing colony or apartment complex, responsible for managing common services including sanitation and waste management.

Sahabhagita: An MCD incentive scheme designed to encourage RWAs to participate in decentralised waste management, offering financial rewards linked to performance criteria including source segregation and property tax compliance.

Segregation at Source: The practice of separating waste into distinct streams (wet/organic, dry/recyclable, and reject/sanitary) at the point of generation, i.e., at the household level, before collection.

SWM Rules, 2016 / 2026: India's Solid Waste Management Rules, which mandate source segregation, decentralised treatment of biodegradable waste by bulk waste generators, and integration of informal waste workers into formal waste management systems.

Wastepicker / Informal Recycler: An individual who collects, sorts, and sells recyclable materials from households, streets, or waste collection points. Informal waste workers form the backbone of India's recycling economy.

Zero Waste Colony: A designation given by MCD to residential colonies that demonstrate commitment to source segregation, decentralised composting, and dry waste recovery. More than 676 colonies across Delhi have been designated under this programme.

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FOREWORD

How shall we reduce Delhi's landfills?

We know the answer—by decentralising waste management and reducing waste. The principle is simple: waste must be treated where it is generated, before it becomes part of the landfill problem.

As the linkages between Delhi's waste and its air became better understood, it was clear that smart waste management has a bigger impact on public health than we previously appreciated. Chintan began evaluating Municipal Corporation of Delhi's (MCD) Zero Waste Colony initiatives with the aim of understanding how these could be scaled up to reduce the volume of waste sent to landfills and improve the Air Quality Index (AQI).

The MCD's Zero Waste Colony programme was formally launched in September 2022 under the Swachhta Abhiyan initiative. The programme introduced two certification tiers: Harit Mitra, awarded to Resident Welfare Associations (RWA) that adopt parks and maintain in-situ wet waste composting, and Sahbhagita, a higher designation requiring 100% waste segregation at source, 100% in-colony composting of wet waste, 100% recycling of recyclable dry waste, and handover of remaining dry waste to MCD or its authorised agencies. To encourage participation, MCD developed a web portal for registration of RWAs and group housing societies, and introduced an incentive of 5% of property tax paid, which could be channelled back as development works for certified colonies. Since this remarkable scheme began, more than 676 residential colonies have been labelled as Zero Waste Colonies. MCD has set a target to add 200 more certified colonies by May 2027 (MCD Waste Management Report to Chief Minister, 2025)[1].

This report presents the first systematic field-based assessment of these colonies. The study goes beyond just identifying areas in Delhi that are officially labelled as Zero Waste Colonies and critically examines what is actually happening on the ground, which efforts are genuinely making a difference and what factors are driving that success.

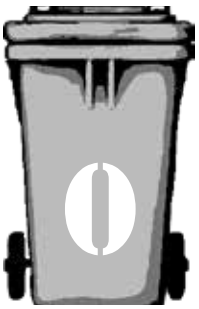
The findings show that while the initiative has expanded the idea of decentralised waste management, implementation remains uneven at best. Many residential areas, several of which qualify as bulk waste generators, continue to send mixed waste into the municipal system.

At the same time, the study highlights examples of colonies where decentralised waste systems are working. These cases show that success is not determined by technology alone but by community leadership, inclusion of wastepickers, trained operators, and sustained institutional support.

As we send this report to print, the Solid Waste Management (SWM) Rules, 2026 have come into force, creating an important opportunity to improve, upgrade and celebrate on-ground work. It also foregrounds performance-based systems that deliver real environmental outcomes. This study shows that the issue is not only about solid waste. Delhi has been repeatedly called out as one of the world's most polluted cities. At a time when we are actively seeking solutions to the city's air pollution crisis, decentralised waste management should be recognised as a critical, viable action that impacts both health and the environment.

We hope this report will help strengthen the implementation of the SWM Rules, 2026, in Delhi, reduce our mountains of waste and positively impact air quality. Undeniably, better air quality and improved waste management go hand-in-hand.

Bharati Chaturvedi
Founder and Director,
Chintan Environmental Research and Action Group



0 EXECUTIVE SUMMARY

Delhi's air pollution crisis is typically attributed to vehicular emissions, industrial activity, construction dust, and seasonal agricultural burning. However, Delhi's waste system contributes to air pollution through three connected pathways. First, when wet waste is mixed with other waste and transported to landfill sites, it decomposes anaerobically, generates methane and contributes to recurring landfill fires. This uncontrolled burning releases a toxic mix of pollutants, including dioxins, furans, and heavy metals, in addition to particulate matter (PM 2.5 and PM 10). Second, when mixed waste accumulates at local dumping points or collection sites, it is often burnt in the open, releasing particulate matter and toxic pollutants. Third, the transport of mixed waste over long distances to landfills and processing sites adds avoidable vehicular emissions. All three pathways are driven by one core systemic failure: inadequate segregation of waste at source. Poor waste segregation, landfill overloading, and open burning of mixed waste release large quantities of particulate matter and toxic gases into the urban atmosphere.

These emissions not only degrade ambient air quality but also pose severe health risks to nearby communities, contributing to respiratory illnesses, cardiovascular diseases, and long-term carcinogenic effects. The problem is particularly acute during winter months, when atmospheric conditions trap pollutants close to the ground, compounding Delhi's already severe smog episodes.

According to DPCC Annual Report 2024–25, Delhi currently generates more than 11,500 tonnes of municipal solid waste per day, of which 50–55 per cent is biodegradable organic waste[2]. When this organic waste is mixed with other waste streams and transported to landfill sites, it decomposes anaerobically, producing methane—a highly combustible gas that frequently triggers landfill fires.

The city's three major landfill sites—Ghazipur, Bhalswa, and Okhla—have exceeded their designed capacity many years ago and continue to receive mixed waste daily. Ghazipur, with a designed capacity of approximately 2.5 million tonnes, is estimated to have received over 14 million tonnes of waste, rising to heights exceeding 65 metres. Bhalswa, designed for 2.2 million tonnes, holds an estimated 8 million tonnes.

Okhla, the smallest of the three, processes waste primarily through a Waste-to-Energy plant, but continues to receive residual mixed waste. Together, these three sites receive an estimated 8,000–10,000 tonnes of mixed waste per day.

Landfill fires at these sites release PM2.5, methane, volatile organic compounds, and black carbon, all of which contribute significantly to Delhi's deteriorating air quality. Studies by the Central Pollution Control Board (CPCB) have found particulate emissions from landfill fires reaching levels hundreds of times above safe limits in surrounding areas (CPCB, 2019).[3,4]

According to a CPCB affidavit filed before the National Green Tribunal (January 2026)[5], Delhi generates approximately 11,852 tonnes of municipal solid waste per day, of which only 7,611 tonnes (64.2%) are processed, leaving around 4,241 tonnes per day disposed of at the Bhalswa and Ghazipur landfill sites (CPCB/DPCC Annual Report 2024–25). To bridge this gap, MCD plans to develop four new solid waste processing facilities at Bhalswa (1,800 TPD), Singhola (700 TPD), Okhla (1,400 TPD), and Narela-Bawana (1,200 TPD), at an estimated cost of ₹361.42 crore (MCD, November 2025). Deadlines for full remediation are: Okhla by July 2026, Bhalswa by December 2026, and Ghazipur by December 2027. [6]

Open burning of waste across neighbourhood collection points, vacant plots and landfill peripheries further compounds the problem. Mixed waste containing plastics, packaging materials and organic waste produces toxic emissions when burnt, exaggerating Delhi's regional air pollution burden.

Recognising these risks, the Solid Waste Management Rules, 2026 mandates source segregation of waste and decentralised treatment of biodegradable waste by bulk waste generators, including residential colonies and institutions. The rules recognise that waste must be treated at the point of generation to prevent it from reaching landfill sites.

The Municipal Corporation of Delhi has promoted decentralised waste management through a range of initiatives, including Sahabhagita, Harit Mitra and the Zero Waste Colony campaign, collectively implemented under the Swachhta Abhiyan, launched in September 2022 and hereafter referred to as the Zero Waste Colony programme (For definitions and certification criteria of each scheme, see Annexure 2). More than 676 residential colonies have been designated as Zero Waste Colonies to encourage segregation at source, decentralised composting, and the recovery of recyclable materials.

The premise of this initiative is both environmentally and socially significant. When waste is segregated and processed within communities:

- Organic waste can be composted locally rather than transported to landfill sites.
- Dry waste can be recovered and recycled, reducing pressure on municipal systems.
- Landfill methane generation and fire risk decline.
- Transport-related emissions are reduced.
- Residents become active participants in environmental stewardship.

However, despite the scale of the Zero Waste Colony programme, very limited field-based evidence exists on how these systems are functioning in practice. Most available assessments rely on administrative reporting rather than on-ground observation of waste flows, infrastructure functionality, and community participation.

0.1 Evaluating Zero Waste Initiatives : Methodology

To address this evidence gap, Chintan Environmental Research and Action Group conducted the first structured field assessment of Zero Waste Colonies in Delhi.

The study examined 68 designated Zero Waste Colonies, representing approximately 10 per cent of the city's designated colonies, across all five administrative zones of Delhi: North, South, West, Central and East.

The assessment combined multiple field-based methods, including:

- Physical verification of decentralised composting infrastructure
- Structured interviews with Resident Welfare Associations (RWAs) and caretakers
- Direct observation of segregation practices and waste flows
- Photographic documentation of infrastructure status
- Key informant discussions with local stakeholders

This approach allowed the study to move beyond administrative reporting and generate ground-level evidence on the operational realities of decentralised waste systems.

0.2 Key Findings

A WEAK HOUSEHOLD SEGREGATION

Household-level segregation emerged as the single most significant bottleneck across the sampled colonies.

Nearly 43 per cent of surveyed RWAs reported negligible segregation, while only 18 per cent achieved more than 60% compliance at the household level. In about 82% of societies, residents continued to dispose of mixed waste, despite awareness campaigns.

The study found that segregation performance was strongly linked to active monitoring by trained personnel and sustained RWA engagement. Where accountability systems were absent, segregation practices deteriorated rapidly.

Without reliable segregation, composting systems receive contaminated feedstock containing plastics and inert materials, making biological processing difficult or impossible.

B WET WASTE PROCESSING: A GAP IN MOST COLONIES

Physical verification revealed that 85 per cent of the surveyed colonies were not processing household wet waste on-site, despite being designated as Zero Waste Colonies.

Among the assessed colonies:

- 37 per cent had no composting infrastructure installed
- 28 per cent had infrastructure that was non-functional
- 22 per cent were processing only garden waste
- Only 13 per cent were actively composting household wet waste.

This means that the majority of colonies continue to send mixed waste into the municipal collection stream, ultimately reaching landfill sites.

In many cases, composting systems had been installed through CSR initiatives but were abandoned due to odour complaints, a lack of trained staff or lack of maintenance funds.

The findings indicate that infrastructure installation alone does not guarantee operational success.

C TECHNOLOGY IS NOT THE PROBLEM

Three primary composting technologies were observed across the sample:

- Pit composting systems
- Aerobin composting units
- Semi-automated Organic Waste Converters (OWCs)

No technology consistently outperformed the others. Instead, system performance depended on:

- Feedstock quality (segregated organic waste)
- Trained operators managing daily operations
- Routine monitoring and maintenance support

Where these conditions were absent, systems were unable to sustain operations regardless of technology type.

D DRY WASTE RECOVERY DRIVEN BY WASTEPICKERS

Wastepickers and informal recyclers play a critical role in dry waste recovery across Delhi's colonies. Yet, this work receives limited support from the RWA or MCD. As a result, this aspect is wholly dependent on informal workers who operate without any institutional support or integration and are left to fend for themselves. Adequate decentralised dry waste recovery infrastructure is largely absent across the assessed colonies.

The study found:

- 90 per cent of colonies (RWAs) lacked a structured recovery mechanism such as a Material Recovery Facility (MRF) or a Reduce–Reuse–Recycle (RRR) centre, leaving wastepickers to work without infrastructure.
- 6 per cent had a partial or informal system
- Only 4 per cent of colonies had a functional RRR centre, actively managed by RWA members and residents.

As a result, recyclable materials including low-value plastics continue to enter the mixed municipal waste stream. Strengthening decentralised waste systems must therefore include formal recognition and integration of informal waste workers.

E SPACE IS NOT THE CONSTRAINT

A commonly cited barrier to decentralised waste management is the lack of space within residential colonies.

However, the field assessment found that:

- 97 per cent of assessed RWAs reported adequate space for waste infrastructure

Most colonies had parks, green areas or service spaces capable of accommodating composting systems. This finding shifts the policy focus towards governance design, operational capacity and institutional support.

0.3 Why the Systems Are Not Working

The study identifies several systemic factors that explain the poor performance of decentralised waste systems.

A POOR FEEDSTOCK QUALITY

- 82% of RWAs lack household-level segregation, resulting in contaminated organic waste that causes odour problems and degrades composting quality
- To maintain a functional feedstock, 22% of RWAs have restricted composting to horticultural waste only, abandoning the processing of kitchen/food waste

B ABSENCE OF TRAINED OPERATORS

- 88% of colonies have no dedicated trained staff to manage composting systems
- Without trained personnel, technical issues such as odour management and leachate control go unresolved, leading to system failure or abandonment

C LACK OF POST-INSTALLATION SUPPORT

- 51% of colonies with installed composting infrastructure reported as non-functional, as they were installed through CSR or project-based initiatives with no provision for ongoing technical support or maintenance after handover. The MCD also did not have a cell to support these potential users.

D INEFFECTIVE INCENTIVE STRUCTURES

- Only 1% of surveyed RWAs reported receiving any incentive under the Sahabhagita scheme
- The scheme requires 90% property tax compliance as a condition—an eligibility criterion that RWAs have no authority to enforce, making it practically inaccessible

E LIMITED INTEGRATION OF INFORMAL RECYCLERS

- Dry waste recovery across most colonies is entirely carried out by wastepickers and informal recyclers, yet their work remains outside any RWA-managed infrastructure
- No formal mechanism exists within decentralised systems to integrate or support informal recyclers at the colony level

0.4 Implications for Delhi's Air Pollution Strategy

The findings of this study have direct implications for Delhi's clean air strategy. Currently, decentralised waste systems fail in 88 per cent of assessed colonies. Organic and other wastes continue to reach landfill sites, contributing to methane generation and landfill fires.

If the 676 designated Zero Waste Colonies were functioning at the level demonstrated by the best-performing colonies in this study, hundreds of tonnes of organic waste could be diverted from landfill sites each day.

This would lead to:

- Reduced methane emissions from landfill decomposition
- Lower landfill fire risk
- Reduced open burning of waste across the city
- Lower particulate pollution associated with waste burning.

Decentralised waste management should therefore be recognised as core environmental infrastructure within Delhi's air pollution mitigation framework, alongside controlling vehicular emissions, industrial monitoring and dust suppression measures.

0.5 Pathways for Strengthening the Programme

The study identifies several priority actions for strengthening decentralised waste management in Delhi.

A REDESIGN THE ZERO WASTE COLONY FRAMEWORK

The Zero Waste Colony designation should be linked to measurable performance indicators and verified through periodic physical audits. The current framework is largely non-functional as there is no mechanism to track whether systems installed at the time of certification remain operational. Zero Waste Colony status should be reviewed at regular intervals (annually or bi-annually) to ensure continued compliance, with designations revoked where systems are inactive or non-functional. A tiered framework—such as Bronze, Silver and Gold levels—can acknowledge colonies at different stages of progress and incentivise gradual improvement rather than an all-or-nothing designation.

B INSTITUTIONALISE POST-INSTALLATION SUPPORT

Every decentralised waste system should receive ongoing technical support or maintenance after handover. Monitoring, refresher training, and troubleshooting support can be delivered through partnerships with authorized private actors and NGOs.

C REFORM INCENTIVE STRUCTURES

The Sahabhagita scheme should be redesigned to reward verified waste processing outcomes rather than administrative conditions. Incentives should be tied to measurable waste outcomes such as tonnes of wet waste composted, percentage of households segregating and volume of dry waste recovered. These metrics can be verified through physical audits rather than self-declaration. Currently, the incentive can only be used for general development work recommended by the RWA. The scheme should be amended to allow the direct use of incentive funds for waste management infrastructure such as composting units, operator training and MRF equipment, in order to create a self-reinforcing cycle.

D NEED TO TRAIN OPERATORS

Decentralised waste systems require dedicated, trained operators supported by clear operational guidelines on segregation monitoring, feedstock checking, moisture and odour

control, routine composting operations, basic equipment maintenance, record-keeping and reporting, and dry waste coordination with recyclers.

E INTEGRATE INFORMAL WASTE WORKERS

Waste pickers and recyclers should be formally integrated into colony-level dry waste systems, in line with the SWM Rules, 2026.

F DEVELOP MARKETS FOR DECENTRALISED COMPOST

Municipal procurement frameworks should create the demand for compost produced by RWAs for parks, horticulture and landscaping. NDMC, MCD and other civic agencies should incorporate RWA-produced compost into their procurement frameworks, creating a stable and predictable demand channel. Compost procured from RWAs should meet minimum quality standards as defined under the Fertiliser Control Order or equivalent norms, encouraging RWAs to invest in better feedstock management and composting practices.

A transparent, fixed price mechanism should be established to ensure RWAs receive fair and timely payment, making compost production financially viable at the colony level. An aggregation model should be introduced at the neighbourhood or zone-level to pool compost for bulk supply to municipal buyers. This can be facilitated by ULBs or NGOs.

G CREATE A DEDICATED INSTITUTIONAL STRUCTURE

A dedicated decentralised waste management vertical within MCD, supported by a Programme Management Unit, led by a consortium of credible private organisations, can coordinate implementation, monitoring and scaling of successful models.

H RECOGNISING WASTE MANAGEMENT AS A CORE AIR POLLUTION MITIGATION AND LANDFILL REDUCTION STRATEGY

Decentralised waste management should be treated as core urban environmental infrastructure, supported by dedicated budgets, institutional capacity, and policy attention comparable to those for other air pollution mitigation measures.

0.6 Moving Forward

The best-performing colonies demonstrate that decentralised waste management is feasible, replicable, and environmentally beneficial in Delhi. What is required now is a shift from symbolic designation to performance-driven implementation. Strengthening decentralised waste systems offers Delhi a rare opportunity to address two interconnected urban challenges simultaneously: waste management and air pollution.

Decentralised waste management, when implemented effectively as per the SWM Rules, 2026, can transform residential colonies into active partners in Delhi's future of clean air and sustainable waste management.

1 WASTE, LANDFILLS AND AIR POLLUTION IN DELHI

Delhi's rapid urbanisation and rising consumption patterns have made municipal solid waste management one of the city's most pressing environmental and public health challenges. The capital generates over 11,500 tonnes of municipal solid waste per day, of which nearly half (50–55%) is biodegradable. In principle, this organic waste can be composted or biologically processed near its source. In practice, however, much of it enters a system that remains heavily dependent on mixed waste collection and landfill disposal. The consequences of this system are detrimental.

Delhi's major landfill sites at Ghazipur, Bhalswa, and Okhla have far exceeded their design capacity and continue to receive mixed waste daily. When organic waste, combined with other wastes accumulates in such dumpsites, it decomposes anaerobically, producing methane, a highly combustible gas. The resulting landfill fires are not isolated accidents but a structural outcome of the way waste is currently handled. These fires release large quantities of fine particulate matter (PM2.5), methane, volatile organic compounds, black carbon and other toxic gases, significantly aggravating Delhi's already severe air pollution crisis. Studies by the Central Pollution Control Board (CPCB) have found that particulate emissions from landfill fires can reach levels several hundred times above safe limits in surrounding areas[7].

At the same time, open burning of waste across the city adds another layer of pollution. Waste that is not segregated at source often accumulates at neighbourhood collection points, transfer stations and landfill peripheries. In such situations, burning mixed waste becomes the method of disposal. The burning of plastics, packaging materials, and organic waste produces a toxic cocktail of pollutants that spreads beyond local neighbourhoods and contributes to the wider regional air pollution burden, particularly during the October–February pollution season.

A central driver of this problem is the absence of consistent segregation at source. When biodegradable waste is mixed with dry waste, its composting or bio-methanation potential is lost. Instead, it becomes fuel for landfill methane generation and open burning.

Recognising these risks, India's Solid Waste Management Rules require segregation at source and mandate in-situ processing of organic waste by bulk waste generators, including large residential complexes and institutions. Building on this regulatory framework, the Government of Delhi, through the Municipal Corporation of Delhi (MCD), has launched several initiatives to promote decentralised waste management. A key initiative is the

Zero Waste Colony programme, implemented through community-led initiatives such as Sahabhagita, Zero Waste Colony, and Harit Mitra. Under this initiative, more than 676 residential colonies have been designated as Zero Waste Colonies, with the objective of encouraging local segregation and processing of waste within neighbourhoods.

The underlying premise of this initiative is straightforward but powerful: if organic waste is treated at source, it never becomes part of the landfill problem. Decentralised composting and community-level waste processing can significantly reduce the volume of waste transported to landfill sites, lower methane emissions, prevent landfill fires, and create visible, local accountability for waste handling. Everyday resident behaviour can have significant impact on air quality. In theory, such systems can also generate compost for neighbourhood parks and gardens, closing the nutrient loop and strengthening community participation in environmental stewardship. Similarly, segregated dry waste can be channelled into recycling streams, creating opportunities for material recovery and generating revenue for resident associations or community waste management systems. Implementing these shifts in practice is the central challenge this assessment examines.

The scale of Delhi's Zero Waste Colony initiative represents a formidable, forward-looking effort to shift from a centralised, landfill-dependent model to a decentralised waste management system. However, anecdotal evidence from practitioners and civil society organisations suggests that many of these facilities are not operating at their intended capacity or serving their purpose. In several cases, segregation practices remain weak, decentralised processing units are underutilised or dysfunctional, and waste continues to flow back into the centralised collection system.

Despite the policy importance of decentralised waste management, there has been very limited systematic field evidence on how these initiatives are functioning in practice. Most existing assessments rely on administrative reporting rather than on-ground observation of waste flows, infrastructure performance, and community participation.

Increased accountability and a participatory approach are essential for effective decentralised waste management. Community-level waste processing can reduce the amount of waste sent to landfills, reduce emissions, prevent landfill fires and improve overall air quality.

To address this gap, Chintan Environmental Research and Action Group undertook the first structured field-based assessment of Zero Waste Colonies in Delhi. The study examines 68 designated Zero Waste Colonies to understand how decentralised waste systems are functioning on the ground. Through site visits, stakeholder interactions, and operational assessments, the study seeks to generate evidence on what is working, where the system is failing, and the institutional and behavioural barriers that prevent effective implementation.

The purpose of this report is therefore threefold:

1. To assess the status of decentralised waste management systems in designated Zero Waste Colonies across Delhi.
2. To identify operational, institutional, and behavioural gaps that limit the effectiveness of these initiatives.
3. To propose an actionable pathway for strengthening decentralised waste management as a strategy for reducing landfill dependence, preventing waste burning, and improving urban air quality.

By grounding the analysis in field observations and community-level experiences, this study aims to provide a realistic understanding of how decentralised waste management is unfolding in Delhi. Strengthening decentralised waste management is not only a waste governance issue, but also an important and measurable intervention in Delhi's public health outcomes and broader fight against air pollution. The findings are intended to support municipal authorities, resident communities, and policymakers.

The following sections outline the scope of the study, methodologies used, and key findings from field assessments across the selected Zero Waste Colonies.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2 STUDY APPROACH

The Zero Waste Colony programme represents one of Delhi's most significant policy efforts to promote decentralised waste management. With more than 676 residential colonies designated under this initiative, the programme has the potential to substantially reduce the volume of organic waste reaching landfills, strengthen local segregation practices, and contribute to Delhi's broader efforts to decrease waste-related air pollution.

Adopting a practical, evidence-driven approach rooted in Chintan's long-standing work on waste systems and informal recycling economies, the study involved systematic physical verification of a representative sample covering approximately 10 per cent of the designated colonies across all administrative zones of Delhi. The assessment combined site visits, visual inspections of infrastructure, interactions with residents and resident welfare associations, and observations of waste handling practices.

The study was designed with the following objectives:

- Assess household-level segregation practices in designated Zero Waste Colonies and examine the extent to which wet and dry waste streams are being separated at source.
- Verify the presence, condition, and functionality of decentralised composting infrastructure, including composting pits, bio-digesters, and other organic waste processing systems established within colonies.
- Examine dry waste recovery arrangements, including storage, sorting, and linkages to recycling systems, and identify systemic gaps affecting material recovery.
- Identify operational, behavioural, financial, and institutional barriers that hinder the sustained functioning of decentralised waste systems within residential communities.
- Draw lessons relevant to landfill diversion and air pollution reduction strategies, particularly regarding the management of organic waste streams.
- Generate actionable evidence to inform and refine the policy on decentralised waste management and air pollution, support the development of a compost procurement framework, and contribute to a performance-oriented strategy for strengthening the Zero Waste Colony initiative.

3 METHODOLOGY

3.1 Sample Selection

Delhi has over 676 residential colonies designated as Zero Waste Colonies under various municipal initiatives aimed at promoting decentralised waste management. To understand how these initiatives are functioning on the ground, the study undertook physical verification of a representative sample covering approximately 10 per cent of these colonies.

A total of 68 Resident Welfare Associations (RWAs) were selected for field assessment across all five administrative zones of Delhi (Table 1). The sampling strategy was designed to ensure geographical representation, diversity of colony types, and practical feasibility of decentralised waste management systems.

The selection of colonies was guided by the following criteria:

- **Minimum household size of 100 units,** ensuring that the assessment focused on colonies where decentralised waste management systems would generate meaningful waste volumes and operational insights.
- **Representation across all administrative zones,** enabling a city-wide understanding of how the programme is performing under different local governance and infrastructure contexts.
- **Coverage across diverse income profiles,** including middle-income and higher-income residential areas, where the Zero Waste Colony model is most implemented through RWAs.

The field findings of this study are from Delhi's five broad geographic divisions: North, South, East, West, and Central. The MCD administers the city through 12 operational zones (following its reunification in May 2022) for internal service delivery. This study maps MCD's 12 operational zones into five divisions as outlined: **North** draws from the Civil Lines and Rohini zones; **West** from the West, Najafgarh, Keshavpuram, and Karol Bagh zones; **Central** from the City Sadar Paharganj (SP) and Central zones; **South** from the South zone and southern portions of the Central zone covering Lajpat Nagar and Sarita Vihar; and **East** from the Shahdara South and Shahdara North zones. This framework is applied consistently throughout the report.

Table 1: **Survey Sample**

Divisions	Number of RWAs Assessed	% of Sample
North Delhi	17	25%
South Delhi	15	22%
West Delhi	15	22%
Central Delhi	10	15%
East Delhi	11	16%
Total	**68**	**100%**

The distribution across zones ensured that the study captured variations in institutional support, local governance practices, infrastructure availability, and resident engagement, all of which influence the performance of decentralised waste systems.

3.2 Data Collection Tools

Recognising that decentralised waste systems operate at the intersection of infrastructure, community behaviour, and institutional support, the field assessment adopted a multidimensional methodology to triangulate findings across multiple sources. Our approach emphasised direct observation, verification of physical infrastructure, and engagement with community stakeholders, rather than relying solely on administrative records.

The following tools were used in the assessment:

A STRUCTURED ASSESSMENT CHECKLIST

A structured checklist was given to RWA Presidents, Secretaries, and colony caretakers covering 25 operational parameters including:

- Estimated daily generation of wet waste (kg/day)
- Level of household segregation compliance
- Type of decentralised treatment technology installed (e.g., compost pits, aerobic bins, bio-digesters)
- Operational frequency and maintenance practices
- Costs of installation and ongoing operations
- Arrangements for handling dry waste and recyclables

This tool enabled consistent comparisons across colonies while capturing key operational variables that affect system performance.

B PHYSICAL VERIFICATION OF INFRASTRUCTURE

A core component of the study involved direct inspection of the decentralised waste-processing infrastructure within each colony. Field teams assessed the presence, condition, and functionality of composting units and related infrastructure.

Indicators used to determine operational status included:

- Presence of fresh organic feedstock in composting units
- Evidence of active biological decomposition, such as heat, moisture, or steam
- Functioning leachate management systems
- Availability and quality of finished compost
- Signs of regular use versus abandonment
- Dry waste management infrastructure and system

This step of verification ensured that the study captured actual operational conditions, rather than relying solely on self-reported information.

C PHOTOGRAPHIC DOCUMENTATION

To ensure transparency and evidence-based reporting, geo-tagged photographs were collected during each site visit. Photographic documentation helped classify infrastructure into three categories:

- Operational: actively processing organic waste.
- Abandoned or non-functional: infrastructure present but not in use
- Non-existent: colonies designated as Zero Waste Colonies but lacking decentralised infrastructure.

These records provide visual verification of field findings and allow cross-checking of reported information.

D KEY INFORMANT INTERVIEWS

In-depth discussions were conducted with RWA leaders, caretakers, sanitation workers, and other colony-level stakeholders. These conversations helped uncover institutional, financial, and behavioural dynamics that influence the functioning of decentralised waste systems.

The interviews explored factors such as:

- Governance and decision-making within RWAs
- Financial arrangements for the installation and maintenance of infrastructure
- Resident participation and compliance with segregation rules
- Engagement with municipal authorities and private waste operators
- Operational challenges faced by caretakers and sanitation workers

By combining quantitative indicators with qualitative insights, the methodology helped develop a nuanced understanding of how decentralised waste systems function within residential communities.

Overall, the methodology reflects Chintan's field-oriented and systems-based approach, which seeks to understand and frame waste management not only as an infrastructure issue but also as a culmination of community behaviour, institutional support, and integration with recycling ecosystems.

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4 THE AS-IS SITUATION: FIELD REALITY OF ZERO WASTE COLONIES

4.1 Household Segregation Practices

Segregation of waste at source is the foundation of decentralised waste management. Without consistent separation of wet and dry waste at the household level, composting systems cannot function effectively, and recyclable materials cannot be recovered. The field assessment reveals that source segregation remains the single most significant behavioural bottleneck across Delhi's designated Zero Waste Colonies.

Across the 68 RWAs assessed, nearly half of the colonies reported negligible levels of segregation, with residents continuing to dispose of mixed waste despite repeated awareness campaigns (Table 2). Only a small minority of colonies demonstrated sustained compliance with segregation protocols.

Table 2: **Household Segregation Status Across RWAs (n = 68)**

Segregation Level	Definition	No. of RWAs	Percentage
Nil/Not Practiced	0–10% households	29	43%
Low	11–30% households	10	15%
Moderate	31–60% households	16	24%
High	61–90% households	8	11%
Very High	≥90% households	5	7%

The results indicate that 58 per cent of surveyed colonies fall within the nil or low segregation category, suggesting that the majority of designated Zero Waste Colonies are not achieving the basic behavioural shift required for decentralised waste management to function.

The field evidence revealed that segregation performance is not primarily determined by income levels, awareness campaigns, or the availability of infrastructure. Instead, the data shows that segregation outcomes are strongly influenced by local governance structures within RWAs and the presence of accountable monitoring systems.

Table 3: **Better-Performing Colonies in the Survey Sample**

Colony	MCD zone	Segregation	Composting status	Dry waste recovery	Key point
Anand Lok	City Sadar Paharganj (SP)	80%	Operational	60%	Strongest all-round example in the sample
Bharat Apartment, Mayur Vihar	Shahdara South	75%	2 Aerobins functional	0%	Functional wet waste composting
Green View Apartment, Rohini	Rohini	80%	Operational	0%	One of the few functional systems in the sample
Saraswati Apartment, Mayur Vihar	Shahdara South	75%	5 Aerobins functional	0%	Strong segregation with functional composting
Shakti Apartment, Rohini Sector 9	Rohini	85%	Present	0%	High segregation linked to active daily monitoring
Surya Kiran Apartment, Dwarka	Najafgarh	70%	Pit operational	0%	Functional pit composting system
Vardhaman Apartment, Mayur Vihar Phase I	Shahdara South	75%	3 Aerobins, fully functional	0%	Self-funded and fully functional model
Vasant Vihar C Block	South	80%	Aerobin + pit	90%	Highest dry waste recovery
Navjeevan Vihar	South	90%	10 Aerobins Functional in-colony composting	90%	Highest dry waste recovery
Vasant Vihar E Block	South	90%	4 Aerobins functional	60%	Highest segregation in the sample
Vasant Vihar Sector C, Pocket 7	South	70%	Functional	0%	Functional decentralised composting system

KEY OBSERVATIONS

Three clear patterns emerge from the field assessment:

- **Segregation is based on local initiatives.** The colonies where compliance with segregation is high (>60%) (Table 2), depend on one or two motivated individuals, often a community champion like RWA members, office-bearer or caretaker. When these individuals disengage, segregation practices tend to collapse rapidly.
- **Awareness campaigns alone are insufficient.** Without enforcement mechanisms, colony byelaws or regular monitoring, segregation rates decline progressively over time regardless of initial outreach efforts.
- **Success is possible across income levels and neighbourhood typologies.** Colonies with strong segregation performance exist in multiple zones and socio-economic contexts. What distinguishes them is not income or infrastructure alone, but the presence of accountable human systems that sustain daily waste management practices.

The findings suggest that behavioural compliance and governance mechanisms at the colony level are the critical determinants of decentralised waste management outcomes. Without strengthening these foundations, the Zero Waste Colony programme risks remaining a designation on paper rather than a functioning system of urban environmental stewardship.

Awareness, socio-economic privilege and access to infrastructure do not necessarily result in environmental stewardship. Local governance and grassroots efforts are significant determinants of a functional decentralised waste management system.

4.2 **Decentralised Composting Infrastructure**

Decentralised composting is the operational backbone of the Zero Waste Colony concept, as almost 50% of the waste generated is bio-degradable and can be composted. The programme's premise is that colonies can segregate organic waste and treat it locally through composting or bioprocessing systems. However, the field verification reveals that on-site treatment of household wet waste is the exception rather than the norm (Table 4).

Table 4: **Status of On-site Composting Infrastructure**

Composting Status	Description	No. of RWAs	Percentage
Not Present	No composting performed	25	37%
Present but non-functional	Infrastructure Installed but abandoned/defunct	19	28%
Garden Waste Only	Limited to leaf/green waste	15	22%
Operational (Wet Waste)	Actively processing household wet waste	9	13%

Across the 68 colonies surveyed, 37 per cent had no composting infrastructure, 28 per cent had infrastructure that was non-functional, 22 per cent used it only for horticulture waste, and only 13 per cent were actively processing household wet waste. This means that 88 per cent of surveyed colonies were not composting household kitchen waste on site.

From a compliance perspective, these findings indicate that most designated colonies do not meet the fundamental requirement of decentralised processing of biodegradable waste, which is central to the Zero Waste Colony model.

COMPOSTING TECHNOLOGIES AND INFRASTRUCTURE

The primary composting technologies observed across the surveyed colonies were:

- Pit composting units
- Aerobin systems
- Semi-automated Organic Waste Converters (OWCs)

Aerobin systems were the most widely observed composting technology, present in 19 RWAs (28 per cent), followed closely by pit composting units in 18 RWAs (26 per cent) and semi-automated OWCs in 6 RWAs (9 per cent). The study found that 25 colonies (37 per cent) had no composting technology present. Pit systems were more common in colonies with open space and parks, while Aerobins were typically found in mid- to high-income RWAs and were often installed through CSR-supported initiatives. OWCs were observed mainly in larger or premium residential societies. Across all three technologies, performance depended less on the equipment itself and more on trained operators, feedstock quality, routine monitoring, and maintenance support.

Table 5: **Existing Composting Technologies**

Composting Technology	Typical Context / Location	No. of RWAs where Present	Functional (Wet Waste)	Partially Functional (Garden / Raw Waste Only)	Non-functional/ Abandoned	Key Failure Observed
Pit Composting Units	Large campuses with parks (Sarita Vihar, Vasant Vihar, Lajpat Nagar clusters)	18 (26%)	3 (17%)	9 (50%)	6 (33%)	Anaerobic conditions due to no turning; cooked food excluded
Aerobin Systems	Mid-high income RWAs;	20 (29%)	4 (16%)	6 (32%)	10 (53%)	Incorrect feeding (no carbon layering), overload, no trained operator; odour
Semi-automated Eco Compost / OWCs	Premium societies, City Sadar Paharganj (SP), few of the South Delhi RWAs	5 (8%)	2 (40%)	0	3 (60%)	High OPEX, breakdowns, lack of AMC (annual maintenance contracts) & technical escalation, no in-house capacity
Absence of Composting Technology	Mostly East, North, parts of West & Central Delhi	25 (37%)	–	–	–	
Total		**68 (100%)**	**9 (13%)**	**15 (22%)**	**19 (28%)**	

Pit composting is a low-cost, nature-based composting method where segregated organic waste is deposited into masonry or earthen pits and allowed to decompose aerobically through periodic turning and moisture control. The process typically produces stable compost over several weeks and is well-suited for colonies with available open space.

Pit composting units were commonly found at larger residential campuses with green spaces, particularly in areas such as Sarita Vihar, Vasant Vihar, and Lajpat Nagar.

While technically robust and inexpensive, the performance of pit composting systems depends heavily on regular turning of the waste mass and consistent monitoring. Without daily or periodic turning, the composting process becomes anaerobic, producing foul odours from gases such as hydrogen sulphide and methane. Odour complaints from residents often lead to operational restrictions or shutdown of these systems.

In several colonies, pit composting units were therefore limited to processing leaf litter and garden waste, while household kitchen waste continued to enter the municipal waste stream and eventually ended up at landfills.

Aerobin units were the most widely deployed composting technology, installed largely through CSR initiatives. Aerobins are modular aerobic composting bins designed to process organic waste in enclosed systems, where controlled airflow and moisture conditions accelerate decomposition.

Operational outcomes varied considerably across the surveyed colonies:

- 3 colonies (16%) had functional Aerobin systems processing wet waste
- 10 colonies (53%) had non-functional units
- 6 colonies (32%) used the bins only for garden waste

The primary operational challenge observed was the absence of consistent management after installation. Aerobin systems require specific feeding protocols, including controlled loading of organic waste, layering with dry carbon materials such as cocopeat or dry leaves, and regular monitoring of moisture level. Despite technology and initial training, colonies seem to have stopped using these, possibly due to lack of oversight or shift in local leadership.

In many colonies, these operational practices were not sustained after the initial installation and orientation phase, leading to overloading, contamination with mixed waste, and eventual odour issues. It is possible that those trained may have ceased to be responsible for operations and oversight.

Semi-automated Organic Waste Converters are mechanised composting solutions designed to handle larger volumes of organic waste through shredding, mixing, and accelerated composting.

These systems were observed primarily in premium residential societies in City Sadar Paharganj (SP) Zone and select South Delhi RWAs.

OWCs have the advantage of processing higher volumes of organic waste in shorter timeframes, but they also involve higher capital costs and operational expenditures, including electricity consumption and regular technical maintenance.

Field observations indicate that these systems often face prolonged downtime due to relatively minor technical issues. In several colonies, machines had remained idle for more than 2 months because maintenance contracts were unclear or repair costs were disputed. While RWAs were reportedly willing to bear the one-time repair cost of Rs. 20,000-25,000, the greater challenge was the maintenance contracts with the company. None of the RWAs operating OWCs had in-house technical capacity to troubleshoot equipment malfunctions, making them dependent on external vendors.

Simply setting up waste management systems is not enough. Continuous maintenance and oversight are crucial to sustained success.

PIT COMPOSTING

AEROBON UNITS

SEMI-AUTOMATIC ORGANIC WASTE CONVERTER

As a result, these systems tend to function effectively only in very large residential complexes (gated communities with more than 350 households) with dedicated facility management teams and stable maintenance budgets.

Across all three systems, performance depended more on segregation quality, trained operators, regular monitoring, and maintenance support than on the equipment itself. Pit systems often failed because of poor turning and odour. Aerobins often became unusable because of incorrect feeding, overloading or lack of follow-up after installation. OWCs faced downtime because of high operating costs, breakdowns, and weak maintenance arrangements.

Approximately 20 colonies (26%) had composting infrastructure installed but were no longer operational. The most common examples included:

- Aerobin units that were sealed and left unused by the RWA
- Composting pits that stopped receiving organic waste
- Organic Waste Converters (OWCs) awaiting repair for extended periods

In Vasant Apartments, Mayur Vihar, Aerobin units were found filled with plastic bottles and inert material, indicating that segregation practices had collapsed and the infrastructure had effectively become unusable.

In several colonies in West and North Delhi, Aerobins had been repurposed as temporary storage for garden waste, demonstrating how quickly infrastructure can collapse when operational oversight weakens.

The MCD has not built in penalization for non-compliance or wasting resources.

USED FOR HOUSEHOLD WET WASTE

Only **9 of the 68 colonies surveyed (13 per cent)** were actively processing household wet waste through decentralised composting. These colonies were:

- Anand Lok
- Bharat Apartment
- Navjeevan Vihar
- Saraswati Apartment
- Surya Kiran Apartment
- Vardhaman Apartment
- Vasant Vihar A Block
- Vasant Vihar C Block
- Vasant Vihar D Block

These cases show that decentralised composting can function when there is a trained operator, active RWA or NGO oversight, clear feedstock management, and regular use of compost within the colony.

These examples are important because they show that decentralised composting can function when supported by a similar set of enabling conditions:

- a trained staff member responsible for day-to-day operations
- strong oversight by the RWA or an NGO
- clear segregation and feedstock management practices
- use of compost for the colony's landscaping or gardens

Anand Lok has around 80 per cent segregation, operational composting, and around 60 per cent dry waste recovery. Vardhaman Apartment is notable because it funded its composting system through colony maintenance resources rather than CSR or municipal support. Navjeevan Vihar undertakes community-led zero-waste with organized in-colony composting and an RRR Centre. Vasant Vihar undertakes high levels of segregation, wastepicker integration and composting in different locations close to the generation point. These cases suggest that success depends not on a specific technology, but on local governance, disciplined operations, and continuity of effort.

USED ONLY FOR HORTICULTURE WASTE

In **15 of the 68 colonies surveyed (22 per cent)**, composting infrastructure was present and technically functional but used only for leaf litter, garden trimmings, and horticulture waste rather than for daily household kitchen waste. This represents only a very partial implementation of the Zero Waste Colony model. While such systems do reduce green waste going to landfill, they do not address the main challenge of processing household wet waste, which forms the bulk of biodegradable waste in residential colonies.

Examples of colonies in this category include:

- IB Block, Keshavpuram
- NFC Ashoka Park
- Oberoi Apartments
- Sarita Vihar A-Pocket
- Sarita Vihar L-Pocket

In these colonies, food waste, cooked waste, and kitchen organics continued to enter the municipal collection stream even where composting units were present. This shows that infrastructure can exist without delivering the intended environmental outcome.

KEY OBSERVATION

The findings indicate that Delhi's decentralised composting gap is not only an infrastructure gap. It is equally a usage and operations gap. Many colonies either lack systems, do not use installed systems or use them only for horticulture waste. Across all three categories, the evidence suggests that sustained functionality depends on trained manpower, segregation discipline, RWA ownership, and post-installation support. Without these, even well-designed composting systems tend to become underused, restricted to garden waste or abandoned entirely.

4.3 Dry Waste Recovery Systems

Dry waste recovery is a critical component of decentralised waste management. While composting addresses the biodegradable fraction of municipal waste, systematic recovery of dry waste, particularly plastics, paper, metals, and packaging, is essential to prevent recyclable materials from entering the mixed waste stream. Effective dry waste management reduces landfill burden, supports recycling economies, and prevents combustible materials from contributing to landfill fires.

Among the 68 RWAs assessed, 90 per cent lacked a Material Recovery Facility (MRF) or a Reduce–Reuse–Recycle (RRR) centre (as indicated in Table 5). Dry waste recovery is primarily driven by wastepickers, who operate as informal entrepreneurs and play a critical role in resource recovery. This opens an opportunity for implementing the SWM Rules, 2026 which mandates inclusion of wastepickers.

Our field assessment identified several critical gaps in dry waste recovery across Delhi. The most significant gap was the absence of structured recovery systems for low-value recyclables. It was observed that waste pickers and informal recyclers recover significant quantities of dry waste from residential areas, particularly high-value materials like paper, cardboard, metals, PET plastics, and glass. While some of this is not of high value, it is at least re-usable, which they take home. However, materials such as multilayer plastics, flexible films, sachets, and small mixed plastic items remain largely unaddressed, as informal recyclers find them economically unviable and Extended Producer Responsibility (EPR) systems currently do not include wastepickers.

In the absence of adequate inclusion of wastepickers, including in the EPR chain, low-value plastics reach landfill sites, where they contribute to fire risk. Plastics and packaging waste in particular act as a combustible layer within landfill piles, intensifying fire incidents and prolonging smouldering emissions.

Table 6: **Dry Waste Recovery Performance**

Dry Waste Recovery Level	No. of RWAs	Percentage
No Recovery Infrastructure	61	90%
Partial/Informal Recovery	4	6%
Structured/Functional Recovery	3	4%

Only a few colonies demonstrated structured dry waste recovery systems: Anand Lok (August Kranti Marg, Central Delhi), achieved approximately 60 per cent diversion of dry waste. Navjeevan Vihar, Vasant Vihar A and C Block managed around 90 per cent of dry waste recovery.

These colonies achieved these outcomes through long-term integration with informal recyclers, supported by designated storage spaces for segregated dry waste and clear operational arrangements. Waste collectors in these colonies play a key role in maintaining segregation discipline and ensuring that recyclable materials are channelled into appropriate recycling streams.

Wastepickers play a key role in recycling and maintaining segregation discipline. Inclusion and integration of informal wastepickers can streamline waste management and reduce what ends up in landfills.

These examples demonstrate that structured dry waste recovery is feasible within residential colonies, but it requires deliberate organisation and sustained engagement with recycling actors. The findings also highlight the importance of informal wastepickers and small-scale recyclers, who form the backbone of India's recycling economy. When these actors are recognised and integrated into colony-level systems, recovery rates improve significantly.

In the absence of RRR centres at the community level, Material Recovery Facilities at the colony, ward or zone level, or supporting mechanisms such as EPR partnerships, managing low-value plastics remains practically unviable. With no recovery channel available, these low-value plastics inevitably accumulate in landfills, contributing to fire risk and environmental pollution.

Strengthening this component will require not only infrastructure such as storage spaces and RRR centres, but also systematic integration of informal recyclers, clear operational protocols within RWAs, and stronger linkages to recycling markets and EPR systems. The SWM Rules, 2026, offers this opportunity.

4.4 Availability of Space for Infrastructure

A commonly cited constraint to decentralised waste management in dense urban areas is the lack of space for waste-processing infrastructure. However, the field assessment suggests that this assumption does not hold true for the majority of Delhi's designated Zero Waste Colonies.

Among the 68 RWAs assessed, 66 colonies (approximately 97 per cent) reported having adequate space to accommodate decentralised waste management infrastructure. Most of the residential colonies surveyed, particularly those in middle- and upper-middle-income neighbourhoods, have parks, landscaped gardens or utility areas that can accommodate composting units of varying sizes and technologies (Table 7).

In many cases, these spaces were already being used for horticultural activities, storage of garden waste or other maintenance purposes, indicating that they could reasonably support decentralised composting systems with minimal structural modification. Only a very small number of colonies reported significant spatial limitations that would constrain the installation of such infrastructure.

Table 7: **Availability of Space for Infrastructure**

Infrastructure Space	No. of RWAs	Percentage
Adequate	66	97%
Limited	2	3%

The findings therefore challenge the widely held perception that urban spatial constraints are the primary barrier to decentralised waste management in Delhi's residential colonies. The assessment indicates that the limiting factors lie elsewhere.

Where decentralised waste systems were not functioning effectively, the underlying constraints were organisational and operational rather than spatial. These include the absence of trained personnel, unclear operational responsibilities within RWAs, weak segregation discipline among residents, and insufficient financial provision for maintenance and upkeep.

The findings have important implications for policy and programme design. Since space availability is not a major constraint in most residential colonies, expanding decentralised waste management in Delhi will require less focus on installing infrastructure and greater emphasis on governance, operations, and sustained support systems (trained and paid operators, Standard Operating Procedures (SOPs), post installation technical support, compost procurement, etc). Operationalising the Solid Waste Management Rules, 2026, should therefore prioritise clear accountability within RWAs, training of operational staff, and financial arrangements for long-term maintenance. Based on field observations, functional decentralised waste systems in Delhi require annual operational budgets of approximately ₹2–5 lakh per colony (covering operator salary, maintenance, and consumables).

In practical terms, decentralised waste management in Delhi is not limited by where infrastructure can be placed, but by how effectively it is managed once installed. Strengthening these institutional and operational frameworks will be essential to convert available space into functioning, long-term waste management systems that result in real landfill diversion and air quality improvement benefits.


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5 BARRIERS IN THE FUNCTIONING OF RWAs

Field observations across the 68 RWAs assessed reveal a consistent set of systemic barriers that cut across zones, income levels, and technology types. Some regional variations exist: RWAs in South Delhi and South-West Delhi were somewhat more likely to have operational or partially operational systems, whereas colonies in North, Central, and parts of East and West Delhi more frequently lacked functional infrastructure or operational continuity. Despite these variations, the underlying barriers were broadly similar across the city. Variations appear to reflect differences in local facilitation, active engagement by RWAs, CSR involvement, and NGO presence, rather than any differences in willingness among residents or limitations of physical space. The assessment identifies several structural factors that explain why many decentralised waste systems remain under-utilised or dysfunctional despite infrastructure investments.

5.1 Feedstock Quality and Segregation Discipline

Poor feedstock quality and the absence of segregation discipline undermine composting performance across all technology types. The primary technical causes were excess moisture and insufficient aeration. During and after the monsoon season, kitchen waste already contains high water content and open or poorly covered systems become waterlogged. Compacted or waterlogged conditions displace oxygen, causing the pile to shift from aerobic to anaerobic decomposition. Anaerobic decomposition produces hydrogen sulphide (the “rotten egg” smell) and ammonia, which are the odours that are commonly complained about. In pit composting systems specifically, waterlogging is a structural risk when drainage is inadequate or the pit is located in low-lying areas. Correct composting requires a carbon-to-nitrogen (C:N) ratio of approximately 25—30:1. This means that for every bucket of nitrogen-rich “green” material (kitchen waste, grass clippings), at least two buckets of carbon-rich “brown” material (dry leaves, shredded cardboard, sawdust) must be added to absorb moisture and maintain airflow (Cornell Composting, FAO). When colonies lacked trained operators who understood this balance, systems predictably failed regardless of technology type.

5.2 **Trained Human Resources and Operational Ownership**

The successful operation of decentralised composting systems is consistently associated with the presence of a trained and accountable individual responsible for daily operations. In practice, this role requires someone who understands composting as a biological process that demands regular monitoring, physical intervention, and adaptive management. A trained operator is not merely a caretaker, but rather the first line of defence against system failure.

- **KEY TRAINING AREAS**
  - Feedstock Management and Segregation Enforcement
  - Compost Maturity and Output Quality
  - Resident Engagement and Behavioural Reinforcement
  - System-Specific Operations:
    - Understanding the design logic and specific operational requirements of the installed technology, whether pit composting, drum composting, Aerobin or biodigester
    - Recognising structural vulnerabilities, such as drainage management, odour diagnosis and management
    - Moisture and Aeration Control
    - Knowing when to escalate a technical issue beyond routine management

In approximately 10 observed instances, composting units—particularly Aerobins and pit systems—were informally assigned to gardeners, security personnel or waste collectors without any training in composting practices. In such cases, the units were treated as storage containers rather than active biological systems, leading to rapid operational decline. It was noted that MCD did not set up a Zero Waste Unit to support its own efforts.

The absence of Standard Operating Procedures (SOPs) represents a critical institutional gap. None of the assessed colonies had written operational guidelines accessible to caretakers or sanitation staff. As a result, when a trained operator leaves—which is common in residential complexes—the composting system collapses. This lack of documented processes significantly undermines the sustainability of decentralised waste systems.

Composting is a biological process that requires regular monitoring, physical intervention and adaptive management. In the absence of routine oversight by trained individuals, the system collapses.

5.3 **Post-installation Support and Monitoring**

Most composting installations were implemented through what might be described as a "project mode" approach, a common pattern in infrastructure-led programmes where a system is commissioned, handed over to the RWA, and the implementing partner steps back with limited structured provisions for follow-ups. In several non-functional colonies, RWA representatives noted that while initial commissioning was accompanied by training, subsequent technical challenges arose without accessible support channels. The gap between installation and sustained operation emerged as a systemic pattern rather than an isolated failure.

The early operational phase of composting systems is typically the most technically demanding, and challenges such as managing moisture levels in pits, responding to Aerobin performance issues, or addressing odour complaints from residents tend to emerge within the first few weeks or months. In most of the non-functional colonies assessed, these challenges coincided with the withdrawal of installation-phase support, leaving RWAs without access to timely technical guidance at crucial moments.

In contrast, colonies that benefited from sustained engagement by NGOs or CSR partners were far more likely to maintain operational systems. The most successful colonies in the study all received ongoing technical support well beyond the installation phase.

This pattern indicates that post-installation engagement is not a marginal support activity but a prerequisite for stabilising composting systems during their early operational period.

5.4 Institutional and Incentive Gaps undermining Programme Delivery

The Sahabhagita Scheme[8] was first introduced by MCD in 2022 as part of the Swachh Delhi Abhiyan, an umbrella initiative launched in September 2022. A modified version of the scheme was formally launched on 6 January 2023 (celebrated as Sahabhagita Diwas), following an MoU signed between MCD and URJA (United Residents Joint Action Group, representing over 2,500 RWAs in Delhi). Under the modified scheme, RWAs and Group Housing Societies are eligible for a 10% incentive equivalent to the property tax collected by the RWA (up to ₹1 lakh) for development work, contingent on 90% property-tax compliance among their residents. An additional 5% rebate is available for RWAs that achieve 100% waste segregation at source, in-colony composting of wet waste, recycling of all recyclable dry waste, and handover of remaining dry waste to MCD or authorised agencies. As of mid-2025, MCD reports 338 Sahabhagita colonies. The ₹1 lakh cap on development works was reportedly removed in 2025.

The scheme's eligibility criterion requiring RWAs to ensure 90% property-tax compliance among individual residents, was widely cited by RWAs as unworkable during our interviews. RWAs have no legal authority to compel residents to pay property taxes. It is solely the responsibility of individual property owners and is enforced by MCD's own tax department. Only about 1 per cent of the RWAs in the sample reported receiving any incentive payment.

A proper incentive structure directly linked to measurable environmental outcomes such as verified composting volumes, segregation rates and landfill diversion would motivate RWAs to participate in decentralised waste management.

As a result, the incentive mechanism has not functioned as an effective motivator for decentralised waste management. For the scheme to deliver meaningful results, eligibility criteria would need to be simplified, and payments would need to be timely, transparent, and directly linked to measurable environmental outcomes - such as verified composting volumes, segregation rates, and landfill diversion, rather than administrative preconditions beyond the control of residential associations.

Overall, the assessment indicates that the suboptimal performance of Zero Waste Colonies is driven less by infrastructure deficits and more by systemic operational and institutional gaps. Addressing these barriers will require strengthening operational capacity within RWAs, improving technical support mechanisms, and aligning policy incentives with verifiable performance outcomes. Another systemic constraint is MCD's own institutional capacity for overseeing decentralised waste management at scale. The corporation currently plays a primarily administrative role in the Zero Waste Colony programme, focused on designation and incentive disbursement. It lacks a dedicated technical cell for monitoring operational performance across the 676+ designated colonies. With its existing staffing and organisational structure, MCD does not have the bandwidth to conduct periodic physical verification of composting systems, provide troubleshooting support or enforce performance standards at the colony level. Addressing this gap will require either building dedicated internal capacity within MCD through a decentralised waste management vertical or Programme Management Unit, or formally delegating this function as a paid assignment to a group of credible NGOs operating under a structured MCD partnership framework.

6 IMPLICATIONS FOR AIR POLLUTION AND LANDFILL FIRE RISK

The findings of this assessment have direct and measurable implications for Delhi's air pollution mitigation agenda. When decentralised waste treatment fails, which is the case for 88 per cent of the assessed designated colonies, mixed waste continues to enter the municipal waste stream. It ultimately reaches landfill sites, where it contributes to methane generation, landfill fires, and open burning.

In this context, the Zero Waste Colony programme, as currently implemented, is not delivering air-quality benefits at scale, despite its conceptual alignment with Delhi's clean-air objectives. When wet waste is not segregated and treated locally, it becomes part of the combustible load that accumulates at landfill sites such as Ghazipur, Bhalswa, and Okhla, increasing the likelihood of fires and the release of particulate matter, toxic gases, and greenhouse gas emissions. This becomes particularly concerning, given that biomass burning, including municipal solid waste, contributes an estimated 17–23 per cent of Delhi's PM 2.5 levels in winter, making it a significant and preventable source of air pollution.

The implications become clearer when considering the potential scale of impact. If the 676 designated Zero Waste Colonies were performing at the level demonstrated by the eight fully operational RWAs in this study—processing household wet waste at source while recovering recyclable dry waste—the volume of mixed waste transported to Delhi's landfill sites would decline substantially. Even a modest estimate suggests that hundreds of tonnes of organic waste could be diverted daily, significantly reducing the combustible material that fuels landfill fires. This is critical, as landfill sites are already prone to fire risks due to methane generation and spontaneous combustion, particularly during high-temperature periods. Improved recovery of recyclable materials would further reduce the accumulation of plastics, paper, and packaging waste that intensifies smouldering fires and toxic emissions.

Such a shift would yield measurable reductions in methane emissions, particulate matter, and greenhouse gas emissions from Delhi's major landfill sites. It would also reduce emissions from open waste burning, which currently occurs when mixed waste accumulates due to gaps in structured waste collection and processing systems, contributing to both city-wide and hyperlocal air pollution.

From this perspective, decentralised composting must be recognised as an essential component of Delhi's air pollution control strategy. This is further reinforced by the fact that secondary particulate matter, formed from gases released during combustion processes including waste burning accounts for as much as 27 per cent of PM2.5 in winter, amplifying the overall pollution burden. It should be treated as core air pollution control infrastructure, comparable in policy importance to vehicular emission standards, industrial emission monitoring, and dust suppression measures.

For decentralised waste management to contribute meaningfully to clean-air outcomes, it cannot remain an optional community waste management activity or a symbolic designation without performance verification. It requires operational accountability, sustained oversight, and integration into the city's broader environmental management framework.

The Solid Waste Management Rules, 2026, acknowledges this connection by mandating segregation and decentralised waste processing at the level of residential colonies and bulk waste generators. Effective implementation of these provisions will therefore be critical not only for improving waste management outcomes but also for reducing the air pollution burden associated with landfill fires and open burning in Delhi.

Several assessed areas, including Keshav Puram, Sarita Vihar, Civil Lines and Karol Bagh, reported more than 10 fire incidents, indicating that waste burning is recurrent rather than isolated. These areas also showed weak source segregation and poor decentralised wet waste processing. Civil Lines and Karol Bagh reported nil segregation in the sampled colonies, while Keshav Puram and Punjabi Bagh reported segregation levels below 10 per cent. By contrast, Vasant Vihar, which included some of the better-performing colonies in the sample, reported only one fire incident. While this does not establish causality, it suggests that areas with weak segregation and poorly functioning composting systems may be more vulnerable to repeated waste burning.

Areas with weak segregation at source and poorly functioning composting systems are more vulnerable to repeated waste burning. Since open burning and landfill fires are significant contributors to emissions, decentralised composting is bound to reduce air pollution.

In most of the higher-fire areas, composting systems were either absent or restricted to garden waste, reinforcing the finding that infrastructure alone is not enough; what matters is whether wet waste is actually being segregated and processed within the colony. Table 8 provides linkages between fire incidence, segregation levels, composting status, and selected waste-burning characteristics across the assessed areas.

Table 8: **Link Between Fire Incidence and Waste Management**

Area	Fire Incidents Reported	Presence of Paper/Plastic being burned (%)	Segregation (%)	Composting System Status
Keshav Puram	19	26.30%	Less than 10%	Composting infrastructure exists, but is underutilised and does not handle the main household waste stream.
Sarita Vihar	15	93.30%	Less than 10% - 60%	Restricted to low-volume garden waste or completely absent, with no processing of daily household wet waste.
Civil Lines	12	58.30%	Nil	Not Present
Karol Bagh	11	9.10%	Nil	Not Present
Rohini	8	Variable	Nil - 85%	Largely absent or non-operational, with only limited presence of functional systems.
Mayur Vihar	3	100.00%	Nil - 75%	Mix: Aerobins (some functional, many non-functional)
Punjabi Bagh	2	0–100%	Less than 10%	Not Present
Vasant Vihar	1	100.00%	90%	Mostly functional, Aerobin, Pit (some functional)

7 INSIGHTS AND RECOMMENDATIONS

7.1 Lessons from Functional Zero Waste Colonies

The assessment of the small number of functional Zero Waste Colonies provides practical lessons for strengthening decentralised waste management across Delhi. The field evidence shows that success is not determined by the type of composting technology alone. Pit systems, Aerobins and mechanised Organic Waste Converters were found to function in some locations and fail in others. What distinguishes functioning colonies is the presence of clear governance, routine operational capacity, and sustained support systems around the infrastructure.

Across the RWAs that were actively composting household wet waste and recovering dry waste, several enabling factors were consistently observed as follows:

A GOVERNANCE AND LEADERSHIP

A clear governance structure within the RWA emerged as an important feature of better-performing colonies. In these colonies, waste management was treated as a standing responsibility of the association rather than an occasional voluntary activity. Office bearers remained involved in oversight, reviewed performance periodically, and ensured continuity even when individual caretakers or workers changed.

Three governance features were particularly visible in functional colonies:

- **Leadership and accountability.** Functional colonies had clear oversight by RWA office bearers or committees. Waste management was monitored as a recurring service function, with visible responsibility for segregation, composting and dry waste handling.
- **Continuity in decision-making.** Colonies with stable leadership or established committee systems were better able to sustain routine practices over time. Continuity helped maintain segregation discipline and prevented systems from collapsing when one motivated individual disengaged.
- **Institutionalisation of roles.** The stronger colonies did not rely entirely on informal initiative. They had defined responsibilities, basic operating routines, and some continuity of record-keeping. This is better understood as institutionalisation of practice at the colony level rather than abstract governance.

These findings suggest that decentralised waste systems are more likely to endure when waste management is embedded within routine colony administration, rather than being left to ad hoc volunteerism. This is consistent with the broader findings of the report, which show that weak segregation, lack of role clarity and absence of trained staff are major causes of system failure.

B OPERATIONAL CAPACITY AND SYSTEM MANAGEMENT

A second lesson from functioning colonies is that decentralised waste management requires day-to-day operational capacity. The system works when somebody is responsible for checking feedstock, managing moisture and odour, maintaining composting units, coordinating dry waste handling, and keeping basic records. Where this operational layer was absent, systems deteriorated quickly even when infrastructure was available.

Functional colonies showed four recurring operational features:

- **Trained operators or caretakers.** The presence of a trained person was one of the clearest differentiators between functioning and non-functioning systems. Operators played a practical role in checking feedstock, composting operations, troubleshooting, and incorporating resident feedback. RWAs should budget explicitly for operator salaries as a non-negotiable operational cost estimated at ₹8,000–₹12,000 per month for a part-time operator in Delhi's current market.
- **Regular monitoring of segregation.** Better-performing colonies did not rely on awareness alone. They used daily observation, caretaker feedback, or committee oversight to maintain household-level segregation.
- **Defined operating practices.** Even simple systems worked better when there were established routines for collection, feeding, turning, moisture control, use of dry leaves or bulking material, and removal or use of finished compost.
- **Integration of dry waste recovery into colony operations.** In the better-performing colonies, dry waste did not remain outside the system. Space, collection points and working arrangements were created for sorting and recovery, often with the involvement of informal waste workers. For wastepickers, performance-linked payments for low-value plastic recovery would provide income supplementation, while incentivising diversion.

Any structured support programme designed by MCD or NGO partners must include remuneration frameworks as a core element, not an afterthought.

These lessons are important because the wider report shows that most colonies were not composting household wet waste on site. Household segregation remained weak, and dry waste recovery was largely informal and unsupported. The contrast between functional and non-functional colonies therefore lies less in equipment and more in routine system management.

C INCENTIVES, PROCUREMENT AND EXTERNAL SUPPORT

A third lesson is that recognition alone is not enough. The Zero Waste Colony label has helped generate visibility, but without periodic verification, it cannot serve as a reliable

indicator of performance. The field evidence indicates that recognition must be tied to verifiable outcomes, and that sustained composting also depends on practical incentives, remuneration, and market linkages.

Three enabling factors stand out:

- **Performance-linked recognition.** The designation should reflect actual performance, not one-time installation or declaration. Periodic physical verification is needed to ensure that colonies continue to segregate, compost, and recover dry waste.
- **Compost offtake and procurement.** Functional composting requires an outlet for the material produced. Procurement by MCD and other public agencies for parks, horticulture, avenue plantations and landscaping can serve as an incentive for colonies to continue processing wet waste. In this sense, the quantity of compost produced is not only a technical indicator but also a procurement-linked performance indicator.
- **Sustained external support.** In several functioning cases, NGOs or other support agencies played a stabilising role through training, troubleshooting, handholding and community engagement. This support should not be treated as voluntary goodwill alone. When such organisations are engaged in programme delivery, their role, scope of work and remuneration should be clearly defined.

A more nuanced conclusion is that financial contribution alone does not guarantee performance, but that colonies require predictable operational support, reliable incentives, and viable compost offtake arrangements for decentralised systems to be sustainable.

D MEASURING PERFORMANCE MORE CLEARLY

Recognition mechanisms must be complemented by incentive structures that are simple, transparent and linked to measurable outcomes. A redesigned incentive framework may therefore be based on:

- **Verified household segregation levels,** assessed through periodic spot checks by an empanelled private organisation using a standard checklist.
- **Quantity of wet waste processed within the colony,** measured through simple input-output records maintained by the operator or RWA and verified during periodic audits. Composting reduces organic waste to approximately 30–40% of its original volume through decomposition and moisture loss. Compost output can therefore serve as a reverse proxy for waste processed, simpler to measure and verify the gaps
- **Quantity of compost produced and procured:** In addition, regular lifting, use, or purchase of compost by MCD or other public agencies should be treated as an incentive-linked performance indicator. Inability to produce compost of adequate quantity and quality for use or procurement should be taken as evidence that decentralised composting is not functioning effectively.
- **Dry waste recovery from the colony,** should be recorded by the person or entity receiving and handling the segregated dry waste at the colony level, such as the operator, wastepicker, recycler, or aggregator. The point of recording should be the colony's designated collection, sorting, or handover point, including an RRR centre where available.

- **Reduction in reject waste sent to municipal collection,** so that concessionaires are progressively limited to lifting only residual non-recyclable and non-compostable waste.

Tracking of dry waste recovery should be based on records maintained at the colony level by the operator, wastepicker group, recycler, or aggregator receiving material from the colony. In practical terms, this means recording the quantity of dry waste sorted and handed over from the colony collection point or RRR space, rather than relying only on municipal transport records.

Special attention is needed for low-value plastics, which are often left out of existing recovery systems because they have little or no resale value. A targeted incentive may therefore be introduced for recovery of such materials, supported by:

- a minimum recovery threshold for eligibility
- direct per-kilogram payments to wastepickers or collection workers handling this stream
- ward or zone level aggregation arrangements
- onward linkage to authorised channels such as EPR systems, co-processing facilities, or other approved end-users.

E IMPLICATION FOR PROGRAMME DESIGN

Overall, the lessons from functional colonies show that decentralised waste management cannot be strengthened through infrastructure provision alone.

The programme requires three linked elements: RWA/colony-level governance, trained operational capacity, and sustained incentives with external support. If these conditions are built into programme design, the Zero Waste Colony initiative can move from symbolic designation to verified environmental stewardship.

7.2 **Recommendations**

The field assessment of 68 designated Zero Waste Colonies across Delhi indicates that the current framework is not achieving decentralised waste management at scale. While the initiative has expanded formal coverage and created symbolic recognition, these designations have not translated into institutionalised, verifiable, performance-based outcomes.

The evidence reveals a consistent pattern across zones. Physical space is largely available, composting technologies are well established, and successful community models already exist within the city. Yet, the programme has struggled to produce consistent results because governance structures, operational systems, and incentive mechanisms remain misaligned with the intended outcomes of decentralised waste management.

The assessment also confirms that decentralised waste management, when implemented effectively, can play a meaningful role in reducing landfill dependency, preventing open burning and associated air pollution, and lowering methane emissions associated with landfill fires.

Based on the field evidence, the following recommendations are presented for the consideration of the Municipal Corporation of Delhi (MCD) and other stakeholders.

A RECOMMENDATIONS FOR THE MUNICIPAL CORPORATION OF DELHI (MCD)

The evidence points to several structural gaps in how MCD designs, supports, and monitors the Zero Waste Colony programme. Addressing these gaps requires changes at the institutional and programmatic level.

- **Convert the Zero Waste Colony framework from designation-based to performance-based.**
  Zero Waste status should be retained only where periodic physical verification confirms segregation, wet waste processing, dry waste recovery, and minimal reject waste.
- **Redesign the Sahabhagita scheme around measurable waste outcomes.**
  The present design has little operational value. Only 1 per cent of surveyed RWAs reported receiving any incentive. Incentives should be linked to verified segregation, wet waste processed, compost produced and procured, dry waste recovered, and rejected waste reduced.
- **Establish a dedicated decentralised waste management cell.**
  MCD should create a dedicated unit or Programme Management Unit to oversee implementation, monitoring, data management, technical support, and field verification.
- **Institutionalise post-installation support.**
  All certified colonies should receive structured technical support, refresher training, troubleshooting, and periodic audits through empanelled technical agencies or other contracted support organisations.
- **Use compost procurement as an incentive and verification mechanism.**
  Compost procurement by MCD and other public agencies should be linked to colony performance. Inability to produce compost of adequate quantity and quality for regular use or purchase should be treated as evidence of non-functional wet waste processing.
- **Create ward and zone level compost aggregation systems.**
  MCD should enable compost from multiple colonies to be pooled, quality-checked, and supplied for parks, horticulture, avenue plantations, and civic landscaping.
- **Restrict concessionaire lifting to reject waste from compliant colonies.**
  In colonies practising segregation, composting, and dry waste recovery, municipal collection should progressively be limited to non-recyclable and non-compostable rejects.
- **Support decentralised systems through pollution abatement and landfill-diversion funds.**
  Given the direct relationship between landfill-bound organic waste, methane generation, landfill fires, and air pollution, such funds should be used for composting support, operator training, dry waste recovery infrastructure, aggregation, and monitoring.
- **Prioritise decentralised systems in budget planning.**
  Available strategic analysis for Delhi indicates operating expenditure of about ₹687 per tonne for decentralised systems compared with about ₹912.65 per tonne for centralised systems. Decentralised systems should therefore be treated as both an environmental and a cost-saving measure.

B RECOMMENDATIONS FOR RWAS

Several of the most significant factors determining whether a colony's waste system functions or fails lie within the direct control of the Resident Welfare Association. Field evidence from high-performing colonies consistently points to the same enabling conditions at the RWA level.

- **Treat waste management as a standing institutional responsibility.**
  RWAs should create a designated committee or office-bearer responsible for decentralised waste management, with regular review and reporting.
- **Enforce segregation through routine monitoring.**
  With 43 per cent of surveyed RWAs reporting negligible segregation, daily or weekly compliance monitoring should be institutionalised through caretakers, resident feedback systems, or building-level supervision.
- **Engage trained operators through one of two models.**
  Since 88 per cent of colonies had no trained operator, RWAs should adopt either:
  - **Model A: Ward-level mobile operators:** MCD trains a cadre of composting operators who are deployed across colonies within a ward on a rotation basis. Each operator services multiple colonies per week, managing composting systems, troubleshooting issues, and harvesting finished compost. MCD collects and retains the compost produced for use in civic horticulture and parks.
  - **Model B: Colony-owned composting with MCD offtake:** Individual RWAs employ and manage their own trained operator. MCD enters into a simple compost purchase agreement with qualifying colonies, buying finished compost at a fixed rate per kilogram. This model rewards operational performance with a revenue stream and creates a financial incentive for RWAs to maintain high-quality systems.
- **Adopt written operating procedures.**
  RWAs should maintain simple SOPs covering collection, feedstock checking, bulking material use, moisture control, odour management, compost curing, dry waste handling, and record-keeping.
- **Integrate informal waste workers into colony systems.**
  RWAs should provide designated sorting or collection space and formalise working arrangements with wastepickers, recyclers or aggregators already recovering materials from the colony.
- **Maintain auditable records.**
  Colonies seeking certification or incentives should record segregation compliance, wet waste processed, compost produced, compost used or sold, dry waste recovered, low-value plastic handed over, and reject waste sent to municipal collection.

C THEMATIC RECOMMENDATIONS

A final set of recommendations addresses systemic gaps that span both MCD and RWAs, and require coordinated action beyond the colony level.

- **Recognise decentralised waste management as core environmental infrastructure.**

Decentralised composting should be treated as part of Delhi's landfill-reduction and air-pollution mitigation strategy, not merely as a sanitation initiative.

Pollution abatement funds should be used to support decentralised composting and dry waste recovery systems, given their direct relevance to landfill diversion, methane reduction, fire prevention, and air pollution control. Release and continuation of such support should be linked to periodic monitoring, physical verification, and outcome-based reporting.

- **Make procurement central to programme design.**
  Compost purchase and use by public agencies should be built into the system as both an incentive and a test of actual processing performance.
- **Create a targeted mechanism for low-value plastic recovery.**
  Since low-value plastics are rarely recovered through existing market systems, MCD should introduce modest recovery incentives, aggregation arrangements, and end-linkages through authorised channels.
- **Fund the human systems required for decentralisation.**
  Operators, wastepickers, recyclers, field monitors, and technical support organisations should be recognised as essential components of programme delivery and remunerated accordingly.
- **Shift reporting from infrastructure counts to waste diversion outcomes.**
  Programme reporting should measure wet waste diverted, compost produced and procured, dry waste recovered, and reject waste reduced, rather than only counting installed assets or designated colonies.

ANNEXURE 1:
LIST OF RWAS VISITED

#	RWA/Colony	MCD Zone	HH	Segregation	Composting Status	Dry Waste	Space
1	B.M. Rohtagi Apartment, City SP	City Sadar Paharganj (SP) Zone	200	Nil	Present (non-functional)	0%	Adequate
2	DMRC Officers Flat, City SP	City Sadar Paharganj (SP) Zone	120	50%	Present (non-functional)	0%	Adequate
3	Lal Quarters CPWD, Press Road City SP	City Sadar Paharganj (SP) Zone	500	Nil	Not Present	0%	Adequate
4	Oberoi Apartment, City SP	City Sadar Paharganj (SP) Zone	150	70%	Garden waste only	0%	Adequate
5	Radio Colony, Dheerpur, Civil Lines	Civil Lines Zone	375	Nil	Not Present	0%	Adequate
6	Mall Apartment, Mall Road, Civil Lines	Civil Lines Zone	100	Nil	Not Present	0%	Adequate
7	LIG Flat, Prasad Nagar	Karol Bagh Zone	150	Nil	Not Present	0%	Adequate
8	Karmapura, Karol Bagh B Block	Karol Bagh Zone	300	Nil	Not Present	0%	Adequate
9	Block 14A, Western Extension, Rajendra Nagar	Karol Bagh Zone	80	Nil	Not Present	0%	Adequate
10	Western Extension Area, Karol Bagh	Karol Bagh Zone	227	Nil	Not Present	0%	Adequate
11	9A WEA, Rajendra Nagar	Karol Bagh Zone	350	Nil	Not Present	0%	Adequate

#	RWA/Colony	MCD Zone	HH	Segregation	Composting Status	Dry Waste	Space
12	IB Block, Keshavpuram	Keshavpuram Zone	120	<10%	Aerobin (garden waste)	0%	Adequate
13	Milap Apartment, Keshavpuram	Keshavpuram Zone	100	Nil	Not Present	0%	Adequate
14	DDA SFS Flats, Dwarka Sector 2	Najafgarh Zone	170	Nil	Not Present	0%	Limited
15	Anant Apartment, Sector A, Dwarka	Najafgarh Zone	80	Nil	Not Present	0%	Adequate
16	Vedanta Apartment, Dwarka	Najafgarh Zone	80	50%	Present (Aerobin)	0%	Adequate
17	Anant Apartment, Dwarka	Najafgarh Zone	80	40%	Aerobin (non-functional)	0%	Adequate
18	Beverly Hills Park, Dwarka	Najafgarh Zone	256	60%	Present (partial)	0%	Adequate
19	Sadbhavana Apartment, Dwarka Sector 11	Najafgarh Zone	70	10%	Garden waste only	0%	Adequate
20	Brahma Apartment, Dwarka	Najafgarh Zone	200	Partial	Present	0%	Adequate
21	Devdoot Apartment	Najafgarh Zone	112	Nil	Not Present	0%	Adequate
22	Surya Kiran Apartment, Dwarka	Najafgarh Zone	100	70%	Pit (operational)	0%	Adequate
23	Joy Apartment, Dwarka Sector 2	Najafgarh Zone	180	80%	Present (non-functional)	0%	Adequate
24	Green View Apartment, Rohini	Rohini Zone	300	80%	Operational	0%	Adequate
25	Dharam Kunj, Rohini Sector 9	Rohini Zone	300	Nil	Not Present	0%	Adequate
26	Amit Apartment, Rohini Sector 13	Rohini Zone	300	Nil	Not Present	0%	Limited
27	Balaji Apartment, Ring Road, Sector 14	Rohini Zone	134	<10%	Not Present	0%	Adequate

#	RWA/Colony	MCD Zone	HH	Segregation	Composting Status	Dry Waste	Space
28	Kadambari Apartment, Rohini Sector 9	Rohini Zone	135	<10%	Not Present	0%	Adequate
29	Shakti Apartment, Rohini Sector 9	Rohini Zone	304	85%	Present	0%	Adequate
30	Swastik Kunj, Rohini Sector 13	Rohini Zone	235	<10%	Not Present	0%	Adequate
31	Rose Apartment, Prashant Vihar	Rohini Zone	300	Nil	Not Present	0%	Adequate
32	Citizen Enclave, Rohini Sector 14	Rohini Zone	120	<10%	Not Present	0%	Adequate
33	Sita Apartment, Prashant Vihar	Rohini Zone	80	Nil	Not Present	0%	Adequate
34	Gayatri Apartment, Rohini Sector 9	Rohini Zone	199	Nil	Present (non-functional)	0%	Adequate
35	Sanskrit Nagar Apartment, Prashant Vihar	Rohini Zone	126	50-60%	Present (Aerobin)	0%	Adequate
36	AP Block, Pritampura	Rohini Zone	115	60%	Present (Aerobin)	0%	Adequate
37	LD Block, Pritampura	Rohini Zone	80	60%	Present (Aerobin)	0%	Adequate
38	Rosewood CGHS, Mayur Vihar	Shahdara South Zone	120	10-15%	Present (non-functional)	0%	Adequate
39	Dainik Janyug NAPPH CGHS	Shahdara South Zone	82	<30%	Aerobins (partial)	0%	Adequate
40	SFS Flat, Pocket B, Mayur Vihar	Shahdara South Zone	N/A	40%	Garden waste only	0%	Adequate
41	Mayur Green, SFS Pocket D	Shahdara South Zone	120	10-15%	Aerobin (non-functional)	0%	Adequate
42	Vasant Apartment, Mayur Vihar	Shahdara South Zone	180	Nil	2 Aerobins (non-functional)	0%	Adequate
43	Rosewood Apartment, Mayur Vihar Phase I	Shahdara South Zone	200	60%	3 Aerobins (2 functional)	0%	Adequate

#	RWA/Colony	MCD Zone	HH	Segregation	Composting Status	Dry Waste	Space
44	Vardhaman Apartment, Mayur Vihar Phase I	Shahdara South Zone	143	75%	3 Aerobins (self-funded, fully functional)	0%	Adequate
45	Samachar Apartment, Mayur Vihar	Shahdara South Zone	100	Nil	None	0%	Adequate
46	Saraswati Apartment, Mayur Vihar	Shahdara South Zone	150	75%	5 Aerobins (functional)	0%	Adequate
47	Bharat Apartment, Mayur Vihar	Shahdara South Zone	150	75%	2 Aerobins (functional)	0%	Adequate
48	Lovely Apartment, Mayur Vihar	Shahdara South Zone	128	Nil	None	0%	Adequate
49	Moonlight Apartment, Mayur Vihar	Shahdara South Zone	110	NA	None	0%	Adequate
50	Sarita Vihar, L Pocket	South Zone	580	60%	Garden waste only	0%	Adequate
51	Sarita Vihar, A Pocket	South Zone	777	<10%	Garden waste only	0%	Adequate
52	Sarita Vihar, F Pocket	South Zone	610	Nil	Not Present	0%	Adequate
53	Lajpat Nagar III, F & I Block	South Zone	140	<50%	Pit (partial)	0%	Adequate
54	Anand Lok, August Kranti Marg	South Zone	215	80%	Operational	60%	Adequate
55	NFC Ashoka Park, Sarita Vihar	South Zone	N/A	Nil (garden)	Green waste only	0%	Adequate
56	Vasant Vihar, D Block	South Zone	400	100 %	Present (functional)	0%	Adequate
57	Vasant Vihar, D Block (II)	South Zone	400	10-15%	Present (non-functional)	0%	Adequate
58	Vasant Vihar, E Block	South Zone	400	90%	4 Aerobins (functional)	60%	Adequate

#	RWA/Colony	MCD Zone	HH	Segregation	Composting Status	Dry Waste	Space
59	Vasant Vihar, C Block	South Zone	400	80%	Aerobin + pit	90%	Adequate
60	Vasant Vihar, Sector B-10	South Zone	174	60-70%	Present (functional)	0%	Adequate
61	Vasant Vihar, Sector C, Pocket 7	South Zone	240	70%	Present (functional)	0%	Adequate
62	Arihant Nagar RWA, Punjabi Bagh	West Zone	300	<10%	Not Present	0%	Adequate
63	Laxmi Vihar, Vikas Puri	West Zone	134	Nil	Not Present	0%	Adequate
64	Antariksh Apartment, Vikas Puri	West Zone	160	Nil	Present (non-functional)	0%	Adequate
65	Evershine Apartment, Vikas Puri	West Zone	147	40%	Not Present	0%	Adequate
66	Kangra Nikatan, Vikas Puri	West Zone	602	<80%	Present (semi-operational)	0%	Adequate
67	C-5-C Block, Janakpuri	West Zone	134	10%	Not Present	0%	Adequate
68	C-5-D Block, Janakpuri	West Zone	300	Nil	Not Present	0%	Adequate

ANNEXURE 2:
DEFINITIONS OF MCD ZERO WASTE SCHEMES

1. Zero Waste Colonies

- **Definition:** Residential areas which divert waste from landfills, achieving 90%+ segregation, composting, and recycling. Waste is completely segregated at source into wet, dry, sanitary, domestic hazardous, and e-waste categories, with on-site processing through decentralised composting and authorised recycling.
- **Key Features:**
  - Complete elimination of waste sent to landfills but sometimes can send residuals (sanitary or hazardous) to landfills.
  - On-site organic waste converters and composting machines
  - Material Recovery Facilities (MRFs) for dry waste
  - Regular capacity building and training programs
- **Current Status:** Delhi has 633 certified zero waste areas (as of 2025), including 593 colonies/RWAs and 40 institutions, processing approximately 100 tonnes of waste daily.

2. Harit Mitra Scheme (MCD)

Harit Mitra and the Sahbhagita scheme were introduced in 2022, which includes incentivising or felicitating RWAs that are taking initiatives towards creating Zero waste colonies

- **Definition:** A community-based initiative where Resident Welfare Associations (RWAs) take responsibility for maintenance of adopted gardens/parks and in-situ wet waste composting.
- **Key Responsibilities:**
  - Garden and park maintenance in adopted areas
  - Wet waste composting within colony premises
  - Community awareness and participation in green initiatives
- **Current Reach:** 255 Harit Mitra colonies across Delhi (2025)

3. Sahbhagita Colony Scheme (MCD)

- **Definition:** An incentive-based program requiring 100% waste segregation, composting of wet waste, and complete recycling of dry waste, with remaining materials handled by MCD or authorised agencies.

- **Eligibility Criteria:**
  - Minimum 90% property tax compliance by RWA
  - 100% waste segregation at source
  - 100% wet waste composting within colony
  - 100% dry waste recycling through authorised channels
- **Financial Incentives:**
  - 10% of property tax collected (maximum ₹1 lakh) for development work
  - Additional 5% incentive for achieving zero waste status
  - Funds utilised for RWAs for developmental projects
- **Current Reach:** 338 Sahbhagita colonies across Delhi (2025)

4. Zero Waste Institutions

- **Definition:** Schools, colleges, offices, and public facilities achieving 100% waste segregation with on-site processing and near-zero landfill dependency.
- **Institutional Requirements:**
  - Source segregation into all waste categories
  - On-site composting facilities
  - Authorised recycler partnerships for dry waste
  - Staff/student engagement programs
  - Regular waste audits and monitoring systems
- **Current Numbers:** 40 certified zero waste institutions in Delhi, including universities, schools, and government offices

5. Anupam Colonies (NDMC)

- **Definition:** Anupam Colonies go beyond basic zero waste certification by integrating 100% waste segregation, decentralised processing (composting, recycling, briquetting, e-waste collection), circular resource systems and extensive resident responsibility for sustainability.
- **Eligibility criteria**
  - RRR (Reduce, Reuse, Recycle) Centres
  - “Neki ki Deewar” (Wall of Kindness) for donations
  - Advanced infrastructure: rainwater harvesting, e-waste collection
  - Mechanised cleaning and AI-based tracking systems
  - Briquetting units for horticultural waste
- **Incentive for Anupam colonies by NDMC**
  - Official Recognition, media highlights & Signage
  - Free Compost distribution from Wet Waste
  - Support in establishing RRR Centre/Neki ki Deewar
  - Technical & Infrastructure Support, guidance and resources to sustain advanced waste processing such as composting units, wire mesh enclosures, e-waste collection channels, and maintenance for these infrastructures

- Priority for Green Initiatives: Mechanised sweeping, rainwater harvesting, water recycling systems, and plastic waste vending machines are implemented with NDMC facilitation, improving infrastructure and environmental quality in Anupam Colonies

6. Difference between Anupam colony and Zero waste colonies

Aspect	Anupam Colony (NDMC)	Zero Waste Colony (MCD/General)
Certifying Body	NDMC (rigorous audits, specific guidelines)	MCD (standard audits, broader parameters)
Waste Segregation	100%, with 12+ waste categories	Often 90%+ (wet, dry, hazardous, e-waste)
On-site Processing	Always: composting, recycling, briquetting, e-waste bins	Mostly: composting, dry waste collected, some e-waste bins
Circular Economy	RRR Centre, Neki ki Deewar, on-site reuse systems	Occasional, not always circular (differs by colony)
Community Engagement	Mandatory, continuous audits, resident-led activities	Variable, main focus education and basic participation
Benchmark Level	Model for replication city-wide	Meets sustainable targets; sometimes aspirational

All Anupam Colonies are zero waste, but not all zero waste colonies meet Anupam standards.

ENDNOTES

1 Vibha Sharma, "Delhi likely to have 200 zero waste colonies by May 2027," The Times of India, May 16, 2025.

2 According to DPCC Annual Report 2024–25, Delhi's processing capacity stands at 8,173 TPD while actual processing is 7,611 TPD, leaving 4,241 TPD dumped at Bhalswa and Ghazipur.

3 CPCB affidavit to National Green Tribunal (NGT), Suo Motu Case on Sanitation, Delhi, January 2026. Cited in: The Hans India (January 2026); Madhyam Online (January 2026).

4 For particulate emissions from landfill fires: Yadav et al. (2023), Springer, International Journal of Environmental Science and Technology — Bhalswa fire study. Also: "Sustainable Management of Landfill Sites in India," Current World Environment Journal, 2024, citing Ghazipur methane emissions of 3,000+ tonnes/year.

5 Down To Earth, "Daily court digest: Major environment orders, January 2, 2026," Down To Earth, January 2, 2026, accessed April 17, 2026, (URL)

6 For overall Delhi waste statistics: Delhi Economic Survey 2025–26, Chapter 2, 2.4. (Daily Pioneer, March 2026); MCD data via The Tribune, November 2025.

7 Studies by the Central Pollution Control Board (CPCB) on landfill fire emissions have been documented in multiple peer-reviewed journals. A key published study is: Yadav et al. (2023), "Air quality changes in Delhi due to open waste burning: an accidental fire in Bhalswa landfill," International Journal of Environmental Science and Technology, Springer. The study recorded PM2.5 levels averaging 107.32 µg/m³ (with peaks far higher) and PM10 levels reaching 338 µg/m³ during the 2022 Bhalswa fire, representing a 45–55% increase over baseline concentrations. For methane-related data, see: "Sustainable Management of Landfill Sites in India," Current World Environment Journal, 2024 (Scopus-indexed), which cites the Ghazipur landfill's methane emissions at over 3,000 tonnes per year.

8 https://mcdonline.nic.in/portal/downloadFile/regarding_sahbhagita_scheme._24010604270616.pdf

About Chintan Environmental Research and Action Group

Chintan, is a do-tank that works on the burning issues of circular economy, waste, air pollution, and climate change. Our interventions are at the intersection of environmental sustainability, social justice, gender equity, and climate resilience. We focus on the people most affected by these challenges.

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