



Reference Book on Integrated Solid Waste Management, IEC & BCC



Towards a Clean, Resource-Efficient, and Circular Future



Reference Book on

**Integrated Solid Waste
Management, IEC & BCC**

May 2026

Foreword

The Swachh Bharat Mission has placed solid waste management at the forefront of India's urban development agenda, reinforcing our commitment to realizing Mahatma Gandhi's vision of a *Swachh and Sustainable India*. Urban Local Bodies play a central role in translating this vision into reality through effective planning, service delivery, and citizen engagement. With rapid urbanization and increasing waste generation, municipal corporations and councils are facing growing challenges in managing waste in a scientific, efficient, and environmentally responsible manner. Strengthening the technical, operational, and institutional capacity of municipal officials is therefore essential for achieving the goals of Swachh Bharat Mission–Urban and the emerging framework of circular economy in waste management.



Recognizing this need, the Swachh Maharashtra Mission (SMM) organized capacity-building workshops to support Municipal Officials and Practitioners. These workshops focus on key areas such as Solid Waste Management Rules 2026, emphasizes greater accountability, improved waste segregation, enhanced processing infrastructure, and adoption of circular economy principles, behaviour change among citizens, and strategies for improving operational efficiency in municipal waste management systems. To support these learning initiatives, this *Handbook on Integrated Solid Waste Management* has been developed as a practical reference guide for Municipal corporations. The handbook compiles relevant policies, technical approaches, operational strategies, and case studies that can assist urban local bodies in planning, implementing, and monitoring effective solid waste management systems.

I congratulate the Swachh Maharashtra Mission team for conceptualizing and developing this valuable resource. I encourage municipal officials, engineers, and staff engaged in solid waste management to actively use this handbook as a guiding tool in their day-to-day work.

I am confident that the adoption of the practices and guidance provided in this handbook will strengthen municipal waste management systems, promote sustainable resource use, and contribute to building cleaner, healthier, and more resilient cities across Maharashtra.

A handwritten signature in black ink, appearing to read 'Dr. K. H. Govinda Raj'.

Dr. K. H. Govinda Raj, IAS

**Principal Secretary,
Urban Development Department-II**

Foreword

The Government of Maharashtra, under the Swachh Bharat Mission, encourages Urban Local Bodies (ULBs) across the state to adopt modern and scientific approaches to urban Solid Waste Management (SWM). With increasing waste generation and emerging environmental challenges, it is essential for cities to move towards sustainable waste management practices that emphasize resource recovery, circular economy principles, and value creation from waste. The Mission also focuses on strengthening the capacities of Urban Local Bodies to effectively plan, implement, and manage solid waste systems in alignment with national policies and sustainable development goals.



In this context, the publication “*Integrated Solid Waste Management*” (ISWM) has been developed to disseminate key guidelines and provide a practical direction for Urban Local Bodies to adopt sustainable and efficient waste management practices. The handbook is intended to support municipal officials in understanding policy frameworks, operational strategies, and implementation approaches for effective solid waste management.

By equipping local bodies with the knowledge and tools required to develop efficient waste management systems, this handbook aims to contribute to cleaner, healthier, and more sustainable urban environments for present and future generations. It will serve as a valuable reference for decision-makers, policymakers, and practitioners working towards strengthening waste management systems across Maharashtra.

I would like to express my sincere appreciation to the Urban Development Department, Government of Maharashtra, under whose overall guidance this handbook was finalized. I also acknowledge the efforts of Kautilya and knowledge partner Kushaagra Innovations Foundation for compiling and developing this reference toolkit, particularly designed to support smaller Urban Local Bodies in the state. I encourage Municipal Councils and Nagar Panchayats across Maharashtra to actively utilize this handbook as a guiding resource for improving solid waste management practices in their cities.

A stylized, handwritten signature in black ink, consisting of a large loop and a long horizontal stroke.

Navnath Wath,

State Mission Director (SBM-U)
Maharashtra

About the Handbook

This **Handbook for decision-makers and technical officials** has been developed as a practical reference to support urban local bodies in improving solid waste management systems. It brings together **policy guidance, technical approaches, tools, and case studies** to help officials plan, implement, and monitor waste management activities more effectively.

The handbook covers key areas such as **policy frameworks, waste management challenges in India, technology and process assessments, circular economy approaches, workforce planning, procurement systems, and sanitation and used water management**.

How to Use the Handbook

Participants can use the handbook as:

- A quick reference for policies, rules, and municipal responsibilities
- A technical guide for planning waste systems and selecting appropriate technologies
- A resource for case studies and practical solutions from Indian cities
- A support tool for decision-making, Programme design, and implementation

The sessions in this training will refer to different sections of the handbook to help participants **connect policy, technical knowledge, and real-world implementation**.

Designed and Compiled by: - HIFEED

Sector Experts for Content Generation

- Zigisha Mhaskar
- Payak Kapre
- Nikhil Vaiude
- Pankaj Kataria
- Mansi Shinde

Design and Layout

- Nikhil Vaiude
- Mansi Shinde

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Chapter 1:

Overview Of The Current Status Of Solid Waste Management

Key Highlights Of This Topic:

- 1.1 Current Solid Waste Management Scenario
- 1.2 Government Mission For Effective SWM In ULBs
- 1.3 Star Rating Framework For Garbage-free City
- 1.4 Key Performance Indicators (KPIs)

About the topic:

This chapter presents an overview of the current solid waste management scenario in India and highlights the increasing challenges faced by cities due to rapid urbanization and rising waste generation. It highlights key government missions, performance targets, and the need for scientific waste collection, segregation, processing, and landfill remediation to support cleaner and more efficient urban systems.

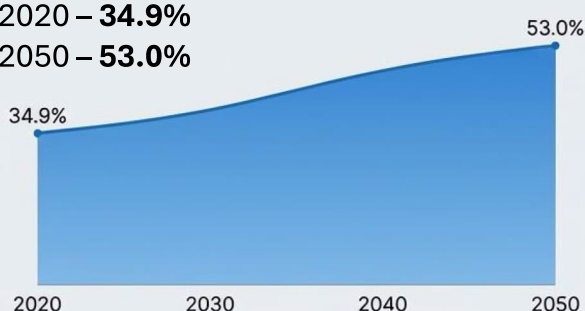
1.1 Current Solid Waste Management Scenario

India's urban population is expected to grow from about 500 million currently to 600 million by 2030 and to 814 million by 2050. Solid waste management is a critical challenge driven by this rapid urbanization, with over 1.85 lakh tonnes per day (TPD) of waste generated in 2023-24. While collection efficiency has improved to over 90%, only about 61% of waste is treated or processed, leaving substantial amounts in landfills. The scenario is shifting toward formalization, enhanced segregation, and circular economy efforts under the Swachh Bharat Mission and new 2026 guidelines. The Supreme Court recently issued a comprehensive set of directions across the country for the implementation of the Solid Waste Management Rules (SWM Rules), 2016, which is set to come into force from April 1, 2026.

The Demographic Pressure India's Urban Population Share

2020 – 34.9%

2050 – 53.0%



100.9 Million Tonnes
Municipal solid waste
generated (2020)

The Emissions Footprint



Landfills are the third-largest source of human-caused methane, contributing nearly **20% of global emissions**

Methane Global Warming Potential (GWP), estimated to be **28 X more potent than carbon dioxide (CO₂)** over a 100-year horizon according to the IPCC Fifth Assessment Report

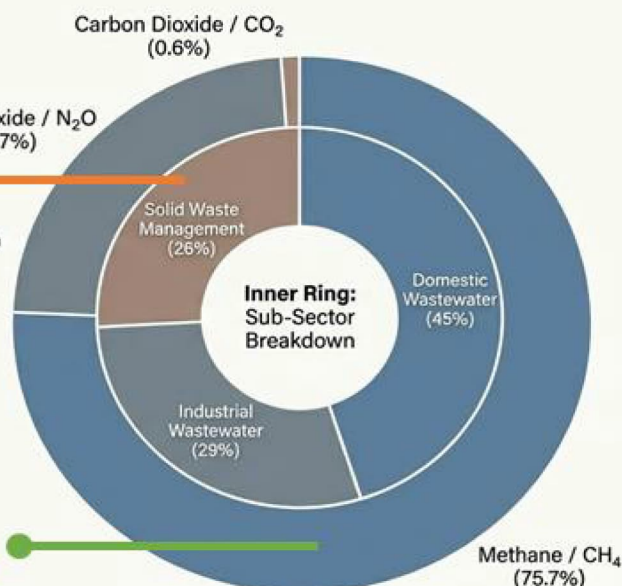
The NITI Aayog Baseline Assessment (2020) identified the waste sector as a major source of methane emissions. Improper landfill management has resulted in over 3,000 disposal sites turning into “man-made mountains” of mixed waste, posing serious environmental and public health risks. Frequent fires, especially during summer, caused by methane generation, lack of segregation, and spontaneous combustion, highlight the urgent need for intervention.

The 2020 Baseline Diagnostic

Total Waste Sector Emissions (2020):
75.64 MtCO₂e (2.56% of India's total emissions).

Solid Waste Management
26%

Methane /CH₄ (75.7%)



1.2 Government Mission For Effective SWM In ULBs

Recognizing the critical need for effective Solid Waste Management (SWM), Government of India has have introduced targeted schemes and missions following the launch of the Swachh Bharat Mission (SBM). To build on this momentum, Swachh Bharat Mission 2.0 (SBM-U 2.0) was launched to further advance urban sanitation. A key component of second phase was the 'Garbage Free Cities' (GFC) initiative, through which the Government of India has established strict, time-bound targets for Urban Local Bodies (ULBs) to scientifically manage Municipal Solid Waste (MSW)



SBM– Urban (2.0) (2021 – Ongoing)

- **Garbage-Free City**
- 100% source segregation
- Door-to-door collection
- Scientific processing & disposal
- Legacy waste remediation



Dumpsite Remediation Accelerator Programme (DRAP)

(08-Nov-2025 To 30-Sep-2026)

The Programme focuses on 214 mega dumpsites across 202 ULBs, covering nearly 80% of India's legacy waste.



SATAT (2018 – Ongoing)

- Compressed Biogas (CBG) production
- Waste-to-energy plants
- Private sector participation

1.3 Star Rating Framework For Garbage-free City

The Garbage-Free City (GFC) Star Rating is an assessment framework under the Swachh Bharat Mission that evaluates cities on their level of cleanliness and scientific solid waste management. Baseline target for GFC requires every urban local body (ULB) across India to achieve a **minimum 3-star garbage** free certification under the official rating protocol for garbage free cities.

	Indicator	★ 1 Star	★★★ 3 Stars	★★★★★ 4-6 Stars	★★★★★★ 7 Stars
1	Door-to-Door Collection	100%	100%	100%	100%
2	Source Segregation	>40%	>60%	>80%	100%
3	Sweeping (Public/Comm.)	100%	100%	100%	100%
4	Litter Bins in Comm. Areas	100%	100%	100%	100%
5	Waste Processing (Wet)	>40%	>70%	>90%	100%
6	Waste Processing (Dry)	>40%	>70%	>90%	100%
7	dumpsite remediation	Action Plan	25-40% Done	>75% Done	100% Done
8	Bulk Waste Generators	Enforcement	>30% On-site	>60% On-site	100% On-site
9	Scientific Landfill	100% Inerts	100% Inerts	100% Inerts	100% Inerts
10	Plastic Waste Mgmt.	Ban Notified	Enforced	Strict (No SUP)	100% Plastic-Free
11	C&D Waste Mgmt.	System Ready	>50% Processed	>75% Processed	100% Processed
12	User Charges	Notified	>25% Recovery	>50% Recovery	100% Recovery
13	Penalty & Spot Fines	Notified	Enforced	Regular	Strict/Automated
14	Grievance Redressal	System Ready	>80% Resolved	>90% Resolved	100% Resolved
15	Visible Cleanliness	Partial	Clean drains	Clean canals	Pristine Water
16	Geo-mapping/MIS	Profile Updated	Facilities Mapped	End-to-end GIS	Real-time tracking

STAR RATING THRESHOLDS		
STAR RATING	MINIMUM MARKS REQUIREMENT	PREREQUISITE SANITATION STATUS
1-STAR ★☆☆☆☆	2,400 / 5,200	ODF (Open Defecation Free)
3-STAR ★★★☆☆	3,600 / 5,200	ODF+
5-STAR ★★★★★	6,300 / 7,500	ODF++
7-STAR ★★★★★★★	7,500 / 7,500	Water+

1.4 Key Performance Indicators (KPIs)

The framework uses Key Performance Indicators (KPIs) to measure a city's progress toward becoming garbage free and environmentally sustainable.

Category	Key Performance Indicators (KPIs) Checked	Target Level for 7-Star
Solid Waste Operations	• Door-to-Door Collection Coverage	100% Across all wards
	• Source Segregation levels (Wet, Dry, Hazardous)	
	• Materials Recovery Facility (MRF) functionality	
Processing & Recovery	• Wet waste processing (Composting/Biomethanation)	100% Scientific Management
	• Dry waste recycling & sale of by-products	
	• Domestic hazardous & Sanitary Waste treatment	
Environmental Cleanliness	• Clearance of Stormwater Drains/Nallahs (using screens)	Zero visible debris day or night
	• Elimination of garbage from rivers and lakes	
	• Daily sweeping of residential & commercial zones	
Legacy & Infrastructure	• Complete remediation of historic legacy dumpsites	Lakshya Zero legacy waste remaining
	• Construction & Demolition (C&D) waste processing	
	• 100% elimination of unscientific open dumping	
Policy & Penalties	• Enforcement of Single-Use Plastic bans	Zero spots / Complete systemic collection
	• Collection efficiency of waste user fees	
	• Elimination of "Red Spots" (spitting) & "Yellow Spots" (urination)	

Now, The Solid Waste Management (SWM) Rules 2026 strengthen the ongoing objectives of the Swachh Bharat Mission by promoting scientific waste management, circular economy practices, and improved accountability. The Rules closely align with the Garbage-Free City (GFC) Lakshya Zero framework, supporting source segregation, waste processing, landfill reduction, and resource recovery, these initiatives help cities reduce pollution and methane emissions while contributing to key Sustainable Development Goals (SDGs) related to sustainable cities and climate action plan.

Chapter 2:

Policy Framework For SWM Rules 2026: By-Laws & Policy

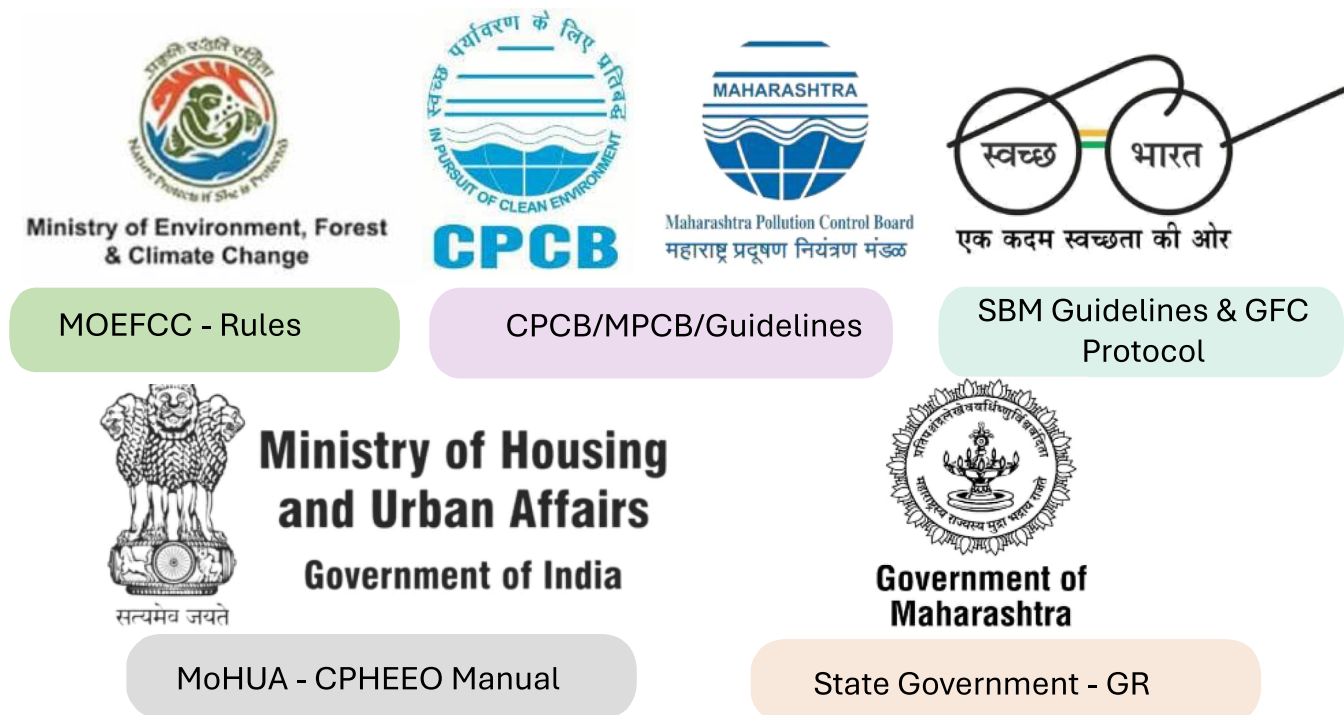
Key Highlights Of This Topic:

- 2.1 The Regulatory Framework And Other Directives
- 2.2 Institutional Framework And Enforcement SWM Rules 2026
- 2.3 Component of the SWM 2026 Rules
- 2.4 Duties Of Waste Generators
- 2.5 Duties Of Urban Local Bodies (Rule 39 –SWM Rules, 2026)
- 2.6 SWM Rules 2026 Implementation Timeline
- 2.7 SWM By-Laws
- 2.8 Enforcement And Penalty Provisions Under Mumbai Bye-Laws
- 2.9 SWM Rules 2016 & 2026 – What Has Changed

About the topic:

This topic covers important waste management aspects relevant to Urban Local Bodies w.r.t. MoEFCC Rules, MoUHA-CPHEEO Guidelines, CPCB and MPCB Guidelines, SBM Guidelines, and GFC Protocol. It covers highlights from rules and guides the user about important references from rules and the CPHEEO manual.

2.1 The Regulatory Framework and Other Directives

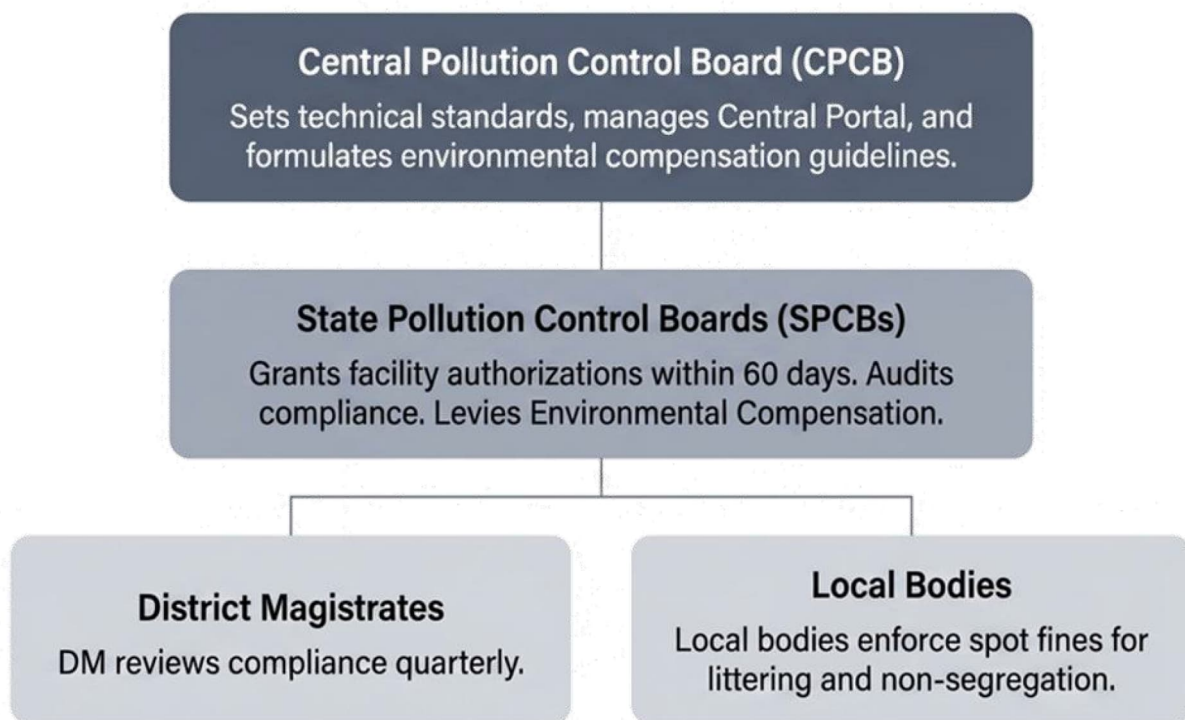


India's municipal solid waste management framework is governed by a set of environmental regulations and sector-specific rules issued by the Central Pollution Control Board (CPCB) and implemented by State Pollution Control Boards. Over the years, several rules have been introduced to regulate different waste generator .

Rule / Regulation	Year
The Environment (Protection) Act (EPA)	1986
The Hazardous Waste (M&H) Rules	1989
Solid Waste Management Rules 2016	2016
Plastic Waste Management Rules 2016	2016 (amended 2018, 2021, 2022)
E-Waste (Management) Rules 2016	2016 (revised 2022)
Bio-Medical Waste Management Rules 2016	2016 (amended 2018, 2019)
Construction and Demolition Waste Management Rules 2016	2016
CPCB Guidelines for Compost Quality Control, Sanitary Waste Management, Waste-to-Energy Plants	2017-2018
CPCB Guidelines for Material Recovery Facilities & Legacy Waste Bio-mining	2019
Battery Waste Management Rules 2022	2022
Solid Waste Management Rules 2026	2026

With the introduction of the Solid Waste Management Rules 2026, India aims to further strengthen urban waste management systems promoting circular economy practices, improved segregation, methane reduction, and sustainable waste processing to support the country's long-term development and climate goals.

2.2 Institutional Framework and Enforcement SWM Rules 2026



The Solid Waste Management Rules 2026, notified by the Ministry of Environment, Forest and Climate Change (MoEFCC) on **January 27, 2026**, establish a comprehensive regulatory framework for the management of solid waste across India. Superseding the 2016 rules, these regulations are in effect from **April 1, 2026**.

The primary objective of these rules is to transition waste management towards a circular economy through mandatory source segregation, the promotion of waste-to-energy technologies, and the rigorous remediation of legacy waste (dumpsites). The framework introduces a Centralised digital monitoring system and defines specific responsibilities for all stakeholders, including individual households, bulk waste generators, local bodies (urban and rural), and industrial units. Key highlights include the mandatory use of Refuse Derived Fuel (RDF) by industries and the introduction of "Extended Bulk Waste Generator Responsibility" (EBWGR) certificates.

The rules now apply to all **urban** and **rural** local bodies, **government organizations** (State and Central), the **private sector**, **notified industrial areas**, **special economic zones**, **Indian Railways**, **airports**, **defense establishments**, and all **individual or institutional waste generators**.

"According to CPCB's 2021–22 Annual Report, India's daily waste generation reached approximately 170,000 tonnes per day, with per-capita waste generation projected to rise from 0.34 kg/day to 0.7 kg/day by 2025."

*"Supreme Court in its Feb 2026 ruling framed solid waste management as inseparable from **Article 21** — the right to life and classified urban waste management as a constitutional obligation, not an administrative option."*

2.3 Component of the SWM 2026 Rules

The booklet covers all major aspects of the Solid Waste Management (SWM) Rules in well-structured and fragmented chapters, which will support effective implementation of the rules. The Rules explicitly define the duties and responsibilities of ministries, departments, Urban Local Bodies (ULBs), waste generators, and bulk waste generators.

1. Preliminary provision definition (rule -1-3)

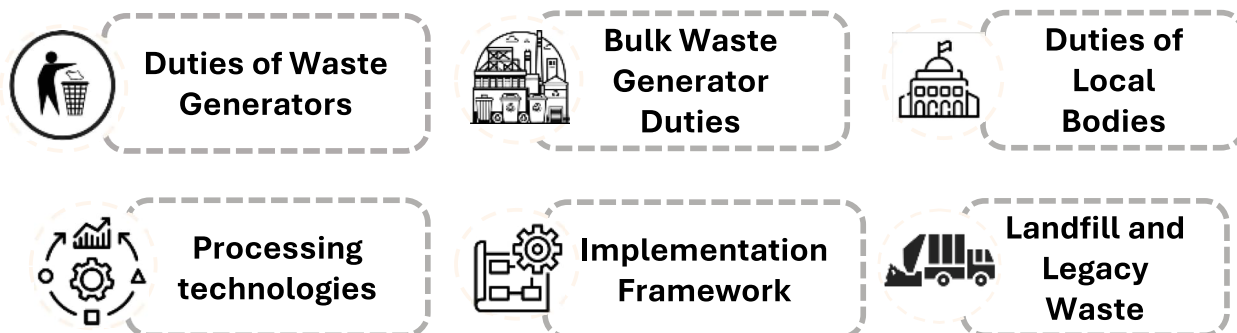
2. Waste Generator Responsibilities/ duties (rules 3- 11)

3. Processing, Disposal and Technical Standards (rules 12-15)

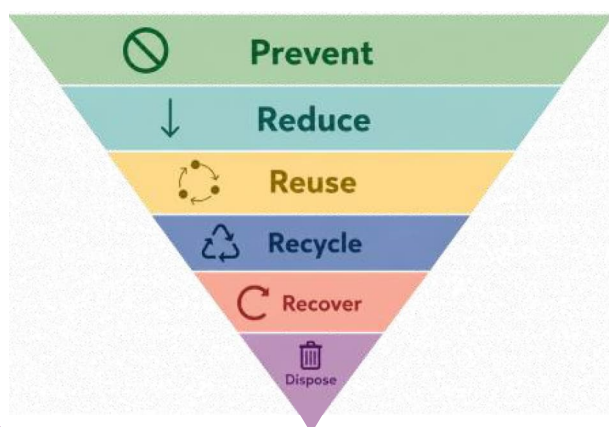
4. Monitoring, Reporting and Compliance (rule 16-21)

5. Duties of Central Ministries and Departments (rule 22- 43)

6. Duties of State, District and Local Authorities (rules 35-41)



The rules **define the waste hierarchy** as a mandatory priority order of management.



Rules adopt the "**Polluter Pays**" principle, allowing SPCB & CPCB to levy environmental compensation for non-compliance. This includes penalties for operating without registration, submitting forged documents, false reporting, and poor waste management

2.4 Duties Of Waste Generators



1. SEGREGATE WASTE AT SOURCE

Segregate waste into separate streams as prescribed.

- Wet Waste
- Dry Waste
- Special Care Waste
- Sanitary Waste

2. FACILITATE COLLECTION OF SEGREGATED WASTE

Ensure separate collection of segregated waste by the local body or its Authorised agency.

3. HANDOVER RECYCLABLE MATERIAL

Handover recyclable material to either:

- Authorised Waste Pickers
- Authorised Recyclers

4. PROCESS BIODEGRADABLE WASTE

Process, treat and dispose of bio-degradable waste through:

- Composting
- Bio-methanation within the premises as far as possible.

5. GIVE RESIDUAL WASTE TO Authorised AGENCY

Give residual waste to the waste collectors or agency as directed by the local body.



All gated communities and institutions with more than **5,000 sq.m. area** and all resident welfare associations, market associations, hotels, restaurants, shall, within one year from the date of notification of these rules in the Official Gazette and in partnership with the local body, ensure The bio-degradable waste shall be processed, treated and disposed of through composting or bio-methanation within the premises **as far as possible**.

Duties of every street vendor

Every street vendor shall maintain suitable containers or bins for storage of waste generated during the course of business activities, including food waste, and shall deposit such waste only at designated waste storage depots, collection containers or waste collection vehicles notified by the ULB.



No street vendor shall throw, burn, bury or dispose of solid waste generated from their activities on streets, open public spaces, drains or water bodies, or outside their designated premises.



Pay such user fee for solid waste management, as specified in the bye-laws of the local bodies



Every waste generator should not

Organise an event or gathering of more than 100 persons at any unlicensed place without informing the local body at least **3 working days in advance**.

- Event / Gathering: More than 100 persons
- Prior Intimation: Minimum 3 working days in advance
- Authority to be informed: Local Body



Organizer responsibilities is to Ensure Segregation of Waste at Source Hand Over Segregated Waste

Segregated waste shall be handed over to:

- Authorised waste collector, or
- Agency specified by the local body

DISPOSAL OF WASTE

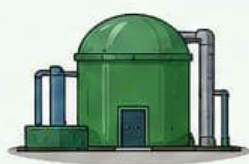
Waste generated during the event shall be disposed of in the manner prescribed under the rules through:

- Composting
- Biomethanation
- Recycling
- Sanitary Landfill

DISPOSE OF WASTE AS PRESCRIBED UNDER THESE RULES



Composting



Biomethanation



Recycling



Sanitary Landfill

2.5 Duties Of Urban Local Bodies (Rule 39 –SWM Rules, 2026)

The responsibility for managing MSW lies with Urban Local Bodies (ULBs). This duty was reinforced by the 74th Amendment to the Indian Constitution in 1992, which included solid waste management in the 12th Schedule listing the functions of urban local bodies

A. Waste Segregation, Collection And Sweeping

1. Ensure source segregation of solid waste into Wet (Biodegradable), Dry (Recyclable), Sanitary and Special Care waste streams.
2. Establish and implement door-to-door collection systems for segregated waste from all households, commercial establishments, institutions and slum areas.
3. Ensure 100% coverage of waste generators under the collection system.
4. Prohibit littering, open dumping and unauthorised disposal of solid waste.
5. Ensure separate collection and storage of street sweepings.
6. Ensure separate Collection and Transportation of drain silt and desilted material.
7. Undertake regular sweeping and cleaning of streets, public places, markets and transportation corridors.
8. Ensure daily sweeping in high-density, commercial and public activity areas.
9. Prohibit open burning of solid waste, horticulture waste and tree leaves.
10. Ensure separate collection and processing of tree leaves and horticulture waste for composting or biomethanation.
11. Ensure street vendors, markets and event organizers maintain source segregation and proper waste storage arrangements.
12. Identify and map garbage vulnerable points and littering hotspots for targeted intervention and monitoring.

B. Waste Transportation And Secondary Storage

13. Ensure environmentally sound transportation of segregated waste.
14. Deploy separate compartments or separate vehicles for transportation of wet and dry waste.
15. Ensure no mixing of segregated waste during collection, storage and transportation.
16. Ensure segregated waste remains separate till final processing or disposal.
17. Establish covered secondary storage facilities for temporary storage of waste.
18. Ensure regular lifting and clearance of waste from secondary storage points.

-  19. Establish transfer stations wherever required for efficient transportation and logistics management.
-  20. Prevent spillage, scattering and leakage of waste during transportation.
-  21. Ensure separate transportation arrangements for Sanitary Waste and special care waste.
-  22. Equip waste transportation vehicles with GPS or digital tracking systems in urban areas with population above prescribed limits.

C. Waste Processing And Resource Recovery

-  23. Ensure biodegradable waste is processed through composting, biomethanation or other approved technologies.
-  24. Promote deCentralised processing of biodegradable waste at household, community and institutional levels.
-  25. Ensure dry waste is transported to Authorised Material Recovery Facilities (MRFs) or recycling facilities.
-  26. Establish Material Recovery Facilities (MRFs) as per waste generation quantities and prescribed timelines.
-  27. Ensure Sanitary Waste is disposed through Authorised incineration or Common Biomedical Waste Treatment Facilities (CBWTFs), wherever applicable.
-  28. Ensure special care waste is channelized to Authorised recyclers, handlers or disposal facilities.
-  29. Promote home composting, community composting and deCentralised waste management systems.
-  30. Promote generation and utilization of biogas from biodegradable waste.
-  31. Ensure market waste and bulk biodegradable waste are processed through composting or biomethanation.
-  32. Ensure separate collection and processing of horticulture, garden and park waste.
-  33. Promote in-situ composting of horticulture waste within parks, gardens and green spaces.
-  34. Reduce and phase out the use of chemical fertilizers in public gardens and landscaping activities.
-  35. Promote utilization of city compost and organic manure in parks, landscaping and agriculture.
-  36. Prepare and maintain inventory of compost plants, biomethanation facilities and waste-to-energy plants.

D. Infrastructure Development And Authorization

-  37. Establish adequate waste processing, treatment and disposal infrastructure within the jurisdiction.
-  38. Obtain authorization from the concerned Pollution Control Board or Committee for facilities handling waste above prescribed limits.
-  39. Ensure timely renewal of authorizations and statutory approvals.
-  40. Integrate solid waste management infrastructure within city planning and development frameworks.
-  41. Ensure building plans and large development projects provide designated space for waste segregation, storage and collection.
-  42. Establish sanitary landfill facilities for disposal of non-recyclable and inert waste as per prescribed standards.
-  43. Ensure only Authorised facilities are utilized for waste processing, treatment and disposal.

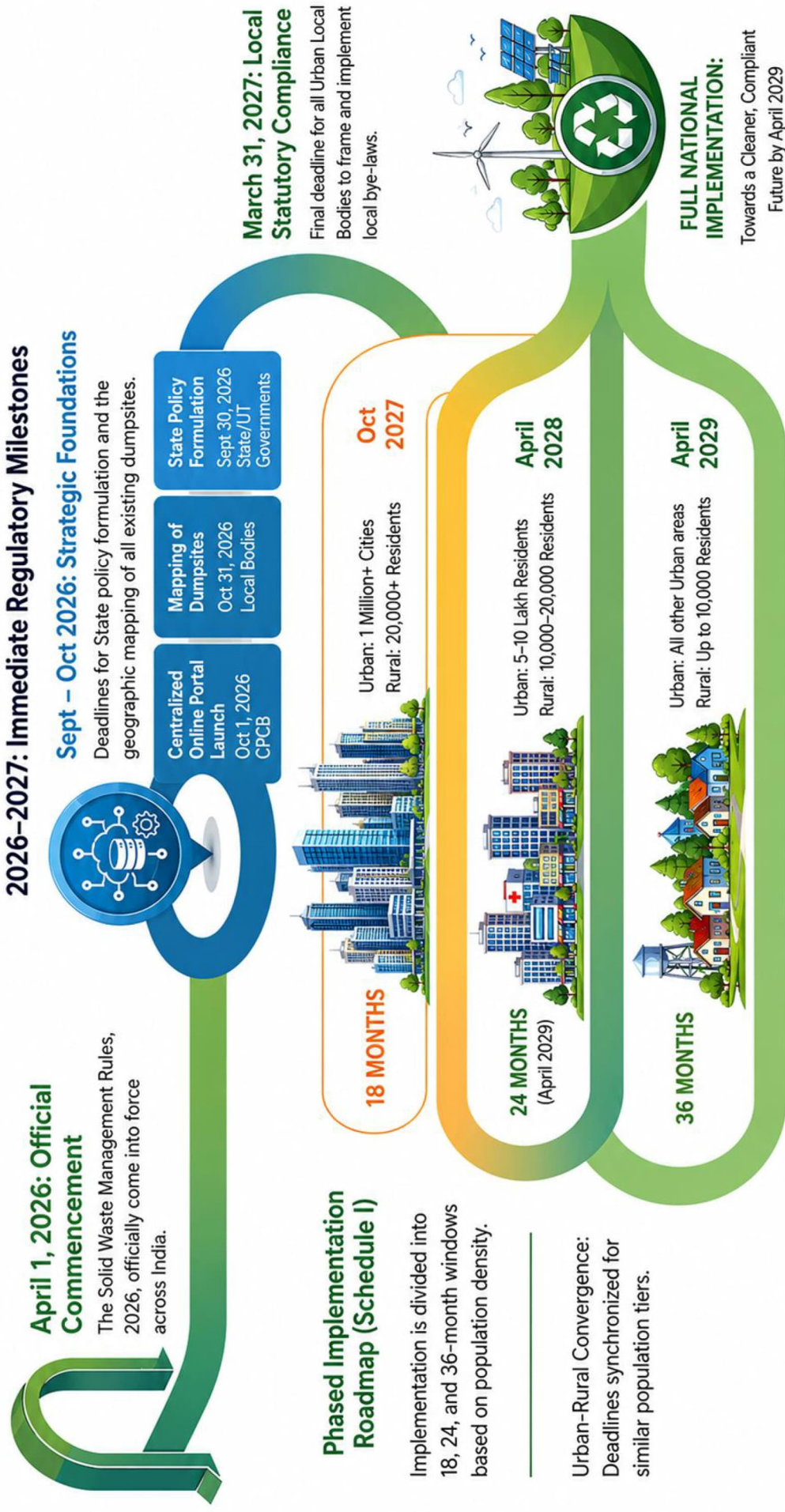
E. Monitoring, Reporting And Digital Compliance

-  44. Register the Urban Local Body on the Centralised online portal developed by CPCB.
-  45. Upload city Solid Waste Action Plans and infrastructure details on the Centralised portal.
-  46. File annual reports and statutory returns within prescribed timelines.
-  47. Maintain records relating to waste generation, collection, transportation, processing and disposal.
-  48. Validate data and returns submitted by concessionaires, operators and processing facilities.
-  49. Monitor concessionaires, contractors and third-party agencies engaged in SWM services.
-  50. Conduct periodic inspections and compliance monitoring of waste management facilities.
-  51. Ensure compliance with CPCB guidelines, environmental standards and statutory provisions.

F. Governance, Financial And Enforcement Measures

-  52. Frame, notify and enforce bye-laws under the SWM Rules, 2026.
-  53. Levy user fees, spot fines and environmental compensation for non-compliance and violations.
-  54. Conduct Information, Education and Communication (IEC) activities and ensure occupational safety, PPE provision and capacity building of sanitation workers.

2.6 SWM Rules 2026 Implementation Timeline



2.7 SWM By-Laws

Municipal bye-laws for solid waste management (SWM) constitute an essential regulatory framework that can encompass all aspects of SWM - from its generation to final disposal, covering collection, transportation, storing, processing, disposal, monitoring and regulations. They also empower local governments to impose penal provisions for non-compliance and violations.

The Solid Waste Management (SWM) Rules, 2026 mandate all urban and rural local bodies, government organizations (State and Central), the private sector, notified industrial areas, special economic zones, Indian Railways, airports, defense establishments, and all individual or institutional waste generators to frame bye-laws incorporating the provisions of SWM, 2026 by **31st March 2027** and ensure timely implementation.

Parameter	SWM Rules 2026	Maharashtra State Byelaws	Facilitation and enforcement
Source Segregation	Waste generators shall segregate waste at source into wet, dry, sanitary and special care waste before handing over to Authorised collectors.	Waste shall be stored separately as biodegradable, recyclable, domestic hazardous and Sanitary Waste.	Waste generator shall hand over segregated waste in separate bins / bags; non-compliance may attract penalties.
Collection from Premises	Local authority shall ensure collection of segregated waste from households, slums, institutions and commercial premises	Municipal Council shall arrange scheduled collection from each house / premises.	ULB shall collect waste from each premises / building through designated vehicles and ward routes.
Transportation without Mixing	Waste shall be collected and transported without mixing different waste streams .	Separate transport arrangement for wet and dry waste shall be maintained.	Waste once segregated shall not be mixed during collection, transport or transfer.
Sanitary Waste Handling	Sanitary Waste such as diapers and napkins shall be securely wrapped and separately stored before disposal.	Sanitary and domestic hazardous waste shall be stored separately in covered containers.	Separate disposal arrangements for Sanitary Waste through notified systems.
User Charges / Service Fees	Waste generators shall pay user charges as notified by the local authority; higher charges may apply for unsegregated waste.	ULB may levy SWM service charges and collection fees.	User fees applicable for waste collection and sanitation services.

Bulk Waste Generator Responsibility	BWGs shall process Organic waste on-site or comply with EBWGR provisions. Threshold: 100 kg/day or equivalent criteria.	Large societies / institutions shall ensure separate storage and processing.	Housing societies, hotels, malls and institutions shall process wet waste at source.
BWG Registration / Compliance	BWGs shall register on central / local portal and comply with monitoring provisions.	Registration with Municipal Authority mandatory for large generators.	BWGs shall register with ULB and comply with notified provisions.
Prohibition of Littering	Littering, dumping and open burning of waste in public places, drains and water bodies is prohibited.	Throwing waste on roads, drains, public spaces and open plots prohibited.	Littering in public places attracts immediate fines.
Penalty / Spot Fine	Environmental compensation and penalties may be imposed for violations under polluter pays principle.	Municipal authority empowered to levy fines for violations.	Spot fines applicable for littering, open dumping and nuisance offences.
Construction & Demolition Waste	C&D waste shall be stored separately and handed over only to notified facilities.	Separate C&D collection and disposal arrangement shall be made by ULB.	C&D waste shall not be mixed with municipal solid waste stream.
Street Sweeping & Public Cleaning	ULB shall ensure regular cleaning of roads, public places, markets and open spaces.	Cleaning of roads, slums, markets, parks and tourism places shall be undertaken regularly.	Manual and mechanized sweeping to be undertaken ward-wise.
Garden / Horticulture Waste	Garden waste shall be separately stored and composted / processed.	Separate collection of garden and tree waste.	Ward-level lifting and processing / composting facility.
Domestic Hazardous / Special Care Waste	Bulbs, batteries, medicines and similar waste shall be handed over only to designated agencies.	Domestic hazardous waste to be separately stored.	Separate collection drives for batteries, bulbs and e-waste.
Legacy Waste / dumpsite remediation	Time-bound biomining and bioremediation of old dumpsites mandatory with quarterly reporting.	Dumpsite monitoring through state and ULB mechanisms.	dumpsite remediation and transfer station modernization.
Infrastructure Mapping / Geo-tagging	All SWM infrastructure shall be mapped, geo-tagged and digitally monitored through portal.	Asset registers and ward infrastructure maps shall be maintained.	Bins, vehicles, transfer stations and MRFs to be geo-tagged.
Monitoring & Grievance Redressal	Nodal officer, digital portal and complaint system to be established.	Complaint cell / municipal grievance register.	Ward complaint cell / app-based redressal mechanism.

2.8 Enforcement & Penalty Provisions Under Mumbai Bye-Laws

Mumbai's SWM bye-laws incorporate a structured penalty framework ranging from minor fines for littering to substantial penalties for bulk waste mismanagement, ensuring accountability across all categories of waste generators.

Parameter / Violation	Provision under Mumbai Bye-laws	Penalty/Action
Littering / Spitting	Littering, spitting, or throwing waste in public places is prohibited	₹200 – ₹1,000; higher penalties for repeated offences
Non-Segregation of Waste	Segregation at source is mandatory (wet, dry, hazardous)	₹100 – ₹500 (households); higher penalties for bulk generators
Bulk Waste Generator (BWG) Non-Compliance	BWGs must process waste on-site (composting/biogas)	₹5,000 – ₹25,000; escalation for continued non-compliance
Illegal Dumping	Disposal of waste in open areas, drains, or unAuthorised locations is prohibited	₹5,000 and above; legal action for commercial entities
Burning of Waste	Open burning of any solid waste is strictly prohibited	₹5,000+ fine; strict enforcement due to environmental impact
Failure to Follow Collection System	Waste must be handed over to Authorised collectors as per schedule	Penalties and service restrictions for repeated violations
C&D Waste Mismanagement	C&D waste must be stored separately and disposed at designated sites	Charges for collection + penalties for non-compliance
Commercial Establishment Violations	Shops, hotels, and offices must maintain cleanliness and proper waste handling	Higher penalties; notices and possible license action
Public Event Waste Mismanagement	Event organizers responsible for waste handling and site cleanup	Penalties and recovery of cleanup costs
Obstruction to SWM Services	Interfering with waste collection or municipal services is prohibited	Penal action under municipal regulations

2.9 SWM Rules 2016 & 2026 – What Has Changed

Parameter	SWM Rules, 2016	SWM Rules, 2026
Applicability & Scope	Applied to urban local bodies, census towns, railways, airports, and special economic zones,.	Expanded to include every rural local body (Gram Panchayats, District Panchayats), food parks, and land adjacent to railway tracks.
Waste Segregation Categories	Mandated three streams: 1. Bio-degradable 2. Non-bio-degradable 3. Domestic Hazardous Waste	Mandates four streams: 1. Wet Waste (Organic Waste) 2. Dry Waste (Recyclable and Non-Recyclable) 3. Sanitary Waste 4. Special Care Waste
Bulk Waste Generator (BWG) Definition	Entities generating an average of more than 100 kg of waste per day.	Entities meeting any of these: 1. >100 kg waste/day; 2. Floor area $\geq$ 20,000 sq.mt.; or 3. Water consumption $\geq$ 40,000 L/day.
Digitization & Monitoring	Focused on manual annual reports and periodic reviews by committees.	Mandates a Centralised Online Portal for mandatory registration of all entities, filing returns, and real-time data tracking.
Extended Generator Responsibility	Applied primarily to manufacturers/brand owners (EPR) for packaging waste.	Introduces Extended Bulk Waste Generator Responsibility (EBWGR). BWGs must procure certificates if wet waste is not processed on-site.
Tracking of Vehicles	No specific requirement for GPS tracking across all cities.	Cities with populations over 5 lakhs must establish control rooms using GPS for tracking collection vehicles.
Penalties & Enforcement	Referred to as "Fines" imposed under local bye-laws,.	Formalized as Environmental Compensation based on the "polluter pays" principle for non-registration, false info, or forgery.
Sanitary Waste Management	Required generators to wrap pads/diapers in pouches or wrapping material,.	Mandates separate red bins in public toilets and use of dedicated incinerators or Authorised recycling technologies,.,.
Legacy Waste & Dumpsites	Encouraged bio-mining and bio-remediation of old dumpsites,.	Mandates geographic mapping of all dumpsites by Oct 31, 2026, with mandatory quarterly progress updates on the portal

Chapter 3:

Strategy For Implementing SWM Rules And Circularity

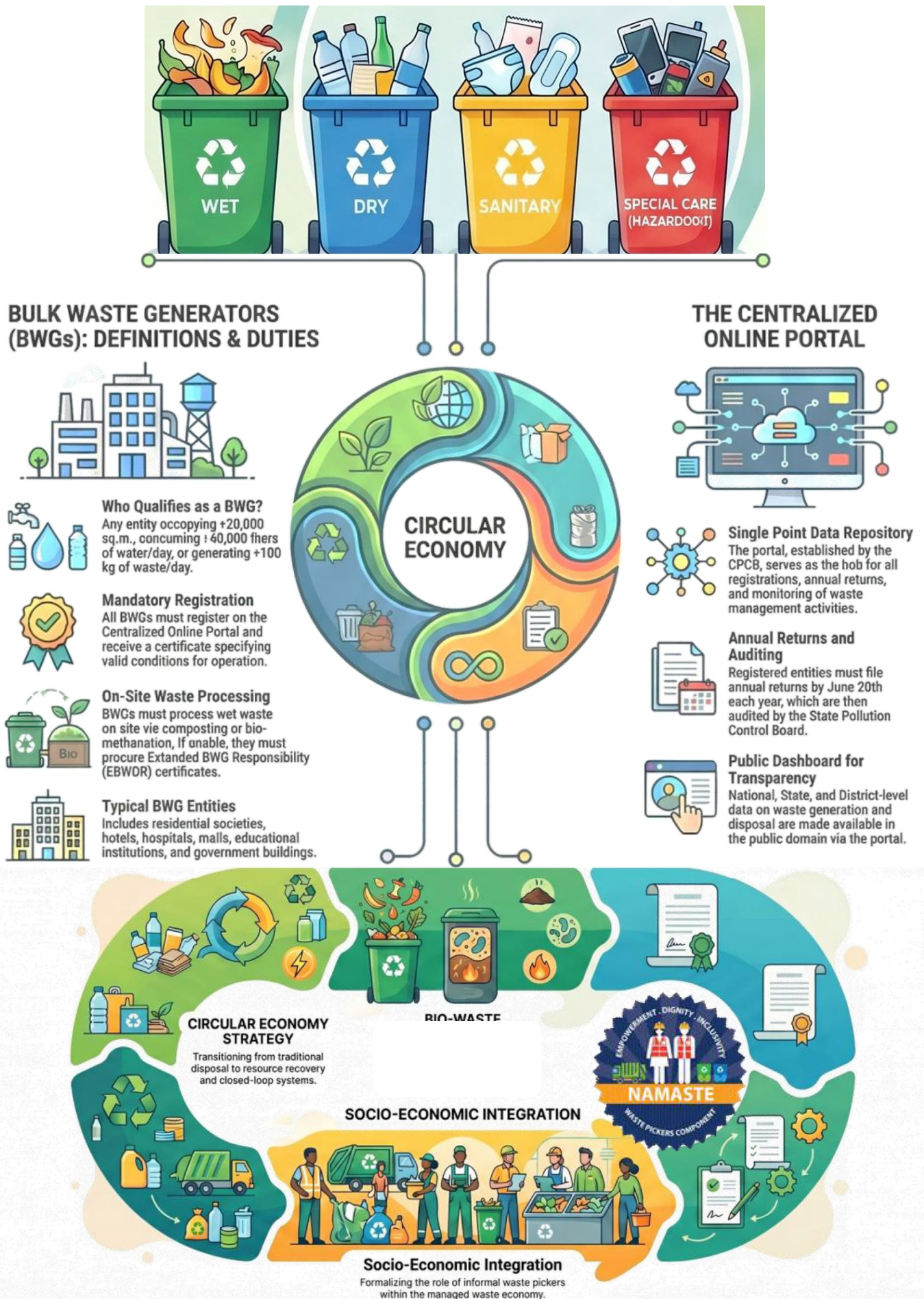
Key Highlights of this Topic:

- 3.1 Key Rules And Policies In SWM Rules 2026
- 3.2 Management Of Bulk Waste Generators (BWGs)
- 3.3 Role Of ULB In Fee Structure For EBWGR Certificates
- 3.4 Digital Governance -Reporting And Monitoring
- 3.5 Geospatial Management Information System (GMIS)
- 3.6 Integration Of The Informal Sector In The SWM Value Chain
- 3.7 SBM – NULM Convergence
- 3.8 Circularity In The Waste Management Value Chain
- 3.9 Basis For Carbon Credits: GHG Emission Reductions
- 3.10 Strategic Roadmap For ULBs To Implement SWM Rules 2026

About the topic:

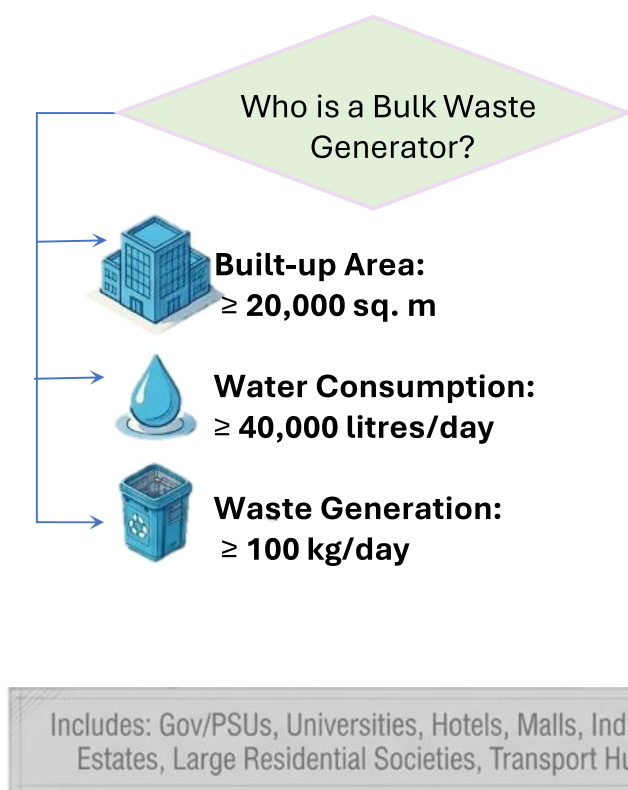
This topic helps to understand importance of circularities and upcoming opportunities for sustainable waste management through implementation of circularity

3.1 Key Rules And Policies In SWM Rules 2026



3.2 Management Of Bulk Waste Generators (BWGs)

The Solid Waste Management Rules, 2026 establish a transformative compliance framework for Bulk Waste Generators (BWGs), shifting significant accountability and financial liability onto large-scale entities through the Extended Bulk Waste Generator Responsibility (EBWGR) mechanism



Waste Generation Threshold (100 kg/day)

Urban waste generation assumption :

• **Per capita waste generation:** ~ 300 g/person/day (0.3 kg)

Waste

= Population × Per Capita Waste Generation

Example Calculation

If 100 flats are in a residential society:

• **Average family size:** 4 persons

• **Total population**

$$100 \times 4 = 400 \text{ persons}$$

Waste generated:

$$400 \times 0.3 = 120 \text{ kg/day}$$

Result:

$$120 \text{ kg/day} > 100 \text{ kg/day}$$

Therefore, the society with more than 100 flats will qualify as a Bulk Waste Generator.

Water Consumption Threshold (40,000 L/day)

Urban water supply planning in India often assumes:

• **135 litres per capita per day (LPCD)**

$$\text{Water Demand} = \text{Population} \times \text{LPCD}$$

Example Calculation

For the same 400 people:

$$400 \times 135 = 54,000 \text{ litres/day}$$

✓ **Result:**

$$54,000 \text{ L/day} > 40,000 \text{ L/day}$$

ULBs must identify BWGs through surveys, geo-tagging them, and update this list on the portal by **April 1st every year**. The rules distinguish between new and existing entities regarding their wet waste obligations:

1. New BWGs:

All new bulk waste generators are required to set up and operate their own deCentralised wet waste processing facilities. These facilities must have adequate capacity to handle all on-site organic and horticultural waste using approved technologies such as composting or biogas production.

2. Existing BWGs:

Entities that are physically unable to implement on-site processing may apply to the local body for an exemption. However, these **exempted BWGs must fulfill their responsibility by procuring Extended Bulk Waste Generator Responsibility (EBWGR) certificates** which would be **Valid for 3 Years**

The EBWGR Certificates (kg) = Quantity of waste collected, transported, and sent to registered processors/recyclers (kg)

3.3 Role Of ULB In Fee Structure For EBWGR Certificates

Under the Solid Waste Management Rules, 2026, the fee for Extended Bulk Waste Generator Responsibility (EBWGR) Certificates is to be set by each ULB.

The fee shall be determined by the respective Urban Local Body (ULB) based on applicable regulatory guidelines and local operational requirements.

Identification and Mapping:

EBWGR Certificates: The local body is the only authority mandated to generate EBWGR certificates on the Centralised online portal. The local body must register itself on the portal before it can issue these certificates for waste collected from BWGs and handed over to registered processors or recyclers

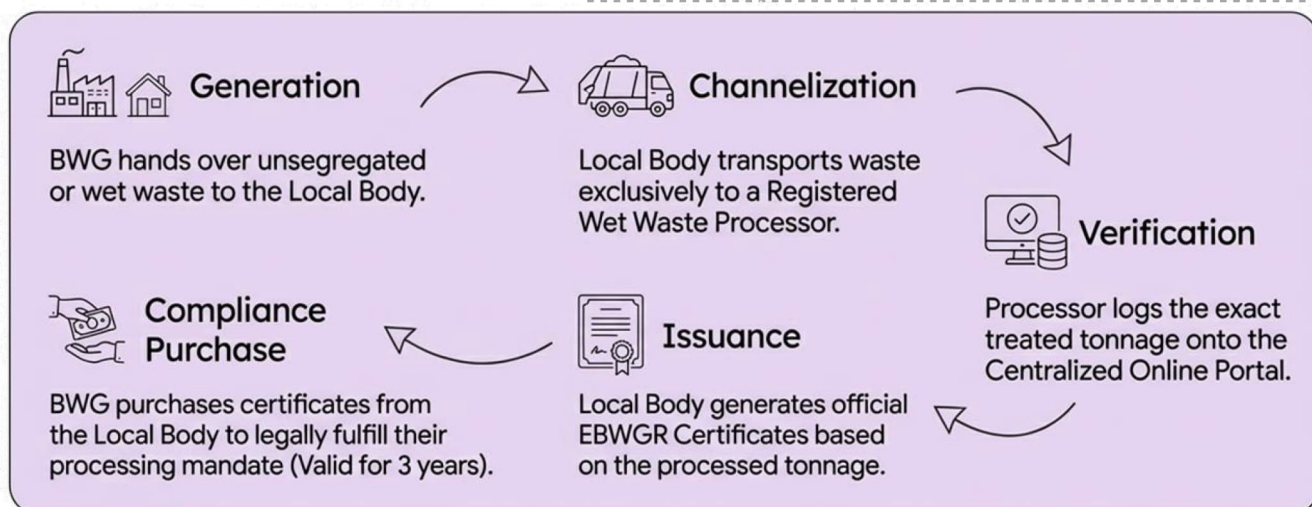
Determination of Fees

- The certificate fee shall be based on **guidelines issued by CPCB** in consultation with **MoHUA** and **DDWS**.
- The **ULB shall notify the applicable fee** through its bye-laws, regulations, or official notifications.
- The notified fee shall be implemented **after approval from the State / UT Government**.

Basis for Fee Calculation

The fee shall consider the actual cost of waste management services, including:

- **Establishment, operation, and maintenance** of SWM infrastructure
- **Collection, transportation, and processing** of waste
- Ensuring **sustainable long-term service delivery**



Funds collected from EBWGR certificate sales are escrowed specifically for local solid waste infrastructure development and third-party audits.

Non-Compliance and Penalties

- Bulk Waste Generators failing to comply through **on-site processing or certificate procurement** shall be liable for **Environmental Compensation** under the **polluter pays principle**.
ULBs may also impose **spot fines and penalties** as per local bye-laws.



3.4 Digital Governance -Reporting And Monitoring

The CPCB is responsible for establishing and operating this system within six months of the rules' commencement (by October 1, 2026). Its key features include

Mandatory Registration:

All obligated entities—including local bodies, bulk waste generators (BWGs), waste processors, and recyclers—must register on the portal

Single-Point Repository:

The portal acts as the national data repository for all solid waste management (SWM) orders, guidelines, and implementation data.

Public Dashboard: A

dashboard provides public access to data on waste generation, collection, processing, and landfilling at the **national, state, and district levels**



Certificate Exchange: The portal facilitates the issuance and exchange of **Extended Bulk Waste Generator Responsibility (EBWGR) certificates**

Reporting Requirements by Stakeholder

The rules establish strict timelines for filing returns and reports via the centralised platform

Stakeholder	Reporting Requirement	Deadline
Bulk Waste Generators (BWGs)	Annual Returns regarding EBWGR obligations and certificate procurement	June 30th every year
Waste Processing Facility Operators	Quarterly Returns on waste received, processed, and residues sent to landfills	15th day of the first month of the next quarter
Waste Processing Facility Operators	Annual Returns (Form III) detailing overall operations and compost quality	June 30th every year
Urban Local Bodies (ULBs)	Quarterly & Annual Returns (Form IV) on waste generation, collection coverage, and infrastructure	June 30th every year
State Pollution Control Boards (SPCBs)	Annual Report (Form V) on state-wide implementation and actions against non-complying ULBs	July 31st every year
Central Pollution Control Board (CPCB)	Consolidated Annual Report with recommendations submitted to the Central Government	August 31st every year

Transparency and Auditing



•**Public Domain:** Annual returns from BWGs and ULBs must be published on the respective local body's website and the Centralised portal.



•**Audits:** SPCBs or registered environment auditors are required to audit the data submitted by ULBs and waste processors, with audit reports uploaded to the portal by **December 31st** of the following financial year.



•**Non-Compliance:** Entities providing false information or concealing facts on the portal are liable for **Environmental Compensation** under the "polluter pays" principle

3.5 Geospatial Management Information System (GMIS)

The Geospatial Management Information System (GMIS) is a mapping and monitoring platform for the Swachh Bharat Mission (SBM). GMIS was introduced and launched by MoHUA to further boost the efforts towards making cities more self-reliant and meet the needs of and provide services to their citizens. The digital backbone uses GIS technology to map and track assets like toilets and waste processing facilities. It was subsequently upgraded to support the targeted "Garbage Free" goals of SBM-Urban 2.0



Urban Local Bodies (ULBs) and designated GIS operators use the dedicated **SBM GMIS mobile app**



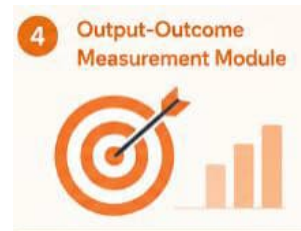
Tracks city performance and benchmarks progress toward Smart City goals.



Shows changes in city rankings over time.



Generates reports on ongoing, geo-tagged, updated, and active/inactive projects



Measures mission outcomes and impacts and impacts.



Aligns Mission performance with Sustainable Development Goals



Maintains records of vendors, ensuring transparency and accountability.



Monitors physical progress of city projects.

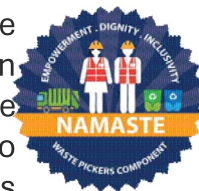


Enables projects to be linked with NIP for infrastructure investment planning.

With GMIS, more than 7,000 Cities projects have been mapped, geo-coordinates, physical & financial progress, for every ongoing and completed project.

3.6 Integration Of The Informal Sector In The SWM Value Chain

India home to an estimated 1.5 to 4 million waste pickers, is one of the countries where informal waste workers play a crucial role in urban sanitation and waste recycling. They recover nearly 20-30% of recyclable waste, preventing it from ending up in landfills and contributing to environmental sustainability. As per the Solid Waste Management Rules 2026, Urban Local Bodies (ULBs) are now mandated to integrate informal waste pickers into the mainstream waste management ecosystem.



The National Action for Mechanized Sanitation Ecosystem (NAMASTE scheme, launched in July 2023) Empowering Sanitation Workers for safety and dignity serves as the primary vehicle for this transition.

Role Of Urban Local Body (ULB) In Implementation Of NAMASTE Scheme



Identification & Database - ULBs could prepare a **ward-wise database** of all informal personnel, including waste pickers and collectors, and upload this information to the Centralised Online Portal , through survey by Collaboration with parastatal agencies or NGOs



Worker Profiling

The ULB conducts profiling camps to enumerate and register all SSWs, including those employed by the ULB, parastatal agencies, and Private Sanitation Service Organizations (PSSOs).



Training Facilitation

ULBs facilitate **occupational safety training** , covering the use of Personal Protective Equipment (PPE), safety gear, and the handling of mechanized cleaning operations



Infrastructure Access

Recognized pickers are Authorised to collect and recover waste from generation sources, including Material Recovery Facilities (MRF)



Mobilizing the waste pickers

Conduct activities such as Health Camps, regular meetings, awareness sessions on hygiene, and social benefits available, etc.



Provision of ID cards to waste pickers

Provide valid work ID cards to pickers to provide them formal access to waste segregation and hold them accountable for work.



Capacity Building – Leadership/Skill Development

Identify leaders from the waste picker's community, understand their circle of influence, and build clarity on the importance of becoming part of a formal system of waste management.



Institution through Self Help Groups

Understand the common interests, willingness, and skill mapping of the community to form a group of 10 people. Process of SHG documentation and corrections from the NULM Department of GMC can ensure disbursement of funds to the SHGs for revolving capital.



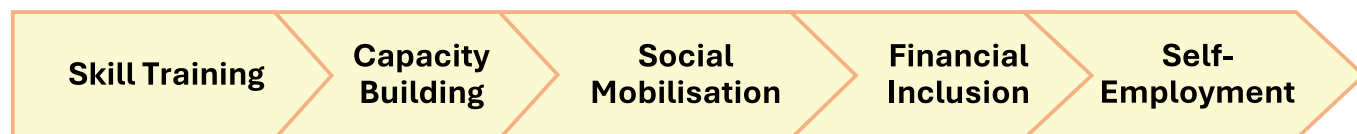
Integration of Community Structure into Waste Ecosystem

Ensure formation and registration of various SHGs of pickers, which are then managed to work towards common goals of livelihood development and improvement of overall well-being.

3.7 SBM – NULM Convergence

The **SBM–NULM convergence framework** identifies key strategies for integrating informal waste pickers through livelihood improvement and social inclusion.

Key Livelihood Upgradation Strategies



Modes of Integration

There are four ways a ULB can formally integrate waste pickers in waste management activities.

Providing Tenders to Formalized SHGs



Organizing waste pickers into a SHG structure and then creating tenders specifically for waste pickers SHGs in street sweeping, collection or operation of dry waste collection centers, etc.

On Payroll by contractor



ULBs require MRF contractors to employ existing waste pickers for dry waste sorting, ensuring minimum wages, safety equipment, and improved working conditions.

Open Contractual Opportunities



ULB, which operates its own collection and processing facilities, can integrate waste pickers as field labor on contractual basis.

Access to waste



ULBs issue identity cards to waste pickers, granting them Authorised access to sort waste at MRFs or dumpsites while ensuring social, health, and improved working conditions.

The four major social security schemes run by the Government of India provide pension, insurance, and health protection to unorganized sector workers, low-income groups, and economically weaker sections.

Atal Pension Yojana (APY):

It is for citizens aged 18-40 years, which provides a monthly pension of ₹1,000 to ₹5,000 after the age of 60 years.

Pradhan Mantri Suraksha Bima Yojana (PMSBY):

This is an accident insurance scheme that provides coverage of ₹2 lakh for accidental death or disability at an annual premium of ₹20.

E-Shram:

It is a database of unorganized workers, which helps cardholders to avail accident insurance of ₹2 lakh and other social security schemes

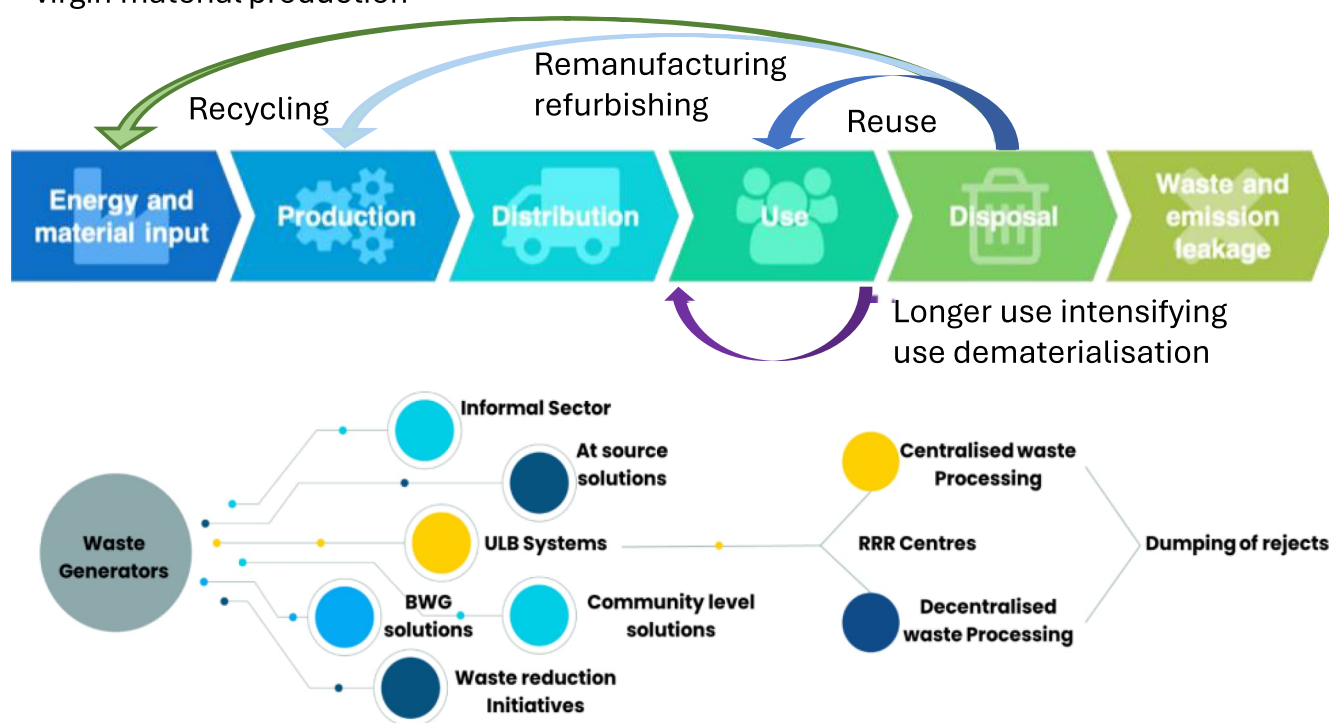
Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY):

This is a life insurance scheme which provides a cover of ₹2 lakh on death at an annual premium of ₹436.

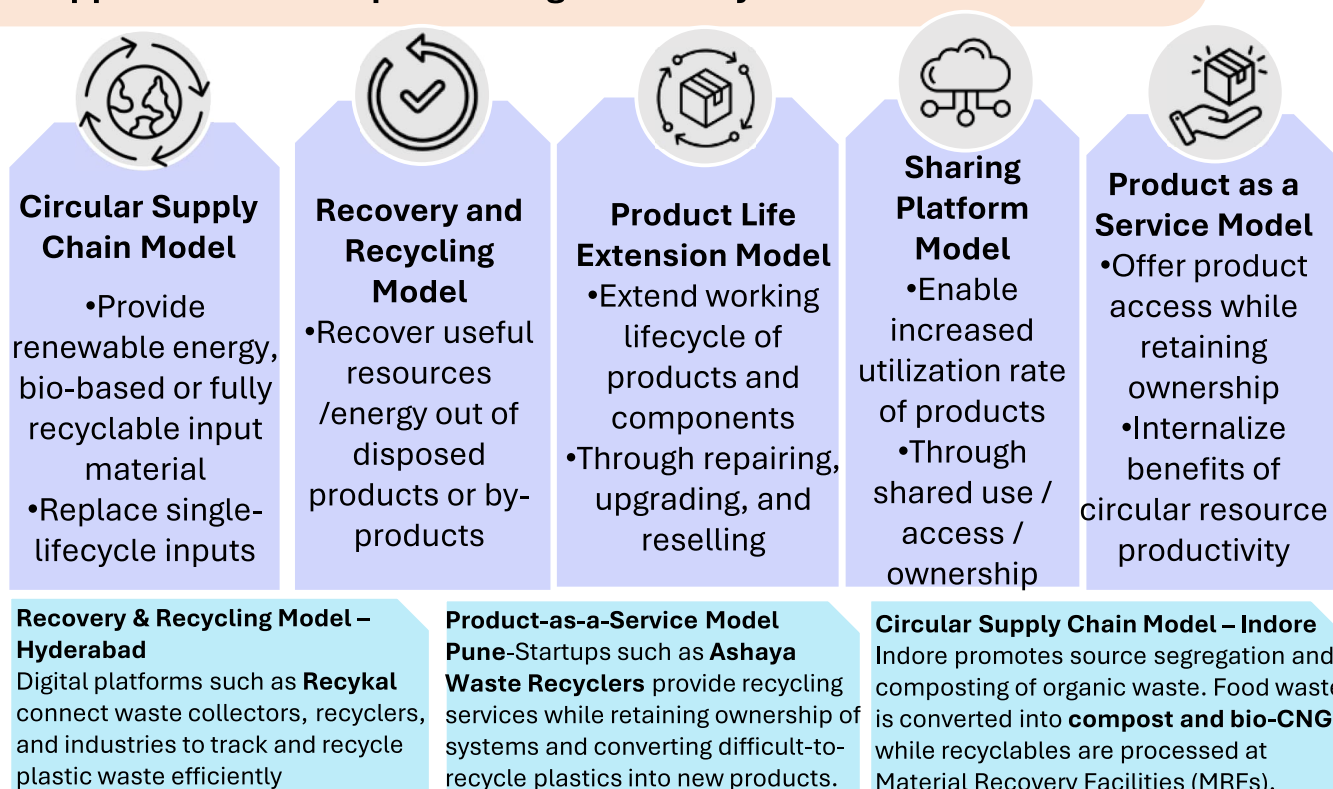
The eShram portal acts as One-Stop" Registration, central database linked with 12 other central schemes, making it crucial for getting the workers to register

3.8 Circularity In The Waste Management Value Chain

Circularity is essential for urban local bodies as it offers a holistic approach to resource management, waste reduction, economic development, climate resilience, community engagement, and long-term sustainability. By integrating circular principles into urban planning and governance, local authorities can create more resilient, equitable, and sustainable cities. Circular economy implementation reduces waste sector GHG emissions by prioritizing waste prevention, material reuse, and efficient resource loops over linear disposal. This shifts away from high-emission practices like landfilling and virgin material production



Opportunities In Implementing Circularity In Waste



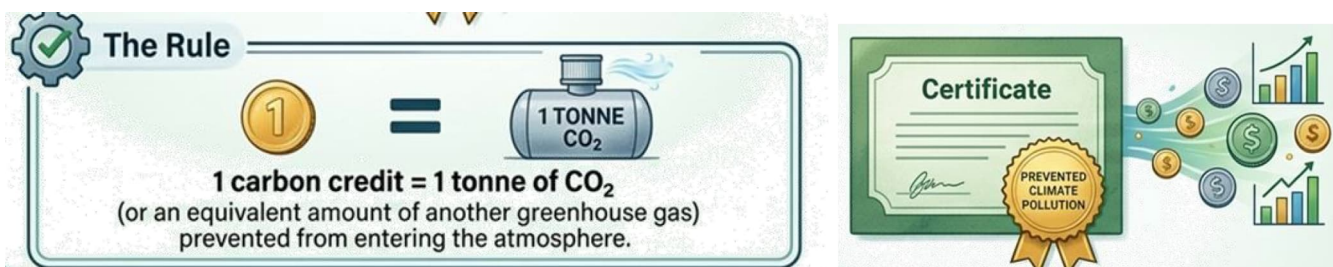
3.9 Basis For Carbon Credits: GHG Emission Reductions

National policies such as the Energy Conservation Act, 2022 and the Carbon Credit Trading Scheme (India) are helping build India's carbon market. In this context, circularity is emerging as an important strategy to reduce waste, save resources, and support sustainable growth. At India Climate Week 2026, cities learned that integrating circular economy practices into waste and urban systems can directly support climate action and reduce emissions. They also highlighted that using data-driven systems aligned with policy and markets can generate measurable carbon benefits and unlock new funding opportunities.



When a city diverts wet waste away from landfills and instead processes it into **compost** or **Bio-CNG**, it helps avoid harmful emissions that would otherwise be released. If these avoided emissions are properly measured, verified, and certified, they can be converted into **carbon credits**.

Carbon credit as a certificate that proves your city has prevented climate pollution and that certificate can have real financial value



Carbon credits can create a **new revenue stream** for the city, beyond traditional sources like **property tax**, while also promoting cleaner and more sustainable waste management.



Wet Waste Circularity: Transitioning to **bio-methanation** for processing wet waste is a key driver. It is estimated that if 50% of wet waste in urban India is processed via bio-methanation, it could lead to a reduction in GHG emissions of approximately **10.36 million tonnes of CO₂ equivalent**



Dry Waste Management: Applying circularity principles, such as "refill" models for bottles, can lead to an **80–85% reduction in GHG emissions** compared to traditional single-use packaging

3.10 Strategic Roadmap For ULBs To Implement SWM Rules 2026

Strategic Action	Key Tasks
Governance setup	appoint nodal officer
Portal compliance	CPCB registration
Baseline mapping	dumpsites + GVP mapping
BWG identification	survey + geo-tagging

Phase 1: Immediate Regulatory Compliance (April 2026 – October 2026)

Phase 2: Planning & Regulatory Framework (By 31 March 2027) The rules specifically require action plans and municipal bye-laws.	Strategic action	Key tasks
	CSWAP preparation	Ward data + 5-year projections
	Bye-laws	Notify local rules
	Fee framework	EBWGR + user charges
	Grievance system	Online complaint portal

Strategic action	Key tasks
Segregation	4-stream rollout
D2D collection	Route coverage
MRF & infra	Facilities + centres
Worker welfare	PPE + training

Phase 3: Operational Deployment (18-, 24-, and 36-month schedule)
 The phased infrastructure timeline depends on city population category.

Phase 4: Monitoring & Accountability Annual reporting and digital validation are mandatory.	Strategic Action	Key Tasks
	Daily monitoring	GPS + control room
	Reporting	Form IV + quarterly returns
	Enforcement	Fines + notices
	Transparency	Public disclosure

ULB Compliance Checklist For SWM Rules 2026 Implementation

Sr. No.	Strategic Area	Key Compliance Requirement	Action Required by ULB	Timeline	Status ✓
1	Planning & Policy	City SWM Action Plan	Prepare 5-year ward-wise waste projections, route plans, infrastructure mapping and sweeping schedule	Within 1 year of State Policy	☐
2	Regulatory Compliance	Municipal Bye-laws	Draft, approve and notify bye-laws aligned with SWM 2026 Rules	By 31 Mar 2027	☐
3	Portal Compliance	CPCB Registration	Register ULB on Centralised portal and upload city action plan	Immediate / within notified timeline	☐
4	Source Segregation	4-bin segregation	Ensure wet, dry, sanitary and special-care waste segregation at source	Mandatory	☐
5	Door-to-Door Collection	100% coverage	Cover households, slums, commercial and institutional areas	Daily operational target	☐
6	Secondary Storage	Covered transfer points	Establish covered points for street sweeping waste and drain silt	Priority infrastructure	☐
7	Vendor & Event Waste	Waste container compliance	Ensure vendors and event organizers follow segregation and prior intimation norms	Ongoing	☐
8	MRF Infrastructure	Dry waste sorting	Establish MRFs as per waste quantity and population norms	Schedule I deadline	☐
9	Processing Facilities	Treatment systems	Develop composting / biomethanation / WtE facilities	Phase-wise	☐
10	Special Care Waste	Collection centers	One center per 5 sq. km for batteries, medicines, e-waste	Mandatory	☐
11	Geo-tagging	Digital asset mapping	Geo-tag bins, MRFs, transfer stations, vehicles and processing plants	Immediate	☐
12	Digital Monitoring	Control room	Cities >5 lakh population to establish control room with GPS dashboard	Mandatory	☐
13	Citizen Complaints	Grievance system	Create online complaint and escalation mechanism	Within 1 year	☐
14	Annual Reporting	Portal reporting	Submit annual returns and compliance reports	By 30 June every year	☐

Chapter 4 :

Technologies And Process Assessments/Reviews

Key Highlights Of This Topic:

- 4.1 Quantum Of Waste Generation And Sources Of Waste
- 4.2 Waste Characterization Methodology As Per The CPHEEO Guidelines
- 4.3 Planning The Waste flow: Collection And Transportation
- 4.4 Transfer Station
- 4.5 Wet Waste Processing Technology And Decision Flowchart
- 4.6 Dry Waste Processing Technology And Decision Flowchart
- 4.7 Legacy Waste And Dumpsite Remediation

About the topic:

Effective planning depends on choosing the right technologies based on waste characteristics and city needs. This section explores technical options, process flows, and assessment methods to support informed decision-making in system design and infrastructure development.

4.1 Quantum Of Waste Generation And Sources Of Waste

Since waste characteristics vary across cities, Urban Local Bodies (ULBs) should conduct scientific waste quantification and characterization in accordance with prescribed standards. Planning should begin with understanding raw waste data before investing in infrastructure. By assessing waste volumes, properties, transport, and treatment needs, ULBs can avoid costly mismatches between waste types and processing technologies.

CPHEEO norms for per capita waste generation based on city population

Population	Per Capita waste generated (in grams)	Total Generation (TPD)
A	B	$C = (A \times B)/1000000$
2,00,000	200	40
	300	60
2 Lakhs to 5 lakhs	300	60 to 150
	350	70 to 175
5 Lakhs to 10 Lakhs	350	175 to 350
	400	200 to 400
Above 10 Lakhs	400	400
	600	600

For long-term planning (20-25 years), the CPHEEO manual provides standard growth factors

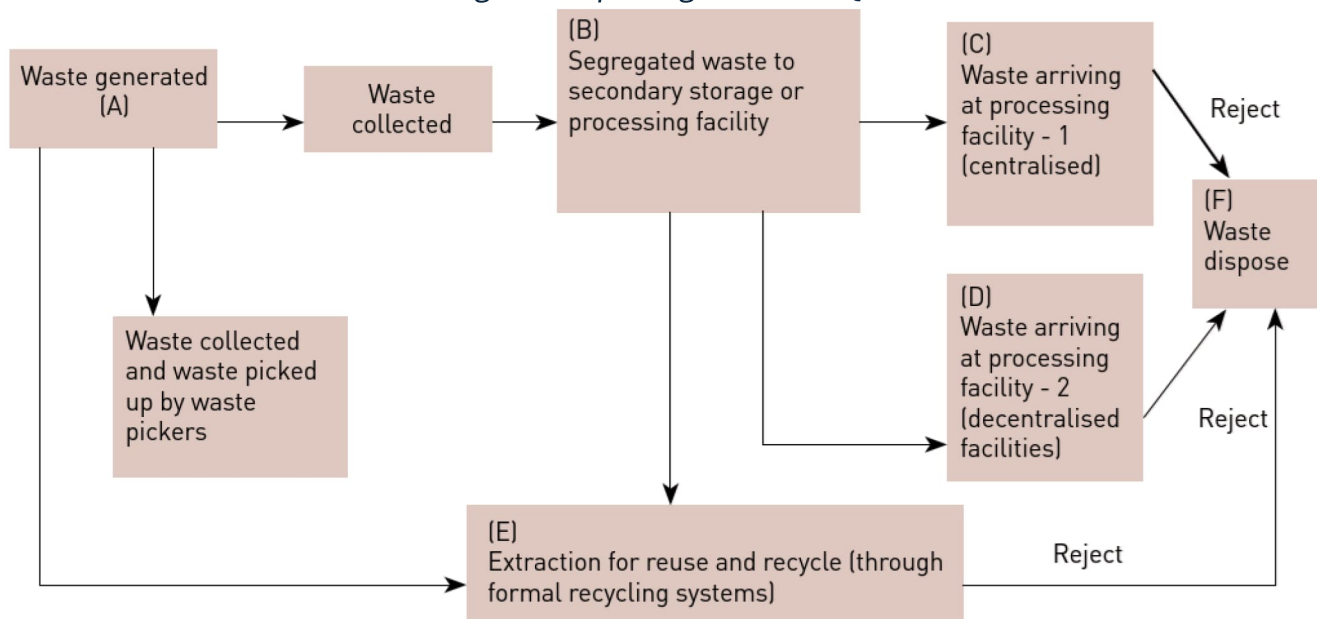
Waste quantification	- Per capita/year increase in waste generation quantity-1.3 %/ year - Annual increase in waste quantities-5% per year.
Waste composition*	- Organic/compostable fraction: 40 – 60%; - Recyclable/ Resource Recoverable fraction: 20 – 30%; - Non-Recyclable/ Combustible (RDF): 10 – 20%’; - Construction and Demolition (C&D) waste and unusable combustible: 5 – 15%.

For cities, even if the Standard practice is to refer to the waste estimations as per Weighbridge Measurement, but an accurate per capita rate cannot be determined simply by looking at waste collected records, as these often miss waste recovered by the informal sector or littered waste.

Another mythology is Points of Quantification, which is suited for larger cities. The process includes generator-level surveys, stratified random sampling across land-use categories, seasonal waste characterization, and quality-control measures to ensure accurate data representation. Quantification should occur at multiple points in the waste flow:

- **Point A:** At the source (generation)
- **Point B:** At transfer stations or secondary storage
- **Point C/D:** At Centralized or decentralized processing facilities
- **Point F:** At the final disposal site (sanitary landfill)

Waste Flow Diagram Depicting Points of Quantification



CPHEEO emphasizes that waste measured at processing sites does not reflect the actual "generation rate" because it misses several streams

Total Waste Generated is the sum of = Waste reaching processing or disposal sites +Waste recovered by the informal sector/ recyclers + Uncollected or littered waste due to system gaps

Method 2 : CPHEEO prescribes a representative sampling method can be used:

- **Sampling Size:** Select at least 100 representative sampling locations per 1,00,000 population.
- **Diverse Representation:** Locations must include low, mid, and high-income households, as well as commercial establishments, institutions, hospitals, hotels, vegetable markets, and industries.
- **Duration:** A minimum of 3 to 7 continuous days across the three main seasons

Extrapolation: Aggregate the weights from the samples, calculate the daily average, and divide by the sample population to obtain the per capita rate. This rate is then extrapolated to the city's total population.

4.2 Waste Characterization Methodology As Per The CPHEEO Guidelines

Waste Density characterization as per CPHEEO	• Density of waste for design consideration:
	• Wet waste- 0.5t/m^3
	• Gross Density of Digested Compost- 0.7t/m^3
	• Gross Density of Finished Compost - 1 t/m^3
	• Dry waste- 0.45t/m^3
	• Inert waste (10-15% of total waste)- 0.85t/m^3
	• C&D waste- 0.6 t/m^3

Waste characterization helps determine the physical, chemical, and biological properties of waste, which is critical for selecting suitable processing technologies such as composting, Bio-Methanation, RDF, or waste-to-energy.

Methodology For Different Generators



At Source Sampling

Waste samples are collected directly from generators such as households or shops.

Waste generators are provided with storage bags for a fixed period (e.g., 3–7 days) and asked to store all daily waste in them. These bags are later collected and analyzed



Daily Collection

Waste is sampled during the daily collection process.

Waste bags collected from different generators are weighed using calibrated scales and recorded according to the waste category or service area (e.g., residential or commercial).

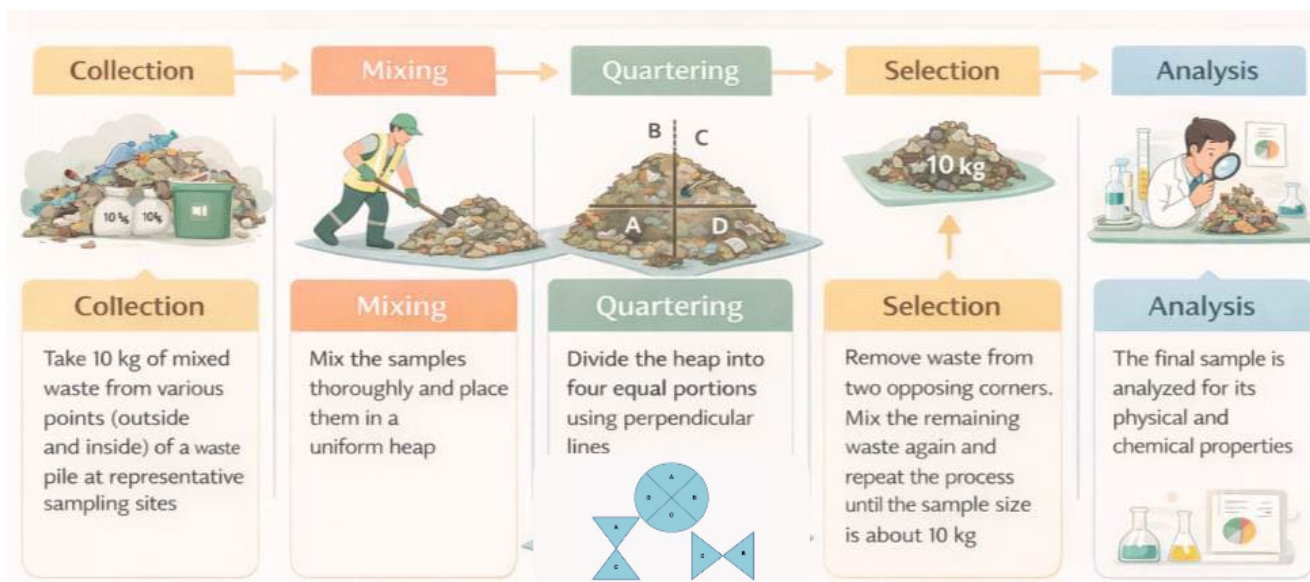


Component Weighing

Mixed waste collected from different sources is **combined and then manually segregated into components** such as organics, paper, plastic, glass, and metals. Each fraction is weighed to determine the **overall composition of municipal solid waste**.

Methodology: The Quartering And Cone And Quartering Method

This method is preferred for reducing large heterogeneous waste samples to a manageable size for manual classification



Physical Analysis

- **Bulk Density:** Measured using standard volumetric boxes and average weight calculations
- **Moisture Content:** Calculated to assess transportation and processing efficiency
- **Chemical and Bio-Chemical Analysis**
Samples should be tested through accredited laboratories for:
 - **pH, NPK, Total Organic Carbon, and C/N ratio**
 - **Calorific value** for energy recovery suitability
 - **Toxicity / heavy metal content** through standard leachability tests

4.3 Planning The Waste flow: Collection And Transportation

The **Solid Waste Management Rules, 2026** establish a rigorous framework for waste collection, shifting focus toward mandatory source segregation and digitized monitoring. Under these rules, collection is not merely about pickup but involves a synchronized system of segregation, specialized transportation, and the integration of informal workers.

Below are the key aspects of waste collection as detailed in the rules:

1. Types of Collection Defined

- **Door-to-Door Collection:** The pickup of solid waste from the entrance or a designated ground-floor location of households, shops, offices, and institutional premises in a **segregated manner** and transporting it to secondary storage points, transfer stations, or processing facilities.

2. Mandatory Source Segregation

- Collection is strictly tied to segregation. Every waste generator is required to separate waste into **four distinct streams** before handing it over to collectors: **Wet Waste, Dry Waste, Sanitary Waste,, Special Care Waste**

3. Monitoring and Digitization

- **GPS Tracking:** Urban local bodies with a population of **more than five lakhs** must establish control rooms to track collection vehicles using GPS and ICT.
- **Geo-tagging:** All solid waste management infrastructure, including collection points, must be geo-tagged.

Vehicle Selection & Deployment Matrix

Vehicle Category	Recommended Vehicle	Where to Use (Application)	When to Use (Criteria/Distance)	Capacity & Performance Norms
Primary Collection	Light Commercial Vehicle (LCV)	Main residential and commercial roads with width > 5m.	Daily morning sessions for 100% door-to-door (D2D) coverage.	1 vehicle per 1,000–2,000 HHs;
Primary Collection	Containerized Tricycle / E-Rickshaw	Congested areas, narrow lanes (< 5m), and hilly terrains.	Used when larger LCVs cannot access the doorstep.	1 per 200–300 HHs;
Secondary Collection	Refuse Compactor (Medium/ Large)	Direct transfer from primary vehicles or lifting 1.1 m ³ bins.	When processing site is 5 km to 15 km from collection area.	Compaction ratio: 800–900 kg/m ³ ; 2.5 MT to 7.5 MT capacity
Secondary Collection	Dumper Placer (Skip Truck)	Markets, public places, and secondary storage depots.	For lifting Inert waste, C&D waste, and street sweepings.	5–6 trips per 8-hour shift
Bulk Transfer	Hook Loader (with 15–25 m ³ containers)	Established Transfer Stations or high-volume generators.	Mandatory when processing/disposal is > 15 km away.	Containers > 10 MT capacity;

4.4 Transfer Station

A **transfer station** is a permanent facility where waste from small primary vehicles (e.g., tricycles or mini-tippers) is transferred into larger vehicles for long-distance transport. It usually includes **large containers (15–25 m³)**, **unloading ramps**, and **sometimes static compactors** to improve transport efficiency.

Purpose of Transfer Stations

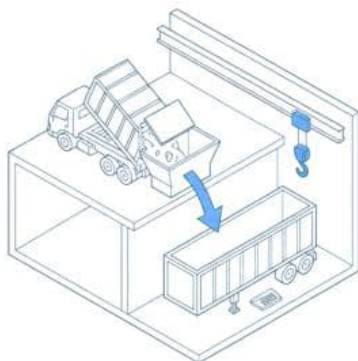
- **Cost and Fuel Efficiency:** Reduces travel time and fuel use by avoiding long trips by small vehicles.
- **Operational Efficiency:** Allows primary vehicles to unload quickly and return to collection routes.
- **Installation and Siting Criteria**
 - **Distance Requirement:** Required in large cities where processing or disposal sites are **more than 15 km away**.
 - **Economic Feasibility:** Suitable when primary vehicle travel time exceeds **30 minutes** or when direct hauling is costlier than transfer-based transport.
- **Infrastructure Requirements:** The facility should be part of the **City Master Plan**, have a **waterproof concrete floor**, and preferably be **enclosed** to control noise and odor.

Scale of Transfer Station as per City

Small Transfer Stations	Medium Transfer Stations	Large Transfer Stations
- Capacity: Up to 100 tonnes per day. - Function: Primarily direct discharge and segregation. Typically lacks advanced processing units. - Design: Can be indoor or outdoor depending on site and weather. Does not have an intermediate waste storage area.	- Capacity: 100 to 500 tonnes per day. - Function: Similar to small stations, but may include "a few processing units." - Design: Can be indoor or outdoor.	- Capacity: Designed for municipal collection vehicles articles and commercial use. - Function: Comprehensive operations including segregation, component separation, size/ volume reduction. May have inbuilt incinerators or composting facilities. - Process: Vehicles are weighed upon entry before proceeding to a pit or platform for unloading.

Type of Transfer Stations

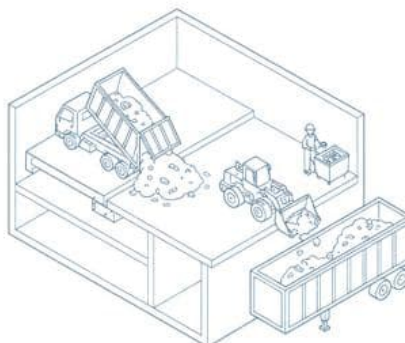
Direct Discharge (Non-Compaction)



Process: Collection vehicles on an upper floor drop waste through a hopper directly into an open-top trailer on a lower floor. A stationary crane distributes the load.

Key Feature: Two-level operation. Trailers have scales to prevent overloading.

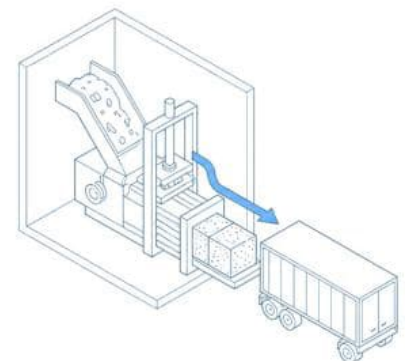
Platform / Pit (Non-Compaction)



Process: Waste is dumped onto a platform or into a pit, serving as temporary storage. Recyclables or unacceptable materials can be segregated by hand. Front-end loaders then push the waste into trailers.

Key Feature: Platform has two levels; pit has three. Allows for large volumes and temporary storage but has increased construction costs.

Compaction Station



Process: Waste is fed into a chute and compressed by mechanical (typically hydraulic) compactors before being baled or loaded.

Use Case: Favored when baling is needed for shipment, site location doesn't permit multi-level building, or size restrictions prevent open trailer use.

4.5 Wet Waste Processing Technology And Decision Flowchart

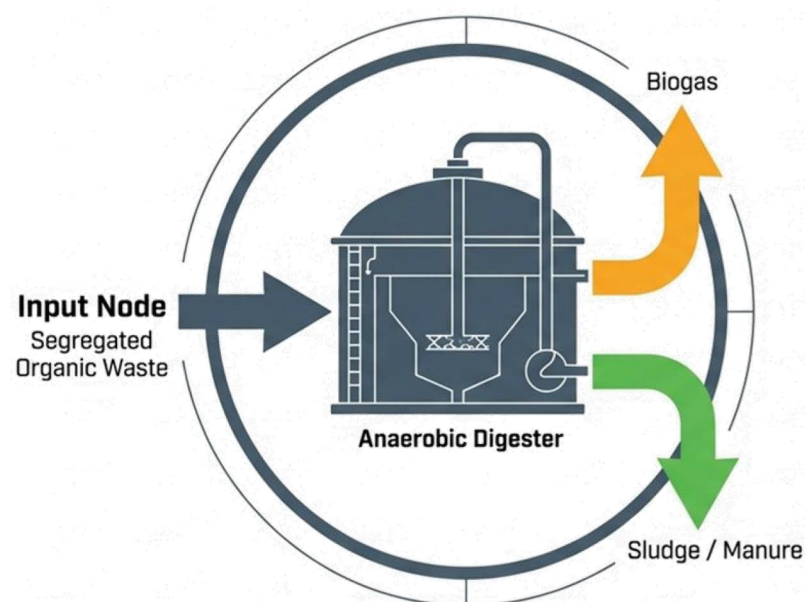
Wet waste, mainly biodegradable organic waste from households, markets, and institutions, should be managed through **deCentralised processing systems** to reduce transportation costs and environmental impacts. Priority is given to **composting and biomethanation at or near the source of generation**. As per guidelines, **bulk waste generators** must process their wet waste within their premises. Commonly adopted technologies include **aerobic composting (windrow or vermicomposting)**, **anaerobic digestion/biomethanation**, and **microbial stabilization methods**

Technology selection matrix

Technology	Primary Output	Process Duration	Land Required (per 500 TPD)	Manpower	Electricity
Windrow Composting	Compost 🌿	8 weeks	8 ha	High ● ● ●	Low ⚡
Aerated Static Pile (ASP)	Compost 🌿	5 weeks	5 ha	Moderate ● ● ○	Moderate ⚡ ⚡
In-Vessel Composting	Compost 🌿	4 weeks	4 ha	Moderate ● ● ○	High ⚡ ⚡ ⚡
Biomethanation	Biogas / Energy 🔥	Continuous	Modular	Low / Skilled ● ○ ○	Net Generator ⚡

Bio-Methanation / Bio CNG

Under the **Solid Waste Management Rules, 2026**, Compressed Biogas (CBG) is classified as a form of **waste-to-energy** recovery



Net Energy Generator

The only technology that produces more power than it consumes.

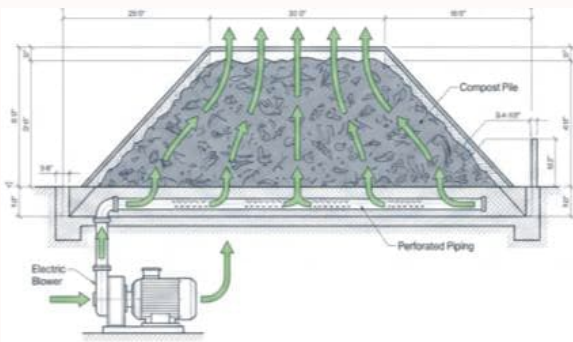
Modular Scalability

Efficiently built and scaled in 50 TPD digester modules.

Strict Prerequisites

Absolutely requires pristine feedstock quality; system fails with mixed inert material.
Demands high technical skill for continuous operational balancing.

Aerated static pile



Accelerated Timeline

Processing time reduced to ~5 weeks.

Reduced Footprint

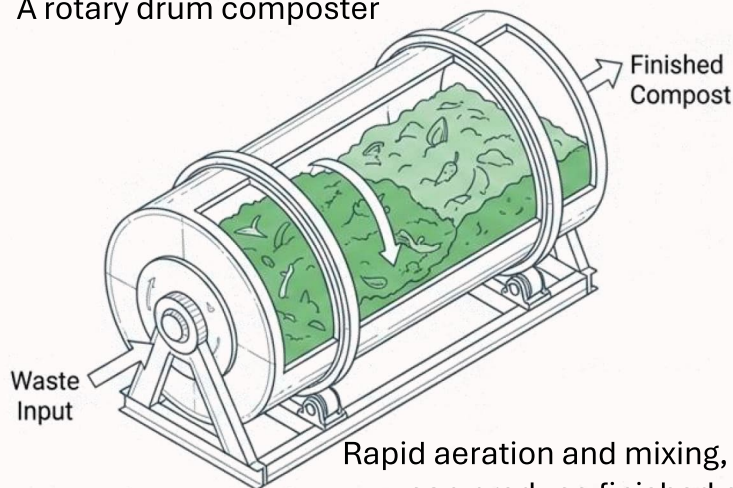
Land requirement is to 5 hectares per 500 TPD.

Technical Shift

Replaces manual turning labor with mechanical blowers and requires moderate technical oversight to monitor pile porosity and air distribution.

In Vessel composting

A rotary drum composter



Minimal Land

Only 4 hectares for 500 TPD

Best Odor Control

Fully enclosed system with no atmospheric release

High Energy Demand

Significant electrical draw required for continuous mechanical mixing and aeration

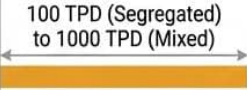
Rapid aeration and mixing, often combined with daily loading, can produce finished compost in as little as 3-7 days

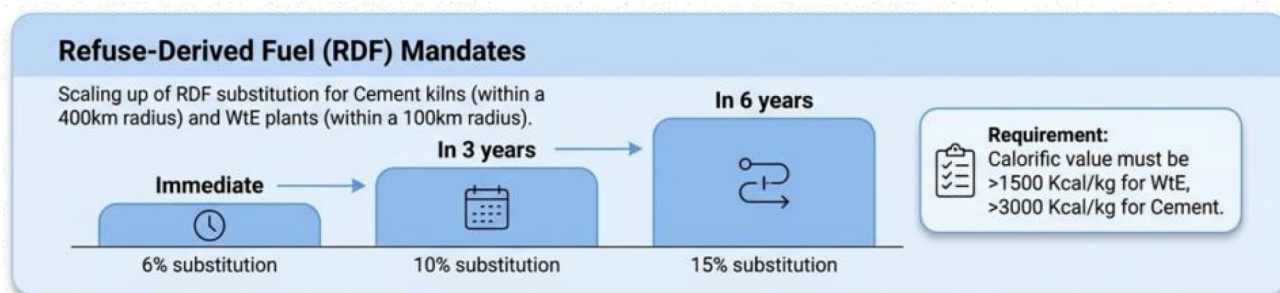
For larger cities, these technologies must be deployed following specific regulatory standards:

- **DeCentralised Priority:** The rules emphasize deCentralised processing (dispersed facilities near the source) to maximize the treatment of wet waste while minimizing transportation costs and environmental impacts
- **Compartmentalization:** All collection vehicles must remain compartmentalized to ensure that the segregated wet waste stream is not contaminated by dry or hazardous waste before reaching these processing facilities
- **Quality Monitoring:** Any organic manure produced must meet the standards of the Fertilizer (Control) Order (FCO) regarding heavy metals, pH, and C/N ratios
- **Leachate Management:** Facilities must have impermeable bases (such as 50cm thick concrete or compacted clay) with a 1%–2% slope and lined drains to collect leachate for treatment or recirculation into the process
- **ULBs** are also mandated to phase out chemical fertilizers within their own jurisdictions (such as in public parks and gardens) in favor of the compost produced by these methods within two years

4.6 Dry Waste Processing Technology And Decision Flowchart

The focus for dry waste processing is on material recovery and energy extraction from non-recyclable fractions under SWM 2026 rules .

	Manual MRF	Mechanized MRF	RDF Production	Incineration (WtE)
Preferred Scale (TPD)	 < 500 TPD (Decentralized)	 > 500 TPD	 100 TPD (Segregated) to 1000 TPD (Mixed)	 > 500 TPD [Source: Table 1.18]
Primary Output	Recyclables	Recyclables	Combustible Fuel	Electricity & Steam
Manpower	 Informal sector & waste pickers	 Semi-skilled technicians	 Skilled operators	 Highly skilled engineers [Source: Section 3.1.4.1, 3.3.3.1]
Electricity Impact	Net Consumer	Net Consumer	Net Consumer	Net Generator
Land Requirements	Minimal (<1 ha)	Moderate	6 ha (for 300 TPD presorted)	5 ha (for 1000 TPD) [Source: Table 1.18]

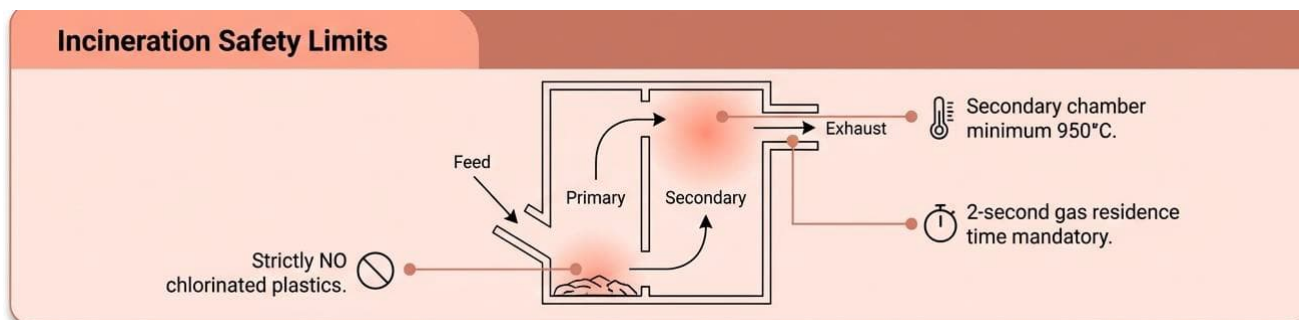


Its mandatory for Industrial units within 100 km of an RDF plant must replace at least 5% of their fuel requirement with RDF

Sanitary Waste Processing

Solid Waste Management Rules, 2026, the incineration of **Sanitary Waste is a mandated** method for its environmentally sound disposal, requiring specific technical standards and operational oversight

Urban local bodies (ULBs) must plan for the management of Sanitary Waste through the use of dedicated incinerators designed specifically for this purpose or through established common biomedical waste treatment facilities



4.7 Legacy Waste And Dumpsite Remediation

According to schedule I of the 2026 rules, ULBs must complete legacy waste remediation within specific periods from the date the rules come into effect (April 1, 2026):

Time line for remediation



- **Million-plus cities: 18 months.**
- **Cities with 5–10 lakh population: within 24 months.**
- **All other urban areas: within 36 months.**

The Rules and SBM legacy waste toolkit outline a clear hierarchy for managing legacy sites, prioritizing **biomining and bioremediation** over capping.

Stop Fresh Dumping: ULBs are strictly prohibited from disposing of fresh solid waste or construction and demolition (C&D) waste on legacy sites where biomining/bioremediation is underway.

Biomining-based remediation should follow six critical steps::

- 1.Pre-feasibility assessment:** Surveying the site and characterizing the waste.
- 2.Systematic excavation:** Using heavy machinery to reach all layers of the waste.
- 3.Stabilization:** Spraying bio-culture (inoculum) on waste windrows to reduce volume and neutralize pathogens.
- 4.Processing:** Using trommels and screens to separate waste into different sizes (e.g., <4 mm, 4–20 mm, >20 mm).

Fraction Utilization:

- **Refuse-Derived Fuel (RDF):** Combustible fractions should be sent to cement plants or waste-to-energy plants.
- **Fines/Bio-earth:** Soil-like material can be used for landscaping or earth-filling after testing for heavy metals.
- **Inerts:** Stones and C&D waste should be sent for processing into building materials.

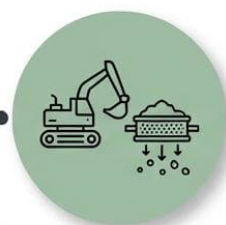
Reclaiming Land: The cleared land should be conditioned and reused for waste processing facilities or other non-residential purposes



Mapping & Planning:



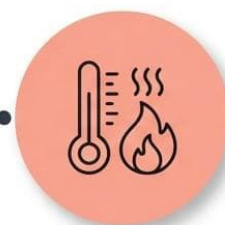
Map all legacy dumpsites by Oct 31, 2026; upload time-bound action plans.



Biomining Process:



Excavation & screening into fractions (RDF, fine earth, C&D). Fine soil for agriculture must pass CPCB tests.



Fire Prevention:



Continuous temperature monitoring (35°C–59°C) at windrows. Install landfill gas detectors downwind.



Strict Prohibition:



No fresh solid waste dumping. Convert reclaimed land for SWM infrastructure.

Chapter 5 :

Management Of Special Waste Streams: Regulations And Operational Guidelines

Key Highlights Of This Topic

- 5.1 Introduction
- 5.2 Plastic Waste Management Rules And Guidelines
- 5.3 Strengthening Extended Producer Responsibility (EPR)
- 5.4 C&D - Waste Management Rules
- 5.5 E-waste Management Rules
- 5.6 Special Care Waste Management
- 5.7 Management Of Sanitary Waste
- 5.8 Rules For Slaughterhouses And Associated Waste Management

About the topic:

Not all waste can be managed through standard systems. This section highlights specific waste streams that require dedicated handling, along with the regulatory and operational approaches needed to manage them safely and efficiently.

5.1 Introduction

Urban solid waste is not uniform; certain waste types require special handling, treatment, and regulatory compliance because of their environmental and public health impacts. The Central Pollution Control Board (CPCB) and the Ministry of Environment, Forest and Climate Change (MoEFCC) have issued specific rules and operational guidelines for managing these special waste streams. Proper segregation, collection, processing, and disposal are essential to prevent pollution, improve recycling, and reduce landfill burden

Type of waste	Need of rule	Guideline Year
 Plastic Waste	Reduce single-use plastics, ensure Extended Producer Responsibility (EPR), and promote recycling and circular economy.	Plastic Waste Management Rules 2016 (Amended 2018, 2021, 2022)
 Construction & Demolition (C&D)	Manage debris from construction activities, promote recycling and reuse of materials like concrete, bricks, and metals.	Construction & Demolition Waste Management Rules – 2016 (MoEFCC) • CPCB Guidelines for Processing and Utilization of C&D Waste – 2017
 Domestic Hazardous Waste	Ensure safe collection, segregation, and disposal of toxic household waste such as batteries, paints, and chemicals.	Solid Waste Management Rules – 2016 (MoEFCC; Section 3(17)) • SBM Urban Advisory on Domestic Hazardous Waste Management – 2018
 Sanitary Waste	Prevent health risks from infectious waste like diapers and sanitary pads through secure wrapping and safe disposal.	Solid Waste Management Rules – 2016 • SBM Urban Advisory on Sanitary Waste Management – 2018
 E- Waste	Promote recovery of valuable metals, prevent environmental contamination, and enforce producer responsibility for electronic waste.	E-Waste Management Rules – 2016 (MoEFCC; Amendments 2018, 2022) • CPCB E-Waste Management Guidelines – 2018)
 Meat/slaughter house waste	Ensure hygienic handling and scientific treatment of organic waste generated from meat processing and slaughterhouses.	Solid Waste Management Rules 2016 + CPCB / State Pollution Control Board Guidelines
 Festival / Event Waste	Manage temporary surge of waste during public events through segregation, collection, and responsible disposal.	SOP for zero-waste events Events (Official functions/ Weddings/ Social or religious functions)

5.2 Plastic Waste Management Rules And Guidelines

The regulatory framework governing plastic waste in India, beginning with the foundational 2016 rules and their subsequent evolutions. These laws establish extended producer responsibility (EPR), requiring manufacturers and importers to manage the lifecycle of their products through mandatory collection and recycling targets.

Recent updates have aggressively targeted pollution by banning specific single-use plastics and progressively increasing the required thickness of carry bags to ensure better recyclability. Ultimately, this legal structure aims to transition the country toward a circular economy by enforcing source segregation and the mandatory use of recycled content.



Regulation or Amendment Date	Policy Category	Target Entities	Key Mandates and Standards	Plastic Classification	Thresholds and Deadlines
2016	Principal Rules (Foundation)	Waste generators, local bodies, Gram Panchayats, manufacturers, importers, and producers	Mandatory segregation at source; ban on plastic sachets for tobacco/gutkha; establishment of collection systems	Carry bags and plastic sheets	Minimum 50 microns thickness 
12th Aug 2021 (Effective Sept 30, 2021)	Thickness Standards	Manufacturers, importers, sellers, and users	Increase in minimum thickness for carry bags to discourage non-recyclable thin bags	Carry bags	75 microns  Thickness standards raised to 75 microns in 2021 to discourage non-recyclable bags.
12th Aug 2021 (Effective July 1, 2022)	SUP Ban	Manufacturers, importers, and sellers	Prohibition of manufacture, import, stocking, distribution, and sale of identified single-use plastic items and polystyrene decoration	Earbuds, balloon sticks, candy sticks, ice-cream sticks, plates, cups, glasses, cutlery, wrapping films	PVC banners less than 100 microns; Non-woven bags 60 GSM
12th Aug 2021 (Effective Dec 31, 2022)	Thickness Standards	Manufacturers, importers, sellers, and users	Further increase in minimum thickness for carry bags to improve recyclability	Carry bags	120 microns

5.3 Strengthening Extended Producer Responsibility (EPR)

Extended Producer Responsibility (EPR): Producers, importers, and brand owners (PIBOs) were made responsible for establishing a system for **collecting back** the plastic waste generated by their products.

Regulation or Amendment Date	Policy Category	Target Entities	Key Mandates and Standards	Plastic Classification	Thresholds and Deadlines
16th February 2022	EPR Guidelines	Producers, Importers, and Brand Owners (PIBOs)	Introduction of comprehensive (EPR) guidelines; mandatory recycling targets and reuse obligations	Category I (Rigid), Category II (Flexible), Category III (Multilayered), Category IV (Compostable)	EPR Targets: 25% (2021-22), 70% (2022-23), 100% (2023-24 onwards)
6th July 2022	Biodegradable Plastics	Manufacturers and Producers	Formal definition of biodegradable plastics; mandatory adherence to BIS standards and CPCB certification	Biodegradable plastics (non-compostable)	Must degrade without leaving microplastics or toxic residues

The Evolution of India's Plastic Waste Management (2016-2026)

Single-Use Plastic (SUP) Ban



Prohibited items including plastic earbuds, balloon sticks, and cutlery July 1, 2022.

Biodegradable Plastic Standards



Defined as plastics degrading without microplastics, requiring BIS and CPCB certification.

EPR Packaging Categories



Rigid



Flexible



Compo Trays



Multilayered



Compostable

EPR Mandatory Targets for Producers, Importers, and Brand Owners (PIBOs)



5.4 C&D - Waste Management Rules

The rules were established because the Central Government found it necessary to provide a regulatory framework for the **environmentally sound management** of construction and demolition waste. This includes ensuring proper segregation, collection, recycling, and disposal to **discourage unscientific dumping** and prevent the loss of recyclable material value. The recent 2025 update was deemed necessary to strengthen existing measures and align them with **circular economy** and resource efficiency approaches

- Construction and Demolition Waste Management Rules, 2016:** These were the original principal rules established to manage civil structure waste.
- Draft Rules 2024:** A draft was published in July 2024 to invite public objections and suggestions for a comprehensive revision.
- Environment (Construction and Demolition) Waste Management Rules, 2025:** These rules were notified on April 2, 2025, and will **supersede the 2016 rules**.
- Effective Date:** The new 2025 rules are set to come into force on **April 1, 2026**

Comparison of Construction & Demolition Waste Management Rules (2016 vs. 2025)

Feature	C&D Waste Management Rules, 2016	Environment (C&D) Waste Management Rules, 2025
 Objective & Approach	Focused on basic segregation, collection, and recycling to prevent unscientific dumping and pollution.	Strengthens the framework by aligning with circular economy and resource efficiency principles.
 Regulatory Model	General duties for waste generators and local authorities without a certificate-based market.	Introduces Extended Producer Responsibility (EPR) and Environmental Compensation for non-compliance.
 Monitoring System	Relied on manual reporting and annual reports submitted to State Pollution Control Boards.	Mandatory use of a Centralised Online Portal for registration, target monitoring, and acting as a data repository.
 Applicability	Applies to every waste resulting from construction or demolition of any civil structure.	Applies to all C&D activities; specifically defines "Producers" as projects with a built-up area of 20,000 sq. m or more.
 Recycling Targets	Suggested mandatory procurement of 10-20% recycled material in government contracts.	Strict phased targets: Recycling reaches 100% by 2028-29; Utilization in new projects reaches 25% by 2030-31.
 Compliance Tools	No specific financial instruments were utilized for compliance.	Use of EPR Certificates; Producers must purchase these from registered recyclers to meet legal targets.
 Role of Local Authority (ULB)	Set up collection points, approve management plans, and track waste generation locally.	Enhanced role: Approve Waste Management and Utilisation Plans online; manage legacy waste; ensure producer EPR compliance.
 Governance Structure	Supervised by local bodies and State Pollution Control Boards.	Oversight by a Central Steering Committee and State-level Monitoring Committees.

Objective Of The Rules



They also seek to promote the **utilization of processed waste** in new construction projects to reduce the demand for virgin materials.



The rules aim to introduce **Extended Producer Responsibility (EPR)** and Centralised online monitoring to ensure accountability among waste generators and producers



The primary objective is to manage C&D waste in a way that minimizes environmental impact and addresses **pollution-related issues** caused by waste dumping.



The rules apply to **all activities** involving the construction, demolition, remodeling, renovation, and repair of any structure.



Exclusions: They do not apply to waste from atomic energy, defense/strategic projects, natural disasters, or acts of war.

Local Bodies

The Urban Local Bodies plays a central role in the ground-level execution of these rules:



Approval of Plans: They are responsible for the timely grant of approvals for **Waste Management Plans** and **Waste Utilization Plans**.



EPR Compliance: They must ensure that producers meet their **Extended Producer Responsibility** targets.



Infrastructure Setup: The ULB must establish **collection points** and **intermediate waste storage facilities** within one year of the rules' notification.



Waste Transport: They facilitate the transport of collected waste to registered recyclers and are Authorized to **collect charges** for these services.



Legacy Waste: They are responsible for taking measures to manage **legacy or orphan waste** lying within their jurisdiction.



Monitoring and Reporting: ULBs must monitor implementation and submit an **annual report** to the State Pollution Control Board by April 30th each year.

The **Brihanmumbai Municipal Corporation**, with a population of 1.24 crore (Census 2011), has implemented an app-based “Debris on Call” system for construction and demolition waste collection. Citizens can request pickup through the mobile app, with free collection up to 500 kg and user charges for larger quantities. The system also enforces strict penalties for illegal dumping as per the Construction and Demolition Waste Management Rules, 2016

C&D Waste Management in Hyderabad, with a population of 67.32 lakh (Census 2011), has developed an organized system for managing Construction and Demolition (C&D) waste through a partnership with SSREC Enviro. The system includes collection, transportation, processing, and recycling of debris into reusable materials such as aggregates and sand.

5.5 E-Waste Management Rules

The **E-Waste (Management) Rules, 2022**, and its subsequent amendments establish a comprehensive framework for the **environmentally sound management of electronic waste** in India. These rules prioritize the protection of human health and the environment by regulating the lifecycle of Electrical and Electronic Equipment (EEE)

The primary objective of these rules is to ensure the **environmentally sound management of e-waste**. This involves taking all necessary steps to manage e-waste in a manner that protects human health and the environment from the adverse effects that can result from such waste. To achieve this, the rules establish an **Extended Producer Responsibility (EPR)** framework, which holds producers accountable for meeting specific recycling targets through registered recyclers.



Scope and Applicability



The rules apply to **every manufacturer, producer, refurbisher, dismantler, and recycler** involved in the manufacture, sale, transfer, purchase, refurbishing, dismantling, recycling, and processing of e-waste or EEE listed in **Schedule I**. This includes components, consumables, and parts that make the product operational.

Exemptions include waste batteries, packaging plastics, micro-enterprises, and radioactive wastes, as these are covered under other specific regulations.

Registration and Business Operations



- **Mandatory Registration:** All regulated entities (manufacturers, producers, refurbishers, and recyclers) must **register on a Centralised online portal** developed by the Central Pollution Control Board (CPCB).

- **Prohibition:** No entity is allowed to carry out business without registration, and registered entities are prohibited from dealing with unregistered ones

Extended Producer Responsibility (EPR)

The core of the rules is the **EPR framework**, which makes producers responsible for meeting specific **recycling targets**.

- **Recycling Targets:** Producers must ensure a specific percentage of the EEE they place on the market is recycled, based on the average life of the product. These targets increase over time, reaching **80% by 2028-2029**.

- **EPR Certificates:** These are generated on the portal in favor of registered recyclers based on the quantity of end-products processed. Producers fulfill their obligations by **purchasing these certificates** from recyclers.

- **Refurbishing:** If a producer buys refurbishing certificates, their recycling obligation for that specific quantity is **deferred** until the end of the refurbished product's extended life.

Key Stakeholder Responsibilities

- **Manufacturers:** Must collect e-waste generated during manufacturing and ensure its recycling or disposal.

- **Recyclers:** Must ensure their facilities meet CPCB standards, maintain records of all collected and processed waste, and dispose of residues in Authorised facilities.

- **Bulk Consumers:** Must ensure the e-waste they generate is handed over only to registered dismantlers, refurbishers, or recyclers.

- **Local Bodies:** Must segregate e-waste found in municipal solid waste and ensure "orphan products" are channelized to registered recyclers.

Changes to the Rules Over Time

Since the publication of the principal rules in November 2022, several amendments have introduced new requirements and relaxations:

- Amended Rule 16 to state that information on hazardous substances must be provided **as and when required by the Central Pollution Control Board (CPCB)** instead of always being in the product documentation.

- Added specific entries to Schedule II regarding **cadmium and lead** in solar panels/cells and **lead in medical devices**.

**E-Waste
(Management)
Amendment
Rules, 2023 (First
Amendment)**

- Introduced requirements for the **secure and sustainable management of refrigerants** generated during the manufacture and end-of-life processing of refrigeration and air-conditioning equipment.

- Added **Schedule II A**, which lists specific applications for medical devices and laboratory equipment that are exempt from hazardous substance reduction provisions.

- Introduced **Schedules II B and II C** to further categorize electrical and electronic equipment covered under the rules.

**E-Waste
(Management)
Second
Amendment
Rules, 2023**

- Updated the definition of a **"dismantler"** to ensure they operate according to CPCB guidelines.

- Introduced a provision (Rule 9A) allowing the Central Government to **relax the timelines for filing returns** by up to nine months in the public interest.

- Established a **platform for the exchange or transfer of EPR certificates**, with the CPCB responsible for fixing the highest and lowest exchange prices based on environmental compensation rates.

**E-Waste
(Management)
Amendment
Rules, 2024
(Third
Amendment)**

Roles and Responsibilities of Urban Local Bodies (ULBs)

Under Schedule V of the rules, Local Bodies (both Urban and Rural) have specific responsibilities to manage e-waste within their jurisdictions:



Segregation and Collection: They must ensure that e-waste found mixed with Municipal Solid Waste is properly **segregated, collected, and channelized** to registered recyclers or refurbishers.



Orphan Products: They are responsible for ensuring that e-waste from **"orphan products"** (non-branded or produced by companies that have closed) is collected and sent to registered entities.



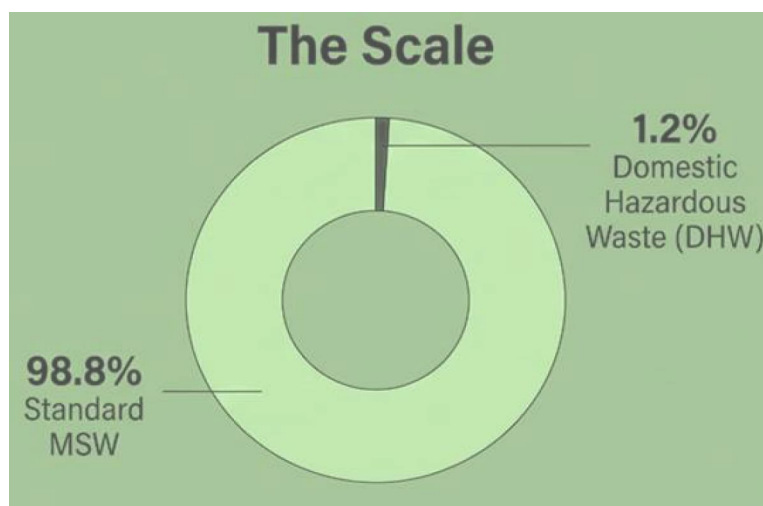
System Facilitation: They must facilitate the setting up of dedicated systems for e-waste **collection, segregation, and disposal**.



Capacity Building: They are required to conduct **training sessions** to develop the capacity of urban and rural local body officials regarding e-waste management

5.6 Special Care Waste Management

The 2026 rules define **special care waste** as items generated at the household level other than dry, wet and Sanitary Waste. A 2021 study by CSE and NITI Aayog found that the percentage of Domestic hazardous waste (DHW) in total waste can range more broadly, from 0.2 per cent to 4 per cent by weight. reports indicate that DHW accounts for approximately 1.2 per cent of the total waste generated.



Definition: Special care waste includes discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, waste batteries, used needles/syringes, and contaminated gauze.

Source Segregation: Every waste generator is legally required to segregate waste into **four streams: wet, dry, sanitary, and special care.**



Responsibilities Of The Urban Local Body (ULB)

Storage and Handover:

- Special care waste must be stored in separate bins or containers at the source and handed over to Authorised waste collectors or deposited at designated centers.

Door-to-door collection

- D2D collection of segregated special care waste from households and institutions.
- Deployment of **compartmentalized and covered vehicles** designed to collect hazardous waste separately from other waste streams.
- Establishment of **waste deposition centers**, with at least **one center for every five square kilometers**, where residents can safely drop off hazardous waste.
- Clear communication to citizens regarding the **locations and operational timings** of these facilities.

Collection and Infrastructure

- ULBs must establish appropriate infrastructure to ensure safe handling and transportation of hazardous household waste.

Awareness Campaigns:

- Conduct extensive Information, Education, and Communication (IEC) campaigns to train citizens on identifying and segregating special care waste.

Safe Storage and Handling

- Storage containers should be **leak-proof and clearly labeled** with hazard details and emergency contact information (as per **Form 8 labeling requirements**).
- Hazardous waste can be **temporarily stored for up to 90 days** before it must be transported for treatment or disposal.
- ULBs must obtain **authorization from the SPCB** for generating, storing, and transporting hazardous waste.

Disposal and Treatment

- For environmentally sound disposal, ULBs should ensure that hazardous waste is processed through Authorised facilities.
- Collaborate with the nearest **Common Hazardous Waste Treatment, Storage, and Disposal Facility (CHW-TSDF)** for final disposal.
- Where applicable, waste should be sent to **registered recyclers, incinerators, or Authorised treatment facilities**.

Prohibitions: Generators shall not throw, burn, or bury special care waste in open spaces, drains, or water bodies. in open spaces, drains, or water bodies



Source: Information from European Union Institutions, Bodies, Offices and Agencies, European Commission, Commission Notice Separate Collection of Household Hazardous Waste, Official Journal of the European Union. Available at <[https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC1106\(01\)&rid=2](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC1106(01)&rid=2)>

Hazardous Product Label Elements



Pictograms

Universal symbols (like skulls or flames) that instantly overcome language barriers for consumers.

Signal Words

- Look for **"DANGER"** – extremely hazardous
- Look for **"WARNING / CAUTION"** – less hazardous but still risky.

Chemical Composition

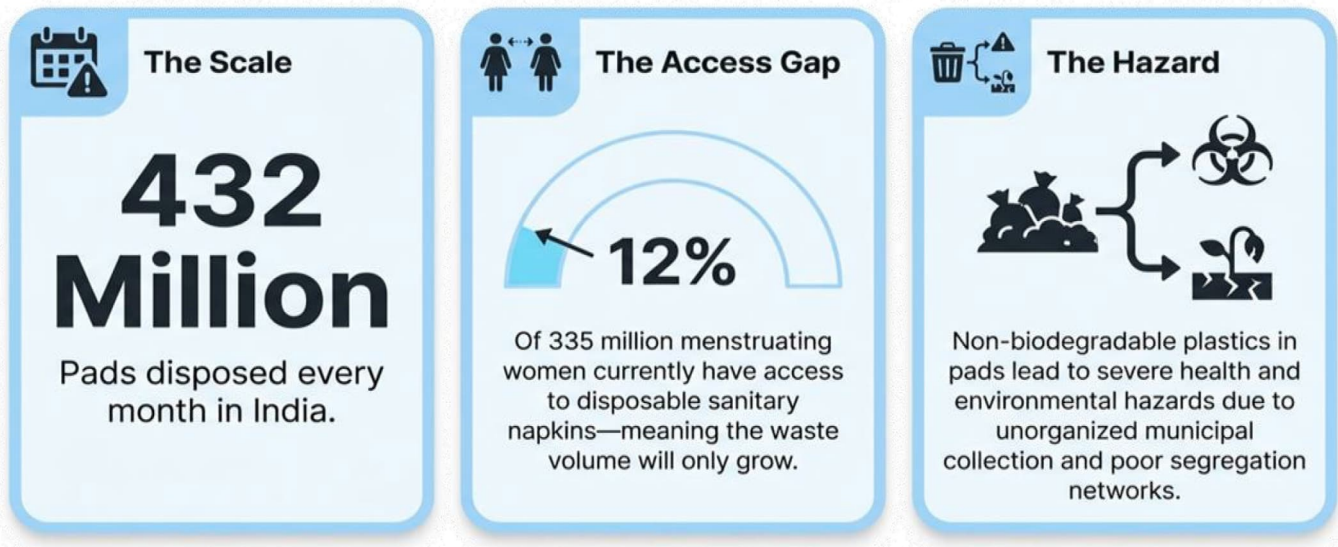
- Ingredients list identifying **active toxins, VOCs, and heavy metals**.

ULB Action Point
Design IEC campaigns teaching consumers to identify these specific label elements and isolate these products into a dedicated hazardous household bin

5.7 Management Of Sanitary Waste

The **Solid Waste Management Rules, 2026** formally recognize **Sanitary Waste as a separate waste stream** within solid waste management. As per the **Central Pollution Control Board** Guidelines for Management of Sanitary Waste, it is categorized as **dry waste (non-biodegradable but combustible)**.

Proper handling is essential because Sanitary Waste has high landfill impact and is difficult to manage once mixed with other waste.



•**The Mandate for Generators:** waste generators are legally required to **wrap used Sanitary Waste securely** in pouches provided by manufacturers or suitable wrapping material and place them in the bin designated for **Sanitary Waste**

•**Manufacturer Responsibilities:** Brand owners and manufacturers of disposable sanitary products must provide **financial assistance** to local authorities for establishing waste management systems. They are also mandated to provide a **pouch or wrapper** for the disposal of each unit and educate the public on proper wrapping and disposal

Action Checklist for ULB Officials

Under the regulatory framework, ULBs have specific duties to manage this waste stream effectively.

System Establishment: ULBs, in association with producers, must make necessary arrangements for the segregated collection and disposal of Sanitary Waste.	Disposal Pathways: Segregated Sanitary Waste should be sent to available management options such as Authorised common Biomedical Waste Treatment and Disposal Facilities (CBMWTFs) or TSDFs for final incineration.	Waste-to-Energy: If Sanitary Waste is collected as part of segregated non-recyclable dry waste, it can be used as feed for Waste to Energy (WtE) plants .	Local Incineration: ULBs have the option to install stand-alone common incinerators to dispose of Sanitary Waste alongside other wastes like STP or drain sludge.
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Awareness and Education (IEC)

- Public Campaigns:** ULBs must conduct Information, Education, and Communication (IEC) campaigns to educate generators on **source segregation**.
- Health Education:** Awareness Programmes should highlight the negative health and environmental consequences of poor Sanitary Waste management.

Training: Conduct regular training sessions in schools and communities regarding hygienic practices in line with Menstrual Hygiene Management (MHM) guidelines

Strategic Planning & Monitoring

Gender-Inclusive Design: ULBs should involve women in the design of sanitation structures to ensure menstrual waste disposal and collection needs are addressed.

Monitoring: Implement systems to monitor Key Performance Indicators (KPIs) and the efficiency of local incinerators.

CSR and EPR Engagement: Officials should engage industrial and commercial groups to manage Sanitary Waste under Corporate Social Responsibility (CSR) and promote Extended Producer Responsibility (EPR) for deCentralised deposit centers.

Approved Disposal Technologies

ULBs must ensure that the disposal methods used comply with environmental standards:

Technology	Application	Key Requirement	
Electric Incinerators	Malls, society complexes, community toilets.	Must ensure complete burning; ash generation should not exceed 5%.	
High-Temp Incinerators	Centralised facilities (CBMWTFs).	Must have Air Pollution Control Devices (APCD) and comply with Bio-medical Waste Rules, 2016.	
Co-processing	Class I cities.	Utilization in cement kilns or power plants as a combustible resource.	
Landfilling	Class I cities.	Only for segregated Sanitary Waste where other options are unavailable.	

Recommended options for disposal of different Sanitary Wastes (as per MHM Guidelines 2015)

Waste Type	Pit Latrine	Deep Burial	Pit Burning	Incineration
Used tissues, paper, cloth, cotton	✓	✓	Less recommended	Less recommended
Cotton napkins (reusable or commercial)	Less recommended	✓	Less recommended	Electric incinerator
Commercial napkins with plastic and liners	Less recommended	✓	Less recommended	Bio-medical/ High-temp

5.8 Rules for Slaughterhouses and Associated Waste Management

The Central Pollution Control Board (CPCB) guidelines, as mandated by the National Green Tribunal (NGT) in 2020, provide a comprehensive framework for the environmental management of poultry farms to mitigate issues related to waste, odor, and emissions

8-Hour Refuse Removal Window



All solid waste must be removed within 8 hours of slaughter completion.

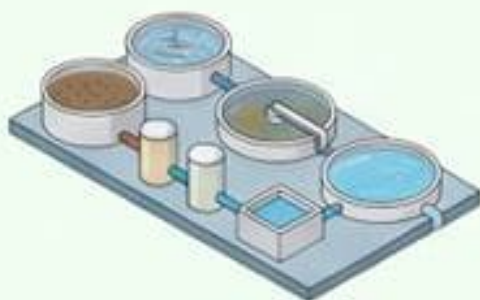
The rules governing slaughterhouses (abattoirs) and waste management are established through several statutes, including the **Prevention of Cruelty to Animals (Slaughter House) Rules, 2001**, the **Food Safety and Standards Act, 2006**, and the **Municipal Solid Wastes (Management & Handling) Rules, 2000 (MSW Rules, 2000)**.

Waste Category Classification & Disposal

Waste Category	Content Description	Disposal Method
Type I	Vegetable matter (Rumen contents)	Composting
Type II	Animal matter (Bones/Condemned meat)	Rendering (Meat meal/Inedible fats)

Licensing and Location: No animal can be slaughtered within a municipal area except in a facility **licensed or recognized** by the local authority. These premises must be located away from vegetable or fish markets and situated on elevated ground to ensure proper sanitation.

Mandatory Effluent Treatment (ETP)



Wastewater must be treated to meet specific BOD and suspended solids concentration standards.

Leak-Proof Transport Logistics

By-products must use water-tight vehicles; condemned materials require dedicated, sealable transport.



By-products:
Water-Tight Vehicle



Condemned Materials:
Sealable Transport

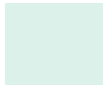
Case example :Ahmedabad Municipal Corporation (AMC), with a population of 55.78 lakh (Census 2011), has proposed a structured system for the collection, transportation, processing, and monitoring of segregated meat waste under a PPP model, linked to a rendering plant at Gyaspur Waste Management Park.

ULB Mandate Checklist for Implementation

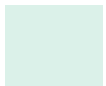
Urban Local Bodies (ULBs) have a critical regulatory role in overseeing these facilities. Based on the rules, the following is a mandate checklist for a ULB:



Licensing & NOC: Issue No Objection Certificates (NOCs) and verify that the facility has a valid license before allowing operations.

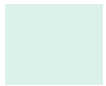


Capacity Determination: Determine the **maximum number of animals** to be slaughtered daily based on the facility's capacity and the local population's requirements.



Staffing: Appoint or contract **qualified Veterinary staff** to conduct mandatory ante-mortem (before death) and post-mortem (after death) inspections.

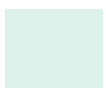
Waste Collection Scheduling: Notify the public and facilities of a regular **waste collection schedule** and timings.



specialized Transport: Arrange for separate, covered vehicles for the transport of biodegradable waste from meat markets.



Monitoring Unhygienic Operations: Conduct inspections to check for **unAuthorised slaughtering** and ensure waste is not being dumped in unAuthorised pits or "dhalaos".



Environmental Compliance: Verify that large slaughterhouses have installed a functional ETP and that their effluent discharge remains within permissible limits.



Enforcement Actions: Initiate legal proceedings or **cancel licenses** for facilities that violate hygiene, animal welfare, or environmental norms

Waste Processing Requirements by Slaughterhouse

Sl. No.	Type of Slaughter house	Capacity (Animal Units/Year)	Typical Waste Generation	Primary Waste Processing Method	Key Requirement
1	Large	> 1,00,000 animal units/year	High (5–8 TPD approx.)	Rendering Plant + Effluent Treatment Plant (ETP)	Recovery of meat/bone meal & fats; Mandatory onsite wastewater treatment
2	Medium	50,000 – 1,00,000 animal units/year	Moderate (2–5 TPD approx.)	Combination of Composting + Rendering / ETP (as applicable)	Partial resource recovery; Proper treatment of liquid waste
3	Small	Up to 30,000 animal units/year	Low (0.5–2 TPD approx.)	On-Site Composting	Waste processed into manure; minimal infrastructure required

Chapter 6:

Information, Education, And Communication (IEC), Behaviour Change Communication (BCC)

Key Highlights Of This Topic:

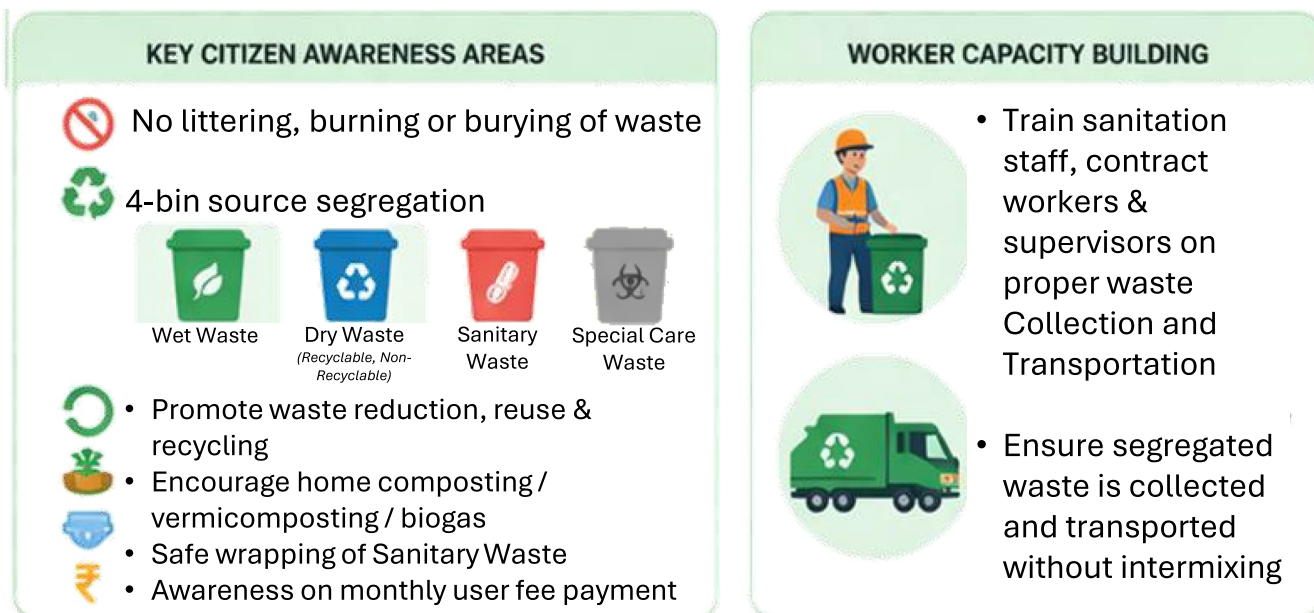
- 6.1 Mandatory Duties For ULBs
- 6.2 Modes Of Communication
- 6.3 Approaches For Citizen Awareness And Participation
- 6.4 Sample Strategies Based On Behaviour Change Communication
- 6.5 IEC / Capacity Building Strategy For Worker Training

About the topic:

Chapter focuses on the role of Information, Education, and Communication (IEC) and Behaviour Change Communication (BCC) in strengthening solid waste management through public participation and awareness. It focus to achieve long-term habit shifts in citizens, the strategies utilize psychological principles such as Nudge Theory (gentle pushes to prompt correct Behaviour) and the MINDSPACE framework

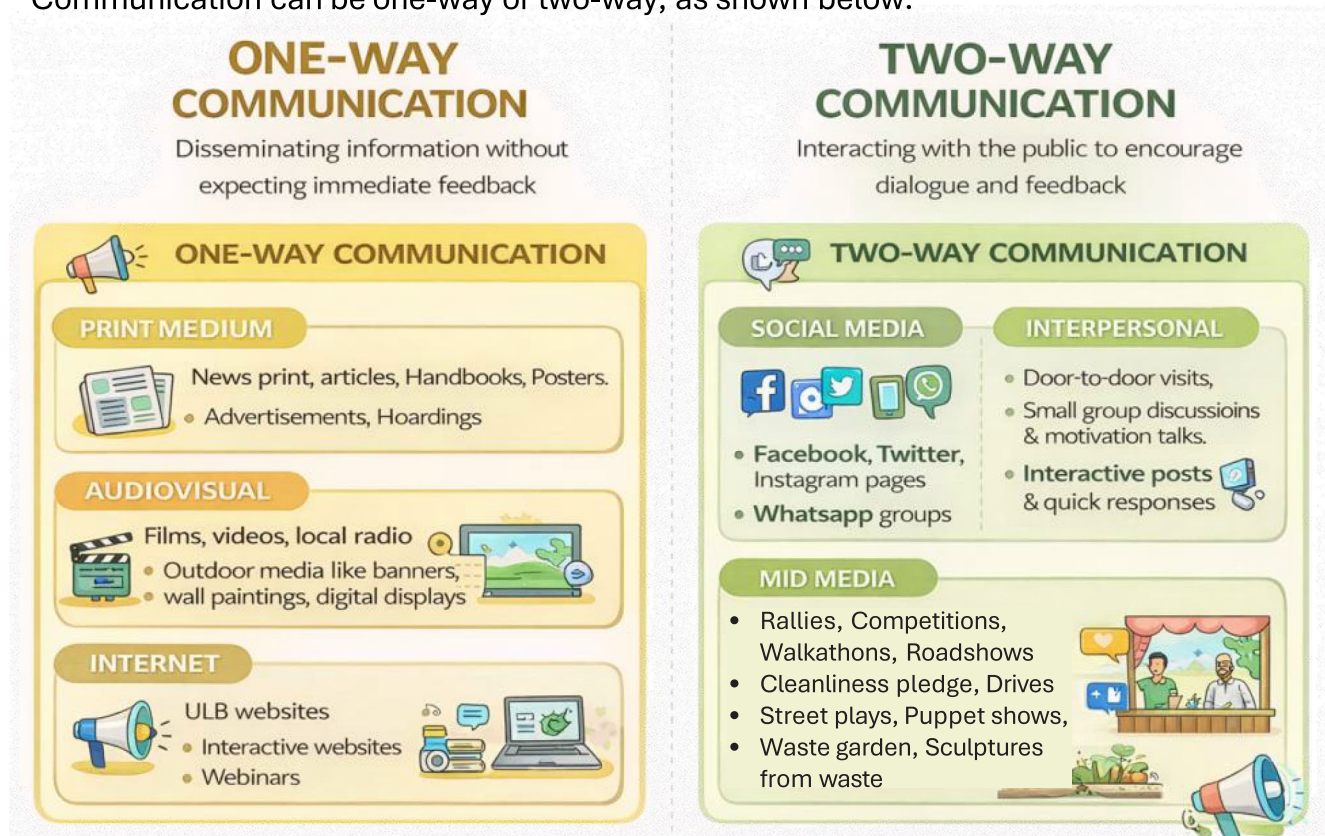
6.1 Mandatory Duties For ULBs

Under the **Solid Waste Management Rules, 2026**, there are several mandatory requirements for **Information, Education, and Communication (IEC)** to drive public awareness and ensure the effective implementation of waste management systems. While the 2026 rules primarily use the term "IEC" and "Public Awareness," the **SBM-U 2.0 guidelines** (which provide the operational framework for these rules) categorize these efforts under **BCC (Behaviour Change Communication) Every Urban Local Body (ULB) must conduct mandatory IEC campaigns for public awareness**



6.2 Modes of communication

Communication can be one-way or two-way, as shown below.



6.3 Approaches For Citizen Awareness And Participation



INFORMATION, EDUCATION, AND COMMUNICATION (IEC)

This approach has been used in several government Programmes based on three principles



Provide information in the public domain



Educate through formal systems & targeted trainings

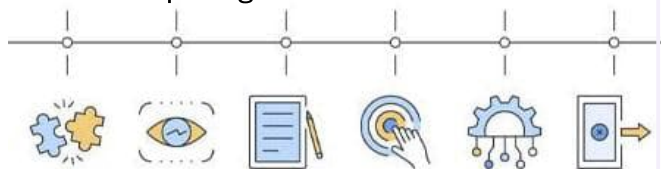


Communicate by spreading the message



BEHAVIOR CHANGE COMMUNICATION (BCC)

A Programmatic approach based on taking citizens through **6 stages of change** to develop long-term shifts in habits.



Pre contemplation

Contemplation

Preparation

Action

Maintenance

Termination

The approach provides **continuous nudges and communication** to consistently guide citizens toward the desired Behaviour.

Nudge Theory

A nudge refers to a subtle intervention designed to influence behaviour positively to prompt them to behave or take action in a certain way. For e.g. placing a color-coded wet and dry litter bin, prompts a person to think whether the waste s/he has to throw is wet or dry.

Mindspace	Explanation with Example from SBM		
 Messenger	We are heavily influenced by who is communicating information.	Promoting local Swachh Ambassadors	
 Incentives	We respond to incentives shaped by predictable mental shortcuts, such as avoiding losses.	Star ranking for schools, hotels, and offices	
 Norms	We are heavily influenced by what others do.	Posters showing prominent film stars doing composting	
 Defaults	We “go with the flow” of pre-set options.	Citizen survey questionnaire	
 Salience	Our attention is drawn to novel things that seem relevant to us.	Setting up waste to wonder parks, RRR centers	
 Priming	Our actions are often influenced by subconscious cues.	Playing the jingle on waste collection vehicles	
 Affect	Our actions can be powerfully shaped by our emotional associations.	Involving citizens in cleanliness drives where they see the waste	
 Commitments	We seek to be consistent with our public promises and to reciprocate.	Taking the Swachhata pledge	
 Ego	We act in ways that make us feel better about ourselves.	Felicitating the sanitation workers	

6.4 Sample Strategies Based On BCC

The **IEC and BCC strategy** should be designed **specifically for different target groups** to ensure greater effectiveness and Behavioural change. Communication approaches must be tailored for stakeholders such as **households, bulk waste generators, commercial establishments, institutions, and sanitation workers**. The objective should be to deliver **clear, simple, and focused messages**, emphasizing **one key action at a time**, such as source segregation, proper waste storage, or responsible disposal practices.

Such targeted and phased communication helps improve understanding, encourages participation, and strengthens the implementation of **source segregation and sustainable waste management systems under SWM Rules 2026**.

Awareness Theme	Target Group	 Mass Media	 Mid Media	 Inter-personal	 Social Media
4-bin source segregation mandatory	Households, Shopkeepers, Offices/Banks, Slums	Local radio jingles on 4-bin segregation	Posters, bin stickers, ward notices	Door-to-door demos by field staff / SHGs	WhatsApp posters, local reels
	Shopkeepers / Commercial	Public banner at markets and commercial zones	Counter-top segregation cards	Association meetings	ULB Facebook recognition posts
	Slum communities	Loudspeaker van campaign	Wall paintings / murals	SHG & ASHA-led household visits	Short community videos
No littering, burning or burying of waste	Households, Hawkers, Slums	Anti-littering radio campaign	Posters at chowks and markets	Weekly visits by sanitation supervisors	Before-after area cleanliness videos
	Hawkers	Announcements in market areas	Stall signage	Field staff interaction	Market association WhatsApp groups
Promote waste reduction, reuse & recycling	School children	School assembly messaging	Activity books / segregation charts	Teacher-led sessions	Parent-teacher WhatsApp messages
	College students	Campus announcements	Reuse clubs / drives	Youth ambassadors	Reels / challenge campaigns
	Senior citizens	Community radio	Flyers through senior clubs	Citizen meetings	WhatsApp circulation in senior groups

Sample Strategies Based On Behaviour Change Communication

Awareness Theme	Target Group	 Mass Media	 Mid Media	 Inter-personal	 Social Media
Encourage home composting / vermicomposting / biogas	Households	Local cable awareness clips	Compost guide booklet	Society demo sessions	DIY composting reels
	Offices	Office circulars	Desk posters	Green office meetings	Internal mailers
	Slums	Community audio announcements	Wall charts	SHG composting demos	Local success story videos
Safe wrapping of Sanitary Waste	Households	Awareness jingles	Pad wrapping instruction cards	Home visits by women SHGs	Short awareness clips
	Schools / Colleges	Health awareness messages	Washroom posters	Teacher / counsellor session	Awareness posts / reels
	Slums	Local announcements	Community wall posters	ASHA worker awareness	SHG social campaign
Monthly user fee payment awareness	Households	Radio reminders	Bills / printed notices	Door-to-door fee awareness	WhatsApp reminder messages
	Offices / Hotels	Public notice boards	Official letters	Manager meetings	Email reminders

Planning And Framework Requirements



Every ULB must include an **assessment of gaps in awareness** among residents and civic authorities in their **City Solid Waste Action Plan (CSWAP)**



IEC campaigns must be **sustained** and target **all stakeholders**: Households, Schools, Market Associations, and Informal Sector.



Awareness activities should be **continuous, inclusive, and not one-time events**

Pune – SWaCH Cooperative Model
Ambikapur: The "Swachhata Didi" Model

Urban Local Bodies can **partner with Non-Governmental Organizations (NGOs)** to strengthen **citizen outreach and community engagement**. NGOs can support in conducting **awareness campaigns, door-to-door communication, community meetings, and educational Programmes**.

6.5 IEC / Capacity Building Strategy For Worker Training

Worker capacity building should follow a continuous reinforcement model through daily briefings, visual SOPs, field demonstrations, and supervisory monitoring to ensure segregated waste is collected and transported without intermixing. IEC and capacity building interventions should be tailored to each institutional level so that every officer and field staff clearly understands their role, responsibility, accountability, and reporting obligations within the SWM chain.

Office / Staff Level	IEC / Capacity Building Requirement	Core Message	Communication Mode
Commissioner / Municipal Head	Orientation on SWM Rules 2026, budget allocation, review of city targets, KPI dashboards	Lead, monitor and enforce city-wide SWM compliance	Policy workshops, monthly review meetings, dashboard presentations
Additional Commissioner / Deputy Commissioner / Zonal Head / AEE	Zone performance reviews, contractor monitoring, grievance and escalation systems	Ensure execution of SWM targets at zone level	Review meetings, SOP manuals, performance scorecards
Health Officer / SWM Officer / MIS Officer	MIS reporting formats, route and waste quantity tracking, IEC campaign reporting	Plan, monitor, analyse and report SWM performance	Technical training sessions, dashboards, reporting templates
Ward Officer / Sanitary Inspector / Supervisor	Daily toolbox talks, beat plans, inspection checklists, issue escalation	Supervise field execution and ensure daily compliance	Daily briefings, ward meetings, field checklists
Sanitation Workers / Drivers / Loaders / Contract Staff	Practical demonstrations, SOP posters, route discipline, safety training	Collect and transport segregated waste without mixing	On-site demos, visual SOPs, shift briefings, mobile videos

SBM - U 2.0 Mandatory BCC Norms

FUNDING NORMS  5% OF TOTAL PROJECT BUDGET Earmarked for IEC/BCC components	BEHAVIOUR CHANGE FOCUS At least 80% of IEC funds must be used for INTERPERSONAL COMMUNICATION: •Door-to-door visits •Volunteer engagement •Community meetings •Direct citizen interaction 	MONITORING  ULBs must report monthly IEC expenditure to the State Mission Directorate
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Chapter 7 :

Government Procurement Framework: Existing Practices, GeM, And PPP

Key Highlights Of This Topic:

- 7.1 Maharashtra Government Procurement
- 7.2 Challenges Experienced By ULBs In Using (GeM) PortalD
- 7.3 Public Private Partnership
- 7.4 Contracting Arrangements For Municipal Solid Waste Services
- 7.5 List Of Cities With PPP Models In Solid Waste Management

About the topic:

Implementing waste management systems requires efficient financial and operational mechanisms. This section focuses on procurement processes, partnership models, and digital platforms that support service delivery and infrastructure development. It helps Urban Local Bodies leverage financial and institutional mechanisms for efficient and scalable waste management systems.

Smarter Urban Waste: Modernizing SWM through Procurement and Partnerships

As urban waste rises, Urban Local Bodies (ULBs) are transitioning from manual systems to modernized frameworks using digital procurement (GeM) and strategic PPP models to balance industrial technology with community participation for efficient Solid Waste Management



Digital Procurement via GeM



Transparent & Efficient Buying

ULBs benefit from buying SWM equipment straight from registered suppliers, ensuring procurement transparency.

Direct Access to Quality MSMEs

The portal provides quick access to a vast pool of verified manufacturers and traders.



Specialized SWM Equipment

Efficiently procure modern assets, including EV waste vehicles and solar-powered charging equipment.

Strategic PPP Frameworks



Centralized Technology-Driven Models

Utilize waste-to-energy technologies and economies of scale for bulk waste handling.

Decentralized Community-Based Approaches

Partner with SHGs and informal workers for ward-level collection



Managing the Waste Value Chain

Integrate private sector efficiency across collection, transportation, and scientific disposal segments.



COMPARISON OF PPP STRATEGIES BASED ON CITY NEEDS



MODEL TYPE:
Centralized

PRIMARY FOCUS:
High-tech processing
(RDF, Power)

BEST SUITED FOR:
Large cities with bulk
waste volumes



MODEL TYPE:
Decentralized

PRIMARY FOCUS:
partner with NGO, for public
privet participation

BEST SUITED FOR:
Ward level implementation

7.1 Maharashtra Government Procurement

The Maharashtra government primarily uses **e-tendering, rate contracts, and the GeM portal** for IT procurement, ensuring transparency, efficiency, and cost-effective bulk purchasing.

E-Tendering Process

E-tendering became mandatory in **2010 for tenders above ₹50 lakh**, covering the entire process from **RFP issuance to online bid submission**. Platforms such as **NIC (mahatenders.gov.in)** and **Sify Next Tenders** are used, with **over 10,898 tenders published by late 2023**, reducing paperwork and speeding up procurement.

GeM Portal. The **Government e-Marketplace (GeM)**, launched in **2016 by the Ministry of Commerce and Industry**.



Quick Compliance Checklist For GeM portal login

- Registration done on gem.gov.in — not a third-party site
- Organization type selected as 'Local Body'
- Procurement mode chosen based on order value
- All orders placed through GeM portal (not offline for listed items)
- Delivery confirmation recorded on portal before processing payment
- Annual procurement reports generated from GeM dashboard



Documents Checklist for Buyer Registration

#	Document	Purpose
1	Aadhaar Card of Registering Official	Identity verification
2	Official Government Email ID	Mandatory — for login and OTP
3	Organisation Registration / ID Number	Verifying the local body
4	Organisation's Bank Account Details	Payment processing via PFMS
5	Official Address of Municipal Corporation	Organisation profile
6	PAN of the Organisation	Tax and financial records
7	Appointment / Authorisation Letter	Proof of designation as HOD/authorised officer

7.2 Challenges Experienced By ULBs In Using (GeM) PortalD

Challenge Area	Description
Official Government Email Requirement	Registration on GeM requires an official government email ID (e.g., .gov.in domain). Some ULBs may initially face delays in obtaining or activating official email IDs for procurement officials.
Account Creation and Approval Time	The creation and approval of Buyer and Consignee accounts may take some time due to verification and administrative processes.
OTP-Based Login Process	Login to the portal requires OTP verification for security purposes. While it ensures secure access, it may occasionally slow down the login process especially when multiple users are involved.
Search and Navigation Issues	Users may sometimes face difficulty locating relevant products due to limitations in the search bar or inconsistent product naming in vendor listings.
Limited Product Filters	In some cases, limited filtering options (such as specification, brand, or price range) make it harder to narrow down suitable products quickly.
Keyword and Product Code Recognition	Search results may be affected when keywords or product codes are not clearly recognized due to spelling variations or inconsistent catalog tagging by vendors.
Availability of Specific Technical Specifications	Equipment matching the exact technical specifications recommended in DPRs prepared by consultants may not always be readily available on the portal.
Availability of Specialized Equipment	Certain municipal equipment or specialized items required by ULBs may not always be listed or available on the platform.
Variation in Product Prices	Similar items may show a wide range of prices depending on vendor specifications, brand, and additional features.
Stock Availability at Time of Purchase	In some cases, products available at the time of search or quotation may become unavailable by the time the purchase order is placed.

7.3 Public Private Partnership

A **Public-Private Partnership (PPP)** is a collaborative, long-term contractual arrangement between a government entity and a private sector organization to provide public assets and/or services. Unlike traditional procurement, where the government manages and finances a project itself, the PPP model integrates various project functions—such as **designing, building, financing, operating, and maintaining**—under a single private entity, typically a consortium of companies known as a **Special Purpose Vehicle (SPV)**.

Core Principles Of The PPP Model

The success of the PPP model relies on several fundamental concepts:



•**Risk Transfer:** A defining feature of PPPs is that risks are allocated to the party best equipped to handle them. For example, the private sector often bears construction and operational risks, while the public sector may retain regulatory or land acquisition risks.



•**Performance-Based Payments:** Instead of receiving upfront payments for capital costs, the private partner is typically compensated based on **service delivery and performance metrics**. If performance standards are not met, payments can be reduced.



•**Value for Money (VFM):** Governments use PPPs when they believe the private sector's efficiency, innovation, and management expertise will deliver a project more cost-effectively than traditional methods. This is often assessed using a **Public Sector Comparator (PSC)**, which estimates the hypothetical cost if the public sector were to deliver the project alone.



•**Private Investment:** The private sector provides a significant portion of the capital, seeking a financial return for assuming project risks.

PPPs can take many different contractual forms depending on the level of private sector involvement:

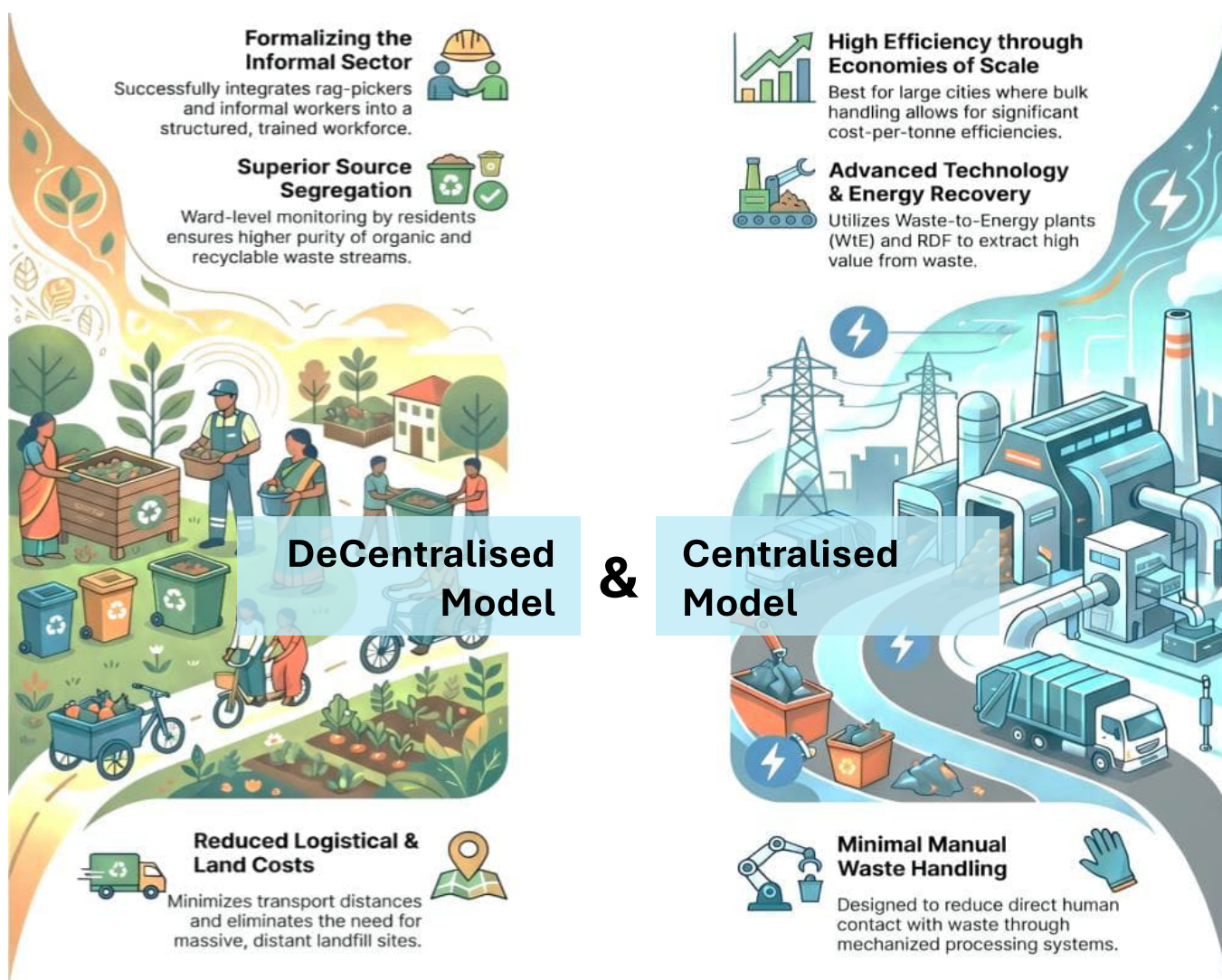
BOO (Build-Own-Operate): The private entity retains ownership of the asset indefinitely.	BOT (Build-Operate-Transfer): The private partner builds and operates the facility for a specific "concession period," after which ownership is transferred back to the government.	DBFOT (Design-Build-Finance-Operate-Transfer): An extension of BOT where the private party is also responsible for the design and initial financing.
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•**Availability-Based vs. User-Fee Models:** In some models, the government makes regular payments to the private partner based on the infrastructure being "available" for use (e.g., the UK's PFI). In others, the private partner collects fees directly from users, such as tolls on a highway.

PPP vs. Traditional Procurement

Feature	Traditional Procurement (Design-Bid-Build)	PPP Model
Contracts	Multiple separate contracts for design and construction.	A single integrated concession agreement.
Risk	Mostly borne by the public sector.	Allocated to the party best able to manage it.
Finance	Funded by the government through taxes or debt.	Primarily financed by the private sector.
Focus	Process-oriented and input-focused.	Outcome-oriented and focused on service performance

India's annual waste generation is projected to reach **260 million tonnes by 2047**. Rather than choosing between models, Urban Local Bodies (ULBs) could adopt a **hybrid approach** that integrates **technology-driven Centralised systems** with **community-based deCentralised solutions**. An integrated PPP framework can combine both approaches to create a **resilient, efficient, and circular waste management system**.



7.4 Contracting Arrangements For Municipal Solid Waste Services

According to Swachh Bharat Mission - Urban 2.0 and Central Public Health and Environmental Engineering Organisation guidelines, the most suitable structure for solid waste management is an **integrated model**. This combines **service contracts for Collection and Transportation** with **BOT/DBO-based concessions for waste processing facilities**, while Urban Local Bodies (ULBs) retain responsibility for **regulation, monitoring, and performance oversight**.

ULBs may refer to the **Model RFP and Concession Agreement for Integrated Solid Waste Management Projects** issued under Swachh Bharat Mission - Urban 2.0, along with PPP guidance documents available on PPP in India, to effectively structure, procure, and implement such projects.

pppinindia.gov.in
Public Private Partnership In India

(Based on SBM-U 2.0 integrated waste management approach)



Prerequisites For Contracting

- Cost benefit analysis of the existing solid waste management system is necessary.
- Services to be outsourced shall be identified maintaining clear accountability.
- Characterization and physicochemical analysis of municipal waste should precede tendering of any waste processing, treatment, and disposal facilities.
- Detailed project development is the key to successful implementation.
- Detailed estimation of cost related to operation and maintenance should be done.
- Detailed project definition and key performance indicators have to be established.
- Land requirements for 20–25 years for proposed facilities shall be assessed and identified.
- Complete ownership of all projects by the ULB (not just ownership of property, but active commitment a monitoring) is crucial.
- The contracting period for each of the activity should be for a minimum of a two year and maximum of 5 years, to maintain continuity.



Special attention is required for:

- **Vehicle Maintenance:** SWM vehicles have a lifespan of 7–10 years with proper upkeep. Regular maintenance of the waste-carrying body is essential to extend vehicle life.
- **Machinery & Infrastructure:** Waste processing equipment should be operated by trained personnel (including outsourced staff), with regular maintenance mandated in contracts.

Not all contracting models are suitable for each of the MSWM operations. Municipal authorities may adopt one or more of the following contracting models:

MSW management and operation	Characteristics	Relevant contract models
Collection and Transportation	Large number of work force, vehicles and equipment	Service contracts
	Logistics-intensive	Management contracts
	Citizen interface	Concession for 7 years or more
	Investment ranges widely depending on scope of work	
Street sweeping	Labor-intensive	Service contracts subject to contract labor (Regulation and Abolition) Act, 1970
	Logistics-intensive	
	Minimal investment in tool and equipment	
	Limited technical skills	
Transport	Capital-intensive	Concession contracts
	Fleet management skills	
Processing and disposal	Capital-intensive	Concession contracts (DBO, BOO, DBOOT) for
	Technically skilled staffing required	20 years or more
	Experience of technology deployed	

7.5 List Of Cities With PPP Models In Solid Waste Management

City/Town	PPP Model / Type of Engagement	Key Details
Kanpur	Reverse Integrated SWM (BOT)	Consolidated various segments (collection, transportation, and processing) under a single private entity to ensure sustainability.
New Delhi (Timarpur-Okhla)	Waste-to-Energy (BOOT)	A large-scale project designed to generate green electricity and carbon credits from municipal waste.
Rajkot & Ahmedabad	Processing of Waste	These cities have specifically partnered with private sector companies for the processing segment of SWM.
Chennai, Namakkal & Trivandrum	Decentralized Management	These municipalities have engaged Self-Help Groups (SHGs) and NGOs for community-based waste management.
Pune	Door-to-door Collection	The municipal corporation provides equipment and financial support to a waste pickers' co-operative called SWaCH.
Mumbai	DeCentralised (ALM Scheme)	Through the "Advanced Locality Management" scheme, the ULB provides subsidies for local composting facilities.
Saharanpur	DeCentralised Partnership	A joint initiative involving a corporate house (ITC), an NGO, and the municipal corporation for localized waste management.
Nashik	Improved Service Delivery	Enhanced collection efficiency by implementing a network of "Ghanta Gadis" (garbage collection tractors).
Pimpri Chinchwad Municipal Corporation (PCMC)	Build-Operate-Transfer (BOT)	PCMC Waste-to-Energy (WTE) plant at Moshi, a 14MW, 1,000-ton-per-day (TPD) facility operated by Antony Lara Renewable Energy Private Limited (ALREPL). The project generates electricity from municipal solid waste, reducing landfill reliance and saving the municipality on power costs.
Thiruvananthapuram	Community + PPP Hybrid	Household decentralized treatment supported through private technology vendors and service operators.

City/Town	PPP Model / Type of Engagement	Key Details
Indore	Integrated SWM PPP Model	Multiple private operators engaged for collection, transportation, transfer stations, composting, biomethanation, and C&D waste management under strict performance monitoring.
Surat	Collection & Transportation PPP	Door-to-door collection and secondary transportation outsourced to private concessionaires with GPS-based monitoring.
Hyderabad	Integrated Waste Processing	GHMC partnered with private firms for transportation, transfer stations, RDF generation, and WtE integration.
Bhopal	Waste-to-Energy (BOOT)	Large-scale WtE plant developed through PPP for municipal solid waste processing and power generation.
Chandigarh	RDF & Sanitary Landfill PPP	Processing and landfill operations handled under concession agreements with private firms.
Tirupati	Smart City SWM PPP	ICT-enabled waste collection, GPS tracking, and processing under private operation models.
Lucknow	Collection + WtE PPP	Door-to-door collection integrated with a private Waste-to-Energy facility processing municipal waste.
Jaipur	Concession-Based SWM	Private contractors manage primary collection, transportation, and waste processing operations.
Coimbatore	Micro-Franchise Collection Model	Ward-level collection managed through private micro-enterprises and women SHGs.
Panaji	Decentralized Waste Centres	Small-scale decentralized sorting and composting facilities run through NGO/private participation.
Solapur Bio-Energy Systems Private Limited (SBESPL)	BOOT (Build, Own, Operate, and Transfer)	SBESPL plant, a 400 TPD (tons per day) waste treatment facility established in 2013 on a BOOT (Build, Own, Operate, and Transfer) basis to convert organic waste into biogas and fertilizer.

Chapter 8:

Festival Waste Management-Guideline

Key Highlights Of This Topic:

- 8.1 Waste Surge From Festivals
- 8.2 Environmental Impacts
- 8.3 Maha Kumbh Waste Management Driving Economic Growth
- 8.4 Char Dham: Driving Waste Recovery Across India's Largest Pilgrimage Corridor
- 8.5 Zero-waste Waste Management At Hornbill Festival, Nagaland

About the topic:

Certain events create temporary spikes in waste generation that need special planning. This section addresses how cities can manage such situations effectively through coordination, preparedness, and responsible waste handling practices with actual examples.

8.1 Waste Surge From Festivals

The vision of Swachh Bharat Mission–Urban 2.0 is to make all cities “Garbage Free” by promoting the 5R principles reduce, reuse, recycle, recover, and refuse along with a circular economy approach to maximize resource recovery. In line with the Government of India’s priorities, the mission also emphasizes the phased elimination of single-use plastics.

During major festivals, urban waste can increase by 25–30%, driven by the use of disposable items, firecrackers, floral offerings, and idols. Public events present a significant challenge for urban local bodies due to the large volumes of waste generated and the complexities of its management. This places considerable pressure on urban infrastructure, making it crucial for cities to implement targeted and sustainable waste management strategies. In India, festival waste management requires focused attention due to the country’s diverse cultural and religious celebrations, which lead to sudden surges in waste generation. Therefore, it is essential to adopt “zero-waste” principles in organizing events to minimize waste generation and ensure safe and efficient disposal.

8.2 Environmental Impacts

Excess waste leads to open dumping and burning, polluting air, water, and soil 20% of Diwali waste (187,200 tons) is mishandled this way. Festivals strain landfills, release toxins from plastics and chemicals, and hinder garbage-free city goals under Swachh Bharat Mission 2.0

The 5 R's of festival waste management

Refuse

Sometimes the best way to manage waste is trying to not create it in the first place. But of course, we know that can be somewhat unrealistic. Encourage attendees and vendors to **refuse single-use items** like straws, cups, and cutlery. Work with vendors to provide **reusable or compostable alternatives** instead.

Reduce

Festival organizers can play a crucial role by reimagining their event’s setup. **opt for digital ticketing and event apps to minimize paper waste.** Collaborate with vendors to **avoid single-use plastics** by encouraging them to use eco-friendly packaging.

Repurpose

Salvage materials from the event, like banners or stage props, and **transform them into functional items for next year.** Collaborate with local artists who **specialise in upcycling** to give waste a new lease on life.

Reuse

Design event merchandise that’s not only trendy **but durable**, so attendees can use them beyond the festival days. Set up designated areas where attendees can drop off items, they no longer need, like camping gear or costumes, for others to reuse.

Recycle

Proper recycling requires **educating both attendees and staff about what can and cannot be recycled.** Remember, contamination can render an entire batch of recyclables useless, so it’s crucial to get everyone on board with the recycling guidelines.

Paving the Way to a Sustainable Festival Experience

8.3 Maha Kumbh Waste Management Driving Economic Growth

Introduction

Waste management strategies for the Maha Kumbh was center on massive, technology-driven, and sustainable infrastructure to manage millions of visitors while protecting the Ganges and Yamuna rivers

The Maha Kumbh 2025
Prayagraj, Uttar Pradesh
January 14 to March 30,
2025

The festival grounds were declared **plastic-free zones**, with a complete ban on single-use plastics.

Notable installations include the “Waste to Wonder” Shivalaya Park, where sculptures inspired by the 12 Jyotirlingas are crafted from recycled materials, showcasing creativity and sustainability.



9,000 square meters of land have been transformed into a thriving green space, home to 27,000 saplings of 27 different species.



Key Strategies

Waste Reduction and Prevention

- Promotion of **eco-friendly alternatives** such as leaf plates (dona-pattals), kulhads, cloth bags, and steel utensils.
- Campaigns to reduce **single-use plastic** through initiatives like “Ek Thali Ek Thaila”.

Waste Segregation and Collection

- Installation of **25,000 dustbins** across the mela area for organized waste disposal.
- 37.75 lakh Use of **liner bags** and designated collection points to ensure efficient segregation and collection of waste.

Transportation and Handling

- A fleet of 120 tippers, hoppers, and 40 refuse compactors ensures efficient transportation and disposal
- Waste collected multiple times daily to manage the high volume generated during peak pilgrimage days.

Waste Treatment and Processing

- Garbage was transported to the Baswar plant in Naini for proper disposal and processing
- Waste-to-art and recycling initiatives promoting circular economy practices.

Monitoring and Governance

- Real-time monitoring through the **Integrated Command and Control Centre (ICCC)** and AI-based tools for tracking sanitation activities.
- Special sanitation teams**, **Ganga Seva Doots** were stationed at bathing areas to maintain cleanliness and promptly remove flowers and other materials from the river .

Public Awareness And Campaign

Public participation was a crucial aspect of maintaining cleanliness at Maha Kumbh. Several initiatives had been launched to engage citizens and promote awareness

Swachhata Rath Yatra, organized by the Municipal Corporation of Prayagraj, has traversed through various city routes to encourage cleanliness.

Public address systems at ghats continuously broadcast messages urging devotees to maintain cleanliness.



Street plays and musical performances educate pilgrims on proper waste segregation and disposal.

The Private Sector Involvement

Coca-Cola India supported recycling initiatives, distributed jackets made from recycled plastic to sanitation workers.



Dabur set up "Daant Snan" zones across the Mela to promote hygiene and cleanliness among pilgrims.



Dettol and **ITC** conducted awareness campaigns, trained sanitation workers, and promoted hygiene practices.



Amazon promoted recycling by converting packaging boxes into temporary resting beds for devotees, encouraging reuse and waste reduction



Key Outcome And Impact

- ✓ **Over 65 crore devotees managed safely**
- ✓ Deployment of **22,000 sanitation workers** ensured a litter-free environment across the fairground.
- ✓ **biodegradable alternatives** helped minimize environmental impact.
- ✓ **River cleaning machines removed 10–15 tons of waste daily** from the Ganga and Yamuna rivers.
- ✓ **Strong public awareness and participation.**
- ✓ Estimated **₹2 lakh crore economic impact**, contributing to growth in the state economy.
- ✓ Hospitality and travel sectors generated **₹2,800 crore**, while trade in religious items and flowers exceeded **₹2,000 crore**.
- ✓ AI-based crowd management, smart surveillance, and digital services improved event management efficiency.
- ✓ **Global Cultural Visibility** Strengthened India's image as a global hub for **spiritual tourism and cultural heritage**.
- ✓ A **7-tier security system** and digital lost-and-found centers ensured better safety and crowd management

8.4 Char Dham: Driving Waste Recovery Across India's Largest Pilgrimage Corridor

The Char Dham Yatra, covering the sacred sites of Kedarnath Temple, Badrinath Temple, Gangotri Temple, and Yamunotri Temple in Uttarakhand, attracts millions of pilgrims every year.

The pilgrimage generates large quantities of plastic waste in fragile Himalayan ecosystems.

To address this challenge, the Government of Uttarakhand partnered with Recykal to implement a Digital Deposit Refund System (dDRS)—a technology-based solution encouraging pilgrims to return plastic packaging for recycling through

Event Scale

Pilgrims: Over **5 crore** visitors annually.

Waste generated: Up to **1,500 tonnes of waste per day** during peak season.



Key Features

•**Refundable Green Deposit:** ₹2–₹10 added to plastic bottles, snack packets, and other packaging items.

•**QR / USI Tracking:** Each item carries a **QR or Unique Serialised Identification (USI)** code linked to a digital refund platform.

•**Return & Refund:** Pilgrims return empty packaging at collection points; deposits are refunded digitally via **UPI or bank transfer**.

Implementation In Char Dham Yatra

- **Pilot Launch (2022):** First implemented on the **Kedarnath Temple route**, where vendors were required to sell only QR/USI-coded packaging.
- **Phase I (May–July 2022):** Implementation at Kedarnath Dham.
- **Phase II (Sept–Nov 2022):** Expanded to **Gangotri Temple, Yamunotri Temple, and later Badrinath Temple**.
- **Infrastructure Setup:** Collection kiosks and digital refund machines installed along the yatra route, with mandatory retailer participation.

Outcomes / Impact

20 lakh plastic bottles collected and diverted to recycling.

66 metric tonnes of CO₂ emissions reduced.

1.63 lakh bottles

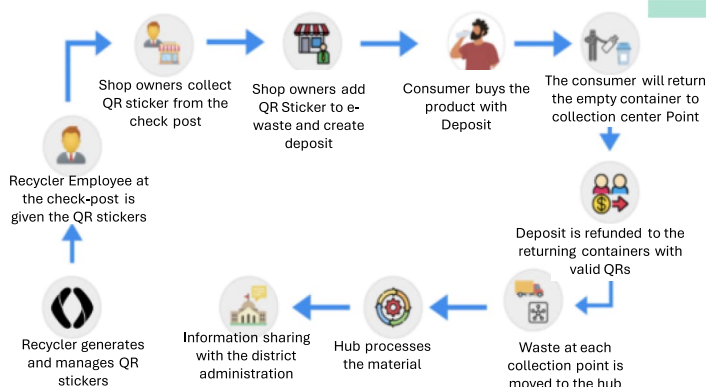
prevented from entering Himalayan rivers.

110+ jobs created in waste collection and system management.

37.5% income increase for the informal waste-collection sector.

Estimated **₹3.73 crore savings** in waste management costs.

Improper littering reduced by over 20%



Recognition

The Rudraprayag District administration received the Digital India Award (2022) from the Ministry of Electronics and Information Technology for the Kedarnath dDRS pilot.

8.5 Zero-waste Waste Management At Hornbill Festival, Nagaland

The Hornbill Festival, held annually at Naga Heritage Village, Kisama, Nagaland, is one of India's largest cultural festivals celebrating the traditions of Naga tribes. The 2024 festival attracted international and domestic tourists. With such a large gathering, managing waste sustainably became a major priority. Along with waste management measures, the SDG Coordination Centre (SDGCC) also set up an SDG One-Stop Destination booth to raise awareness about sustainable development goals among festival visitors.

• **Visitors:** ~ **2,05,968 people** attended the festival.

• **Duration:** **10 days.**

• Participants in SDG activities: 1,300+
participants in SDG games 200 participants in SDG quiz competition



Key Initiatives

- Ban on single-use plastics with eco-friendly alternatives like bamboo straws and leaf plates.
- Source segregation system with separate bins for wet and dry waste.
- On-site waste processing, including composting of organic waste and recycling of dry waste.
- SDG Awareness & Education Initiative.

Social Media Outreach strategy : Awareness campaigns through government agencies, influencers, and development partners.

Replicability / Key Learnings

- Integrate **sustainability awareness platforms** within major cultural events.
- Combine **waste management systems with education and Behavioural change initiatives.**
- Encourage **community participation and volunteer engagement.**
- Use **interactive learning tools such as games, quizzes, and media** to increase public awareness.
- Strengthen **awareness campaigns for e-waste management and recycling systems.**



Key Engagement Activities

- SDG Information Desk: Sharing data and progress on Nagaland's SDG achievements and encouraging collaborations.
- SDG Mascot & Photo Booth: Interactive engagement attracting visitors of all ages.
- SDG Quiz Competition: 200 participants testing knowledge about global and local SDG issues.
- SDG Games: Interactive board games and puzzles with over 1,300 participants, promoting gamified learning.
- Film Screenings: Videos showcasing Nagaland's progress toward SDG Vision 2030.

Outcomes / Impact

- ~1 lakh single-use plastic items avoided per day, totaling nearly 1 million items during the festival. Estimated 50 metric tonnes reduction in CO₂ emissions due to reduced plastic use.
- Strong public engagement in SDG awareness activities, especially among youth.
- Increased understanding of sustainable practices among festival visitors.
- Insight gained on e-waste awareness gaps, highlighting the need for stronger outreach Programmes.

Chapter 9 :

Solid Waste Management In India: Best Practices

Key Highlights Of This Topic:

- 9.1 Factors For Selection Of Case Studies
- 9.2 Collection And Transportation
- 9.3 SBM – NULM Integration
- 9.4 Empowering Waste Pickers And Zero Waste Initiatives
- 9.5 Structured Sanitary Waste Collection And Monitoring System
- 9.6 Construction And Demolition (C&D) Waste Management
- 9.7 Digital Transformation Of Waste Segregation With Recyclink
- 9.8 Upcycling Of Plastic Waste
- 9.9 GWMC Case study
- 9.10 E[co]work Sustainable Solutions E-waste Management
- 9.11 Meat Waste Management System

About the Topic:

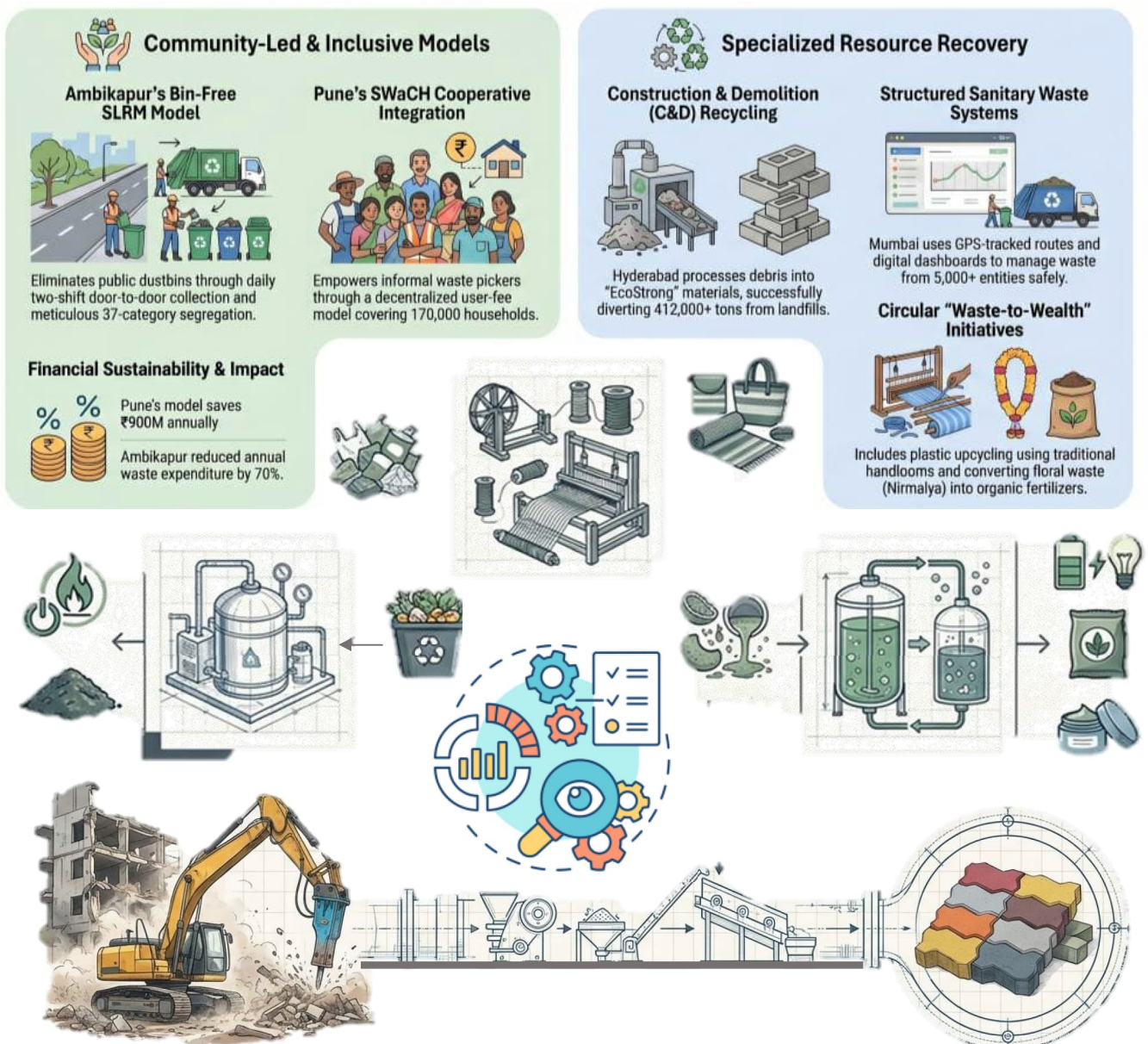
Learning from real-world experiences helps in improving local systems. This section presents successful examples and practical approaches from different cities, offering insights that can be adapted and replicated. It helps cities learn, adapt, and replicate solutions that have already demonstrated impact.

9.1 Factors For Selection Of Case Studies

Urban local bodies across India are increasingly turning to practical, field-tested models to strengthen their waste management systems. Drawing on frameworks and guidance from the Swachh Bharat Mission (SBM), these case studies highlight how cities have translated policy into on-the-ground action. They offer valuable insights from real implementation experiences, demonstrating how diverse approaches can be adapted to local contexts.

The selected case studies (Documented in Person and published by NIUA) serve as actionable references for other cities, showcasing replicable strategies in deCentralised waste management, resource recovery, and circular economy practices.

A key focus of these studies is understanding how cities have effectively integrated multiple stakeholders, including NGOs, informal waste pickers, private players, and community groups, into the system. They also explore the role of technology, public-private partnerships (PPP), and institutional mechanisms in improving efficiency and sustainability. Emphasizing these innovative strategies can inspire policymakers to feel excited about adopting new solutions.



9.2 Collection And Transportation

Ambikapur's transformation into a **bin-free city** is centered on a meticulous, community-led waste management model that has completely eliminated the need for public dustbins. Ambikapur Municipal Corporation (AMC) moved away from traditional dumping to implement the Solid and Liquid Resource Management (SLRM) project



Located :Sarguja,
Chhattisgarh district

City / Town / ULB:
Ambikapur Municipal
Corporation

The "Swachhata Didi" Model

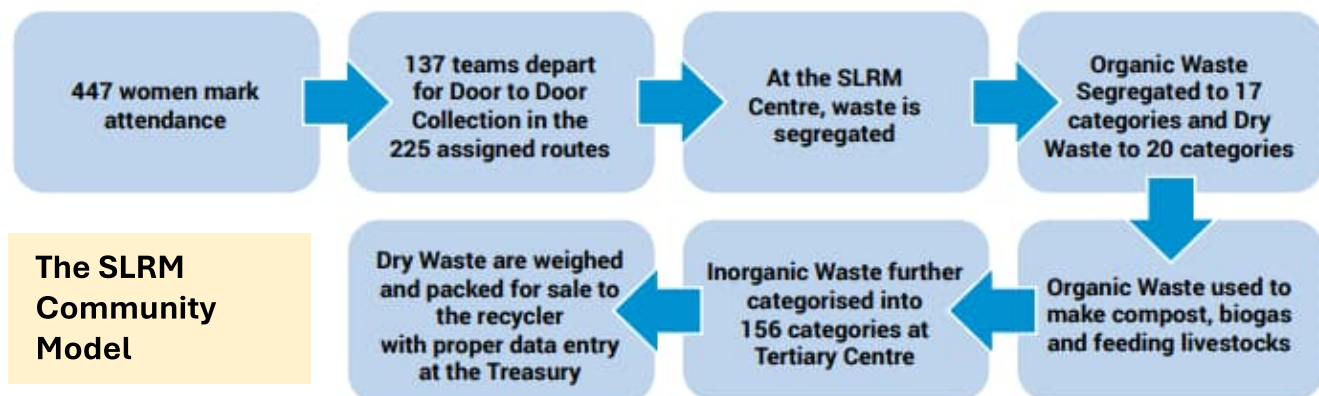
The backbone of this initiative is a dedicated workforce of **447 women**, known as **Swachhata Didis**, organized into 41 Self-Help Groups (SHGs).

Collection Schedule: They conduct door-to-door waste collection daily in two shifts: **7:00 AM to 11:00 AM** and **3:00 PM to 5:00 PM**.

Logistics: The collection is supported by a fleet of **150 manual rickshaws** and **25 battery-operated rickshaws**.

Dignity of Labor: This model has provided sustainable employment and social respect to these women, who are referred to as "Didis" (sisters).

Operational & Monitoring Workflow : Special software was designed in-house and a desk was set up at the District Data Centre. CCTV cameras have been installed in every SLRM Centre.



Ambikapur has moved beyond basic segregation, implementing a highly detailed system to ensure maximum resource recovery:

- **37 Categories of Waste:** Collected waste is sorted into **20 types of organic** and **17 types of inorganic** categories.
- **SLRM Centers:** The city reclaimed 6,689 square meters of land previously occupied by unAuthorised encroachments and worth approximately ₹28 crore to build **17 Solid and Liquid Resource Management (SLRM) centers**.
- **Resource Recovery:** At these centers, dry waste is further segregated and sold, while organic waste is converted into compost or animal feed.



Collection and Multi-Stage Segregation

-dashboard-monitored system to ensure 100% door-to-door collection.

- Collection:** daily for collection across 225 assigned routes, using GPS-tracked vehicles.

- Secondary Segregation:** At SLRM centers, organic waste is sorted into 17 categories, while dry waste is sorted into 20 categories.

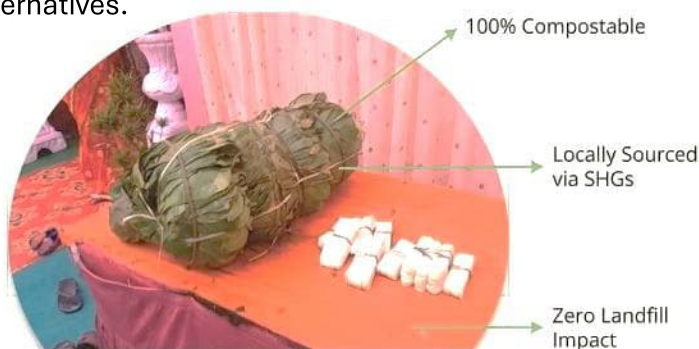
- Tertiary Segregation:** Recyclable waste is taken to a tertiary centre, where it is meticulously classified into **156 different categories** and packed for sale to recyclers.



Direct to the recycler pipeline
Dry, hazardous, and Sanitary Wastes are isolated with industrial precision. Plastics, metals, paper, and glass are sub-categorized by grade, color, and density to command premium market prices from Authorised recyclers.

Zero Waste Events and Infrastructure

To eliminate single-use plastics. The Didi Bartan Bank allows event organizers to rent reusable steel utensils, seamlessly paired with traditional biodegradable alternatives.



•Zero-Waste Weddings:

Ambikapur promotes eco-friendly celebrations using **Dona-pattal (leaf plates)** and offers a **5% discount** on community hall bookings for zero-waste events.

•Didi Bartan Bank:

Residents can rent reusable utensils from this "dish bank" to avoid single-use plastics.

Key Achievements

- Swachh Survekshan:** Ranked **1st** in the 1-3 lakh population category for four consecutive years (2017–2020).

- Recognized as the **"Best Self-Sustainable City"** in 2022 and took first place in its category in the Indian Swachhata League.

- This successful model has now been replicated across Chhattisgarh, providing employment to over **10,000 women** statewide

Impact/outcome

- Ambikapur successfully remediated its 16-acre dumpsite into a Sanitation Awareness Park and eliminated overflowing community bins

- The deCentralised model reduced the city's annual solid waste expenditure from Rs 1.23 crores in 2012 to Rs 37 lakhs in 2017

- By December 2017, the corporation had earned Rs 84.81 lakhs specifically from the sale of recycled waste and city compost

9.3 SBM – NULM Integration

The **Pune Model** represents a transformative approach to **urban waste management** by prioritizing the social and economic inclusion of **informal waste-pickers**. Through the **SWaCH cooperative**, the city has established a deCentralised system where workers collect fees directly from residents while diverting recyclables from landfills

The **Pune Municipal Corporation (PMC)** has focused its cleanliness efforts on community-driven waste management, particularly aiming for **Zero Waste** within its informal settlements.



- **City / Town / ULB** :Pune Municipal Corporation
- **Organisation** **SWaCH**



Reference :NIUA (2025) "Navigating Waste: Stories from Urban India"

Empowering Informal Settlements

PMC has implemented waste management initiatives in **70 informal settlements** to achieve a Zero Waste goal. Key features of this model include:



- **Waste-Picker Integration:** Pune pioneered a **push-cart based, waste-picker integrated doorstep collection system** managed by the **SWaCH Pune Cooperative Society**. This system covers approximately **70% of the city's properties**.
- **Economic Model:** Waste pickers collect monthly service fees directly from citizens and earn additional income by selling recyclables, which empowers them and streamlines the recovery process.
- **Localized Infrastructure:** PMC installed **264 dry waste storage units known as 'Pinjras'**, each capable of enabling the recycling of up to **50 tons of material annually**.

Citizen Incentives :Since 2010, PMC has used financial incentives to encourage sustainable habits among its residents:



Property Tax Rebates: Individual property owners receive a **5% rebate** if they undertake any two of three green initiatives: **on-site composting, installing solar water heaters, or rainwater harvesting**.

Waste-to-Wealth Initiatives

The city has successfully integrated technology to process organic waste at the source:



- **Community Composting:** PMC allocated dedicated spaces for community composting units maintained by NGOs. These units handle **200 kg of wet waste daily**, reducing waste management costs by **50%** and providing waste pickers an additional monthly income of **₹1,500**.

Processing Facilities

Organic Waste

Processing:

•**Bio-CNG:** The Nobel Exchange project (200 MT) generates 4,000 kg of Bio-CNG daily, with 1,000 kg used to **power PMPML public buses**.

•**Biomethanation:** Ten deCentralised 5-MT plants use biogas for captive electricity generation.

•**Composting:** Two deCentralised mechanical composting plants have a combined capacity of 400 TPD.

Material

Facilities (MRFs): Eight deCentralised MRFs have a combined capacity of 850 TPD, extracting roughly 220 TPD of recyclables like plastic, paper, and metal.

Recovery

•**Waste to Energy:** The Pune Bio Energy Plant at Ramtekdi has a 700 MTPD capacity and is designed to produce **13.19 MW of electricity**.

Sanitary Waste:

A specialized AHP (Absorbent Hygiene Products) recycling plant with a capacity of 2,500 MT/annum is expected to be operational by March 2025 to process diapers and sanitary napkins into recycled plastics and cellulose.

Construction and Demolition (C&D) Waste: A 200 MTPD plant at Wagholi processes debris into construction products like blocks and aggregates.

PUNE'S SWACHH STORY:

A Roadmap to Zero Waste Informal Settlements



5% Property Tax Rebate

Financial incentive for citizens adopting solar heating, composting, or rainwater harvesting.

COLLECTION & THE HUMAN ELEMENT



The SWaCH Cooperative Model

An integrated, waste-picker-led doorstep collection system covering 70% of city properties.



'Pinjra' Dry Waste Storage

264 specialized units recycling up to 50 tons of material per unit annually.

DECENTRALIZED PROCESSING INFRASTRUCTURE



Modular Biomethanation Units

50 operational units converting organic waste into over 3 crore liters of biogas. Offsetting 25,000 tons of CO₂ annually.



NGO-Maintained Community Composting

Dedicated spaces for composting that reduce municipal waste costs by 30%. Capacity: 200kg daily per unit.



PUNE



Zero Waste in 70 Informal Settlements

Focused community-driven initiatives aiming for complete waste elimination in vulnerable urban areas.

CITIZEN INCENTIVES & TOTAL IMPACT

170,000
Households

Successful doorstep collection and segregation achieved for approximately 170,000 households.

100%
Collection Reach

Pune Municipal Corporation (PMC) and SWaCH Pune Seva Sahakari Sanstha Ltd. have a longstanding Public-Private Partnership (PPP) model for door-to-door waste collection. This collaborative agreement, often formalized through Memorandums of Understanding (MoU), is structured around a "user fee-based" model rather than a contractor-employee relationship.

Overall Impact

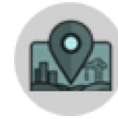
Through these organized processes involving residents, waste pickers, and NGOs, Pune's model has provided **100% doorstep collection and segregation for approximately 170,000 households**.

PMC roughly INR 900M annually in labor, transportation, and processing. Diverts approximately 60 MT of waste from landfills daily.

9.4 Empowering Waste Pickers And Zero Waste Initiatives

Municipal Corporation of Greater Mumbai (MCGM) has recognized Stree Mukti Sanghatana (SMS) as an affiliated federation. It was established in 1975.

Based in Chembur and works towards women's empowerment, women's rights, and environmental sustainability. The organization currently operates 6 Dry Waste Collection and Segregation Centers (DWCCs) across the city and has around 4,000 registered waste pickers in its network.



City ULBs: Municipal Corporation of Greater Mumbai (MCGM).

Organization: Stree Mukti Sanghatana



Stree Mukti Sanghatana
(Women's Liberation Organization)

SMS uses a five-step strategy to implement this model:

Awareness → Waste Audit → Stakeholder Meetings → Training → Implementation

Formal Recognition and Identity:

- SMS secured **official ID cards** from the BMC for waste pickers, providing them with legal recognition and protection.
- Municipalities have recognized SMS-affiliated federations such as PBVS: Parisar Bhagini Vikas Sangh (recognized by MCGM), PSVS: Parisar Sakhi Vikas Sangh (recognized by NMMC), PBVSS: Parisar Bhagini Vikas Seva Sangh as Community Development Societies

Joint Operations at Collection Centres:

- The Chembur Dry Waste Collection Centre (DWCC), run by Parisar Bhagini Vikas Sangh (PBVS), demonstrates deCentralised, sustainable waste management under the Parisar Vikas Programme.
- It processes local dry waste using manual sorting and a baling machine, maximizing resource recovery.
- Spread over 2,600 sq. ft., it has a 5-tonne capacity but currently handles ~2 tonnes daily.
- Waste arrives via one BMC and one private vehicle
- The center employs 11 workers, including 8 women workers involved in segregation and one supervisor.
- At the center, the waste is sorted manually into around 35 different categories.



Worker Compensation and Incentives:

- The **women workers** earn their livelihood directly from the **sale of recyclable materials** they sort and process. Depending on the quantity and quality of the waste, workers can earn between **₹700–800 per**

Sustainability and Accountability:

- To maintain operations, the centre must submit a **yearly report for renewal** that details waste processed, income, and expenses. This ensures the facility remains "sustainable" and "environmentally sound".

The operations and financing of the **Parisar Vikas** Programme are designed to create a self-sustaining ecosystem that empowers waste pickers while providing cost-effective waste management for urban areas.

Financing and Economic Model

The financial structure of the Programme focuses on collective self-reliance and formalizing the informal economy of waste picking.

•Self-Help Groups (SHGs) and Federations:

Women waste pickers are organized into SHGs, which are then affiliated with larger federations like **Parisar Bhagini Vikas Sangh (PBVS)** and **Parisar Sakhi Vikas Sangh (PSVS)**. These groups provide **financial assistance** for essential needs, including education, health, housing, and family functions.

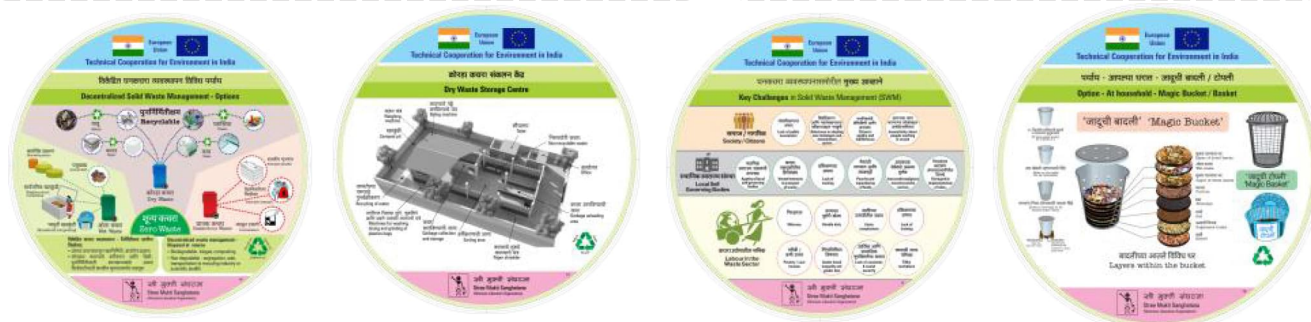
Capacity Building: SMS provides continuous **leadership and job training** to these workers, which aligns with their broader goal of imparting "alternate skills" like composting and bio-methanation.

•Revenue through Products and Consultancy:

SMS offers consultancy services and sells specialized waste management products, such as **Magic Baskets, Tumblers, and FRP Pits**, to families and housing societies.

Management of Scrap Shops: One of the core financial activities is the management of **scrap shops** for and by the waste pickers, ensuring they retain the profit from the materials they collect.

Formation of Cooperatives: SMS facilitates the creation of cooperatives to provide formal **work opportunities** and technical roles (like operating biogas plants or composting units) for their members



Awareness and Education Initiatives

Awareness is the first step in the SMS strategy to achieve a "Zero Waste" society. These activities are crucial for the operational success of the DWCC:

- **Institutional Outreach:** SMS actively conducts awareness sessions in **15 colleges** and numerous schools. In **2024 alone**, they conducted **26 awareness trainings** in these educational settings.
- **Reducing Mixed Waste:** The primary objective of these sessions is to improve **segregation at source**. By educating the community on how to separate dry and wet waste, SMS ensures that the amount of "mixed waste" reaching the Chembur centre is reduced.

Economic and Environmental Impact



- **Cost Reductions:** By processing waste locally, the municipal corporation saves significantly on transport costs and tipping fees paid to landfills
- **Resource Recovery:** It prevents valuable materials from being lost at dumping grounds, helping the city meet sustainability goals
- **Environmental Protection:** The deCentralised model leads to cleaner roads, reduced air pollution from waste transport, and lower emissions

9.5 Structured Sanitary Waste Collection And Monitoring System

Sanitary Waste is one of the most sensitive waste streams in urban solid waste management. In many cities, this waste is often mixed with general waste, which creates challenges in safe handling. The initiative of structured system for separate collection, monitoring, and safe disposal of Sanitary Waste began as a pilot project with Thane Municipal corporation and was later expanded to cover all 25 municipal wards of Mumbai with collaboration Brihanmumbai Municipal Corporation of RNisarg Foundation.

City / Town / ULB:

Brihanmumbai
Municipal Corporation

Organisation:



Key Activities

Registration of Waste Generators

Institutions such as residential societies, hostels, schools, and salons are registered under the Programme. Basic details like address, contact information, and operational data are collected. Registered entities receive a certificate and are included in the dedicated Sanitary Waste collection system.

Awareness and IEC Support

Registered establishments are provided with **Information, Education, and Communication (IEC) materials** explaining proper segregation and disposal of Sanitary Waste. Awareness campaigns and guidance materials help promote safe practices and improve compliance.



Communication and Coordination

Waste generators receive instructions and updates through **WhatsApp communication** and are connected with designated municipal **Junior Officers (JOs)** who assist with operational coordination, collection schedules, and issue resolution.



Special **yellow bags** are distributed to registered establishments for the segregation of Sanitary Waste at source. These bags help sanitation workers easily identify Sanitary Waste and ensure safer handling during collection and transport.



Safe Processing and Disposal

Collected Sanitary Waste is transported to designated **plasma treatment facilities** for scientific processing and disposal. This ensures that Sanitary Waste is handled safely and does not mix with general municipal waste.



A **centralised digital dashboard** is used to track registrations, waste collection, and operational performance. This system improves monitoring, data management, and transparency in the collection process.

GPS-Based Route Planning

Collection vehicles use **GPS-based route planning** to optimise collection routes and ensure timely pickup of Sanitary Waste. This helps improve operational efficiency and reduce delays.



Challenges

- Ensuring consistent segregation by waste generators
- Coordination among multiple stakeholders
- Maintaining accurate data entry in monitoring systems
- Safe handling of sensitive Sanitary Waste



Impact / Outcomes

The initiative has created a **structured and organised system for Sanitary Waste management across Mumbai.**

Key Outcomes

- Over **5,000 registered entities** including residential buildings, hostels, salons, and institutions.
- Improved **source-level segregation of Sanitary Waste.**
- Enhanced **awareness among waste generators** through IEC materials and communication tools.
- More efficient **collection and monitoring through digital dashboards.**
- **GPS-enabled route planning** improved collection efficiency.

Overall, the system has helped **reduce the mixing of Sanitary Waste with general waste**, improving public health and worker safety.



Replicability

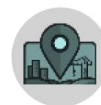
This model can be replicated in other cities through:

- Strong **municipal-NGO collaboration**
- Simple **source segregation mechanisms** (colour-coded bags)
- Use of **digital monitoring and GPS tracking**
- Focus on **citizen awareness and participation**
- Structured systems for collection and treatment

Cities can adapt this approach to strengthen Sanitary Waste management and improve urban hygiene.

9.6 Construction And Demolition (C&D) Waste Management

Hyderabad generates around 2,000 tonnes of Construction and Demolition (C&D) waste every day due to rapid construction and urban growth. Hyderabad has integrated SSREC Enviro into its municipal infrastructure through a formal 20-year C&D mandate awarded in October 2022. As a GHMC-Authorised partner, the company serves the municipal council by taking full responsibility for the Collection and Transportation of construction and demolition waste across the city. This long-term partnership ensures that the city has a reliable, scientifically-managed alternative to illegal dumping



City : Greater Hyderabad Municipal Corporation (GHMC)

Organisation : SSREC Enviro



Objectives

- Proper collection and management of C&D waste
- Reduction of illegal dumping
- Recycling waste into reusable materials
- Conservation of natural resources
- Promotion of sustainable waste management
- Support for compliance and proper disposal
- Encouragement of waste reuse and circular economy



Key Activities

Authorised Waste Logistics: The city receives streamlined, Authorised Collection and Transportation of debris directly from construction and demolition sites.

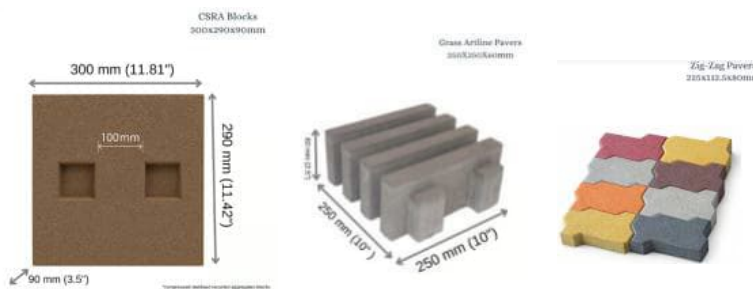
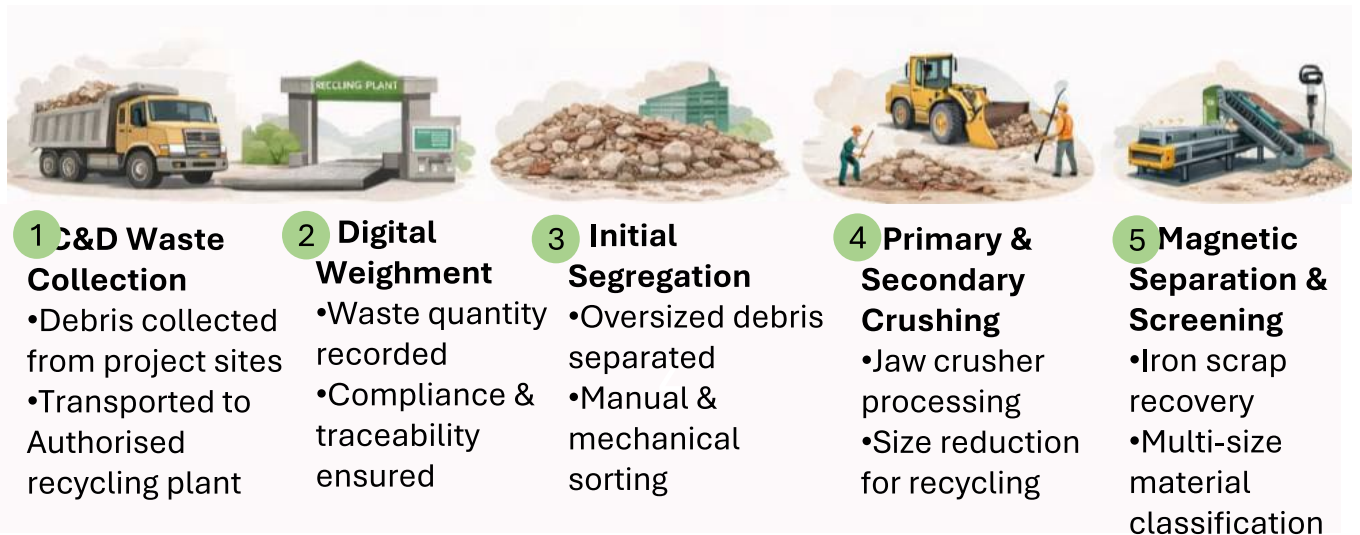
Advanced Processing Infrastructure: Hyderabad leverages two specialized facilities, the **Shamshabad Wet Washing Plant** and the **Thumkunta Dry Processing Unit**, to ensure maximum material recovery from its urban waste.

Supply of Sustainable Materials: The city's construction sector is supplied with high-quality, branded recycled products like **EcoStrong** (sand and aggregates) and finishing materials like **Eco Plast** and **Eco Finish**.

Regulatory & Compliance Support: For large-scale projects, the company provides essential administrative services, including **ULB/PCB reporting**, waste management plan preparation, and official **disposal records**.

Circular Buy-Back Solutions: The city benefits from material recovery and buy-back Programmes that allow projects to reuse their own processed waste

C&D Waste Processing and Material Recovery System



The products manufactured by the company are made from recycled construction and demolition (C&D) waste

The company's core operation involves transforming collected construction debris into a variety of sustainable building materials

100% recycled from C&D waste



Environmental impact

- The collaboration has resulted in measurable environmental and resource-saving impacts for the Hyderabad region:
- Over **412,000 tons of waste** have been successfully diverted from Hyderabad's lakes and landfills.
- The city has reduced its environmental footprint by saving **30,000+ tons of riverbed mining** and preserving **10,000+ CUM of local hills** that would otherwise be quarried for aggregates.
- As of March 2025, the city has access to **1 million tons per year (MTPA)** of certified recycling capacity, ensuring that Hyderabad's growth does not come at the cost of its natural surroundings.
- To date, more than **50,000 MT of C&D waste** has been actively processed and reintroduced into the local economy as usable building materials

9.7 Digital Transformation Of Waste Segregation With Recyclink

The Mira Bhayandar Municipal Corporation (MBMC) has implemented a comprehensive, technology-driven waste management system designed to track, map, and monitor waste from residential sources to the final recycling or processing stage which includes data analysis, optimal routing, logistics scheduling, and capacity optimization by collaborating Recyclink a Software company.



Location : Marigold Society

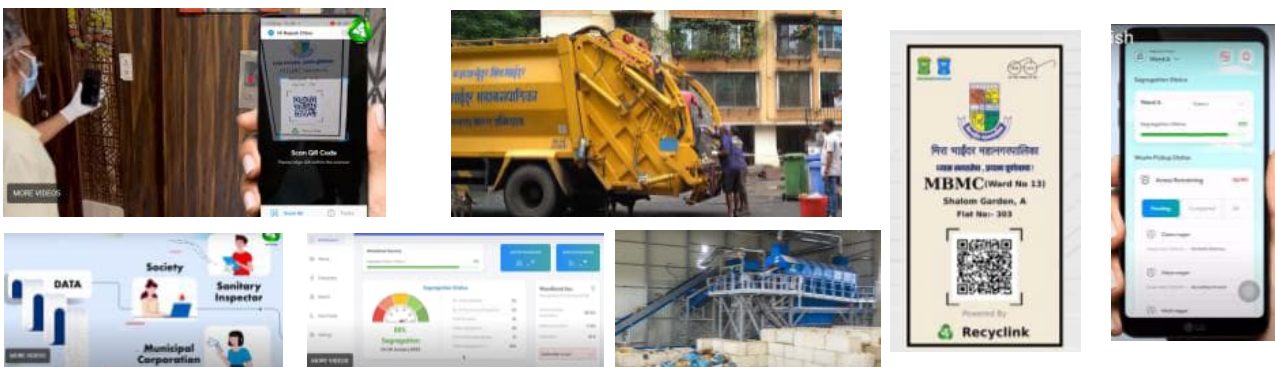
•**State / UT:** Maharashtra

•**City / Town / ULB:** Mira

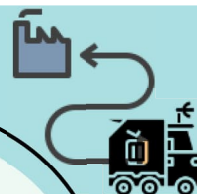
Bhayandar Municipal Corporation



Recyclink



End-to-End Waste Lifecycle Modules: Waste can now be tracked from disposal point to final processing.



Traceability up to MRF: Tracks waste movement from households to the **Materials Recovery Facility (MRF)**.



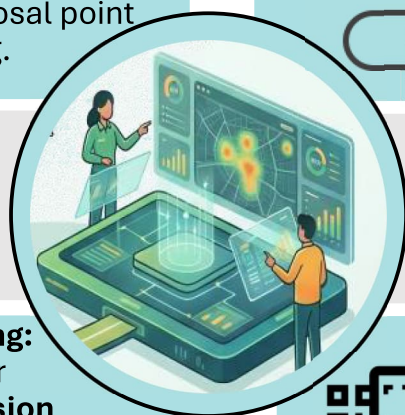
Audit Checks: Built-in verification system to ensure accuracy and reliability of field data



Digital Traceability: Enables municipalities to track waste from the generator to the final recycler



Automated Reporting: Generates reports for **Swachh Bharat Mission** with a single click, reducing administrative workload.



Citizen Engagement : QR codes will connect with a citizen app to support municipal services and IEC communication

The Challenge: Source Contamination

- Despite municipal efforts, waste segregation at the source is a major concern
- Contaminated waste causes collection and processing failures, leading to an increase in landfills
- Lack of digital visibility and accountability at the household level

Replicability and Scalability



- Comprehensive Waste Generator Mapping
- Asset, Route & Workforce Digitization
- Focuses on **optimizing existing infrastructure** and supply chains

Impact



- 24 wards** Complete digitization
- 3,00,000+** Active households
- 100%** mapping of all waste-generating premises
- 78%** reduction in waste contamination at source

9.8 Upcycling Of Plastic Waste

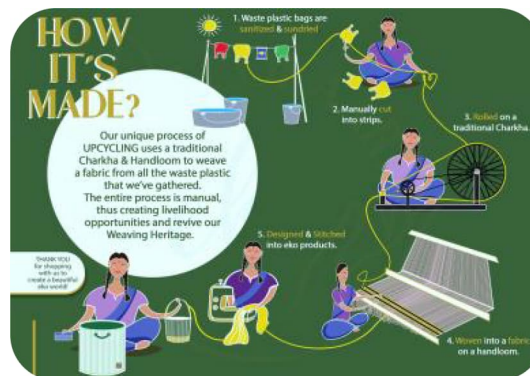
Multilayer plastics are among the most challenging waste streams to recycle due to their composite structure, making conventional recycling processes limited and often economically unviable. In this context, several social enterprises are promoting upcycling of flexible plastics, such as biscuit and chip packets, into value-added products. While these initiatives support circular economy principles and can complement municipal efforts, they are typically small-scale and need to be integrated with larger waste management systems for broader impact.

EcoKaari: Founded by Nandan Bhat, this enterprise focuses on "humanising fashion". They collect waste from households and corporates, then wash, sanitise, and manually cut it into strips.

reCharkha (The EcoSocial Tribe): This organisation specifically targets flexible waste like wrappers and gift paper. They employ tribal women to weave this plastic into products like yoga mat bags, potlis, and home decor, providing dignified livelihoods while preventing

Upcycling Plastic Waste

- Collects plastic waste such as shopping bags, wrappers, and multi-layered plastics from organizations and households.
- Plastic is cleaned, cut into strips, spun using **charkha**, and woven on **handlooms** to create durable fabric.



Sustainable Product Manufacturing

- Produces eco-friendly products such as bags, wallets, pouches, home décor items, and accessories made from upcycled plastic fabric.

Circular Economy Practices

- Uses biodegradable cleaning agents and careful water management.
- Repurposes leftover materials and offers **lifetime repair of products** to extend product life cycles.

Livelihood Generation

- Provides skill training and employment to **women and youth from marginalized communities**, enabling them to become financially independent.

CSR Plastic Offset Programme

- Works with companies to replicate its upcycling model under CSR initiatives, helping reduce plastic waste and create livelihoods

Replicability

- Requires **simple traditional technologies (charkha and handloom)**.
- Can be implemented through **CSR partnerships, NGOs, or community groups**.
- This model can therefore be adapted by **municipalities, NGOs, and social enterprises in other cities or regions** to manage plastic waste while creating sustainable livelihoods

Impact / Outcomes

Environmental Impact

- More than **5 million pieces of plastic waste upcycled**.
- Approximately **1.4K+ tons of carbon emissions saved** through sustainable production.

Social Impact

- 300+ livelihood opportunities created** for artisans and workers from disadvantaged communities.

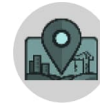
Economic Impact

- Supports local artisans through skill development and income generation while promoting sustainable consumer products.

9.9 GWMC Case Study

The Goa Waste Management Corporation (GWMC) was established in 2016 as a Special Purpose Vehicle under the Department of Science & Technology & Waste Management, Government of Goa.

It aims to facilitate the systematic and scientific management of solid waste, E-waste, biomedical waste, hazardous waste, and construction and demolition (C&D) waste.



State/UT: Goa
Urban Local Body :
 Goa Waste Management Corporation (GWMC)



Legacy

Reclamation

Bioremediated Sonsodo (15,000 sq m, 187,000 m³ waste cleared by May 2025), reclaiming land, cutting fire risks, and enabling reuse.

Dumpsite

Centralised Institution Building

Authorities created GWMC as a Special Purpose Vehicle in 2016 for streamlined planning, professional management.

Scientific

Investments

Shifted from dumping to Saligao (250 TPD waste-to-energy, biomethanation) and Cacora (100 TPD) plants, plus specialized biomedical (5-6 TPD) and hazardous waste facilities (25,000 TPA landfill).

Processing

Innovative Programmes

Goa Budget 2026 funds RDF digital tracking, solar cameras, and data analytics for monitoring.
 Land-Optimized Approach
 Achieved ~99% diversion at Saligao, minimizing landfills in space-scarce Goa.

Citizen-Centric Initiatives

Pioneered Deposit Refund System (first in India), boosted segregation to 90-99% via campaigns and community drives.

Circular

Promotion

RDF substitutes coal in cement plants, compost (7-8 TPD Saligao) aids farming, POTI recycles 500 kg textiles daily, Bicholim processes 60-65 tons plastics monthly.

Economy

Replicability

DeCentralised waste collection systems
 Community-driven models like DRS
 Strong institutional framework via SPVs

Scaling **Infrastructure**
 Projects like the **Verna 250 TPD waste-to-energy plant (16 MW)** required:

- Environmental clearances
- Capacity expansion planning

Impact & Outcomes

Emission Reduction by RDF replacing coal reduced emissions by **35,482–43,330 tCO₂-eq**

Energy Generation -37.9+ million electricity units generated at Saligao

Dumpsite Reclamation -Sonsodo: ~15,000 sq. m land restored

System Expansion -Cacora reaching full capacity by 2025

9.10 E[co]work Sustainable Solutions E-waste Management

E[co]work is an innovative initiative designed to empower informal micro-entrepreneurs by providing safe, inclusive, and legally compliant solutions for electronic waste (e-waste) management. IT is national hub where approximately 90% of India's e-waste is recycled. The project bridges the gap between legal requirements and the practical needs of informal dismantlers.

State/UT : UttarPradesh
Organisation : E[Co]Work



1. Circular Economy Approach

- Focus on reducing landfill dependency through recycling and resource recovery.
- Encourages segregation, reuse, and sustainable material management.
- Supports transition from a “waste disposal” model to a “resource recovery” model.

2. Sustainability-Centred Operations

- Integrates environmental responsibility into operational processes.
- Aligns with SDGs, especially:
 - SDG 11 – Sustainable Cities
 - SDG 12 – Responsible Consumption & Production
 - SDG 13 – Climate Action

3. Community & Stakeholder Engagement

- Likely involves partnerships with local bodies, institutions, and communities.
- Awareness-building and Behavioral change are critical elements in successful waste initiatives.

4. Innovation & Green Solutions

- Emphasis on eco-friendly systems and sustainable waste handling practices.
- Potential use of technology-enabled waste tracking, recycling channels, or circular supply-chain methods.

Replicability

The E[co]work model is designed for **replicability** by utilizing a **co-working and sharing economy framework** that is specifically **adapted to the local context** of the e-waste sector. By establishing the **first facility in Ghaziabad** as a viable, human-centered business solution, the project creates a **scalable blueprint** for professionalizing informal recycling hubs worldwide.

Impact/Outcomes

- Converts waste into reusable or marketable resources.
- Supports circular business models and cost-efficient waste handling.
- Encourages long-term sustainable urban management practices.
- Lower greenhouse gas emissions through improved waste processing.

9.11 Meat Waste Management System

Introduction

Ahmedabad Municipal Corporation has issued a contractual guidelines for the development of a meat waste rendering plant. This project involves the design, build, finance, and operation (DBFO) of a modular and scalable 7 TPD (Tonnes Per Day) capacity at the Gyasur Waste Management Park in Ahmedabad

The project integrates survey-based planning, route optimization, specialized vehicles, GPS tracking, and scientific processing to shift from informal disposal to a more hygienic, accountable, and environmentally compliant approach.



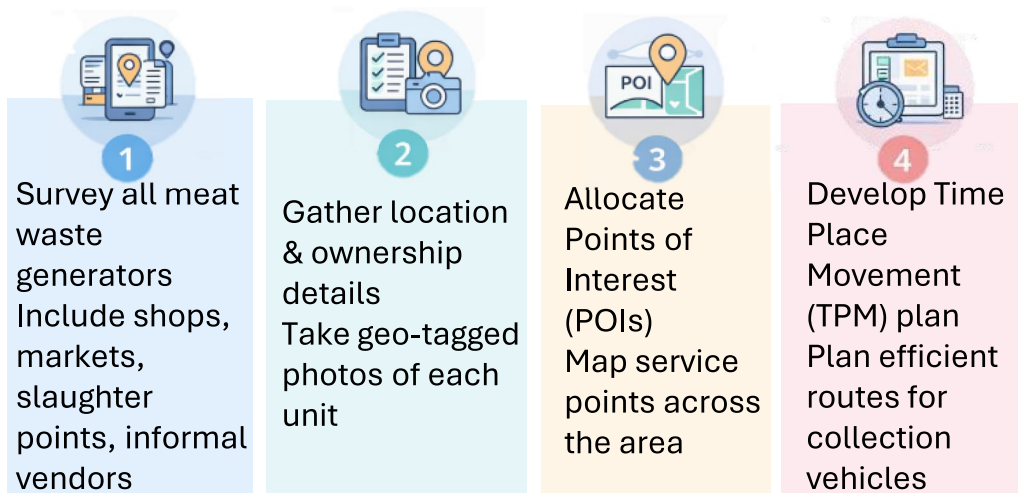
ULBs /city :

Ahmedabad Municipal Corporation

The Meat Waste Rendering Plant is designed to process segregated meat waste into several specific **value-added products** and reusable by-products

Ahmedabad Conducted the Survey

The survey formed the foundation of Ahmedabad's meat waste management system, helping identify generators, map service points, and plan efficient collection routes.



Ensure route planning, service coverage, and monitoring

Collection and Transportation

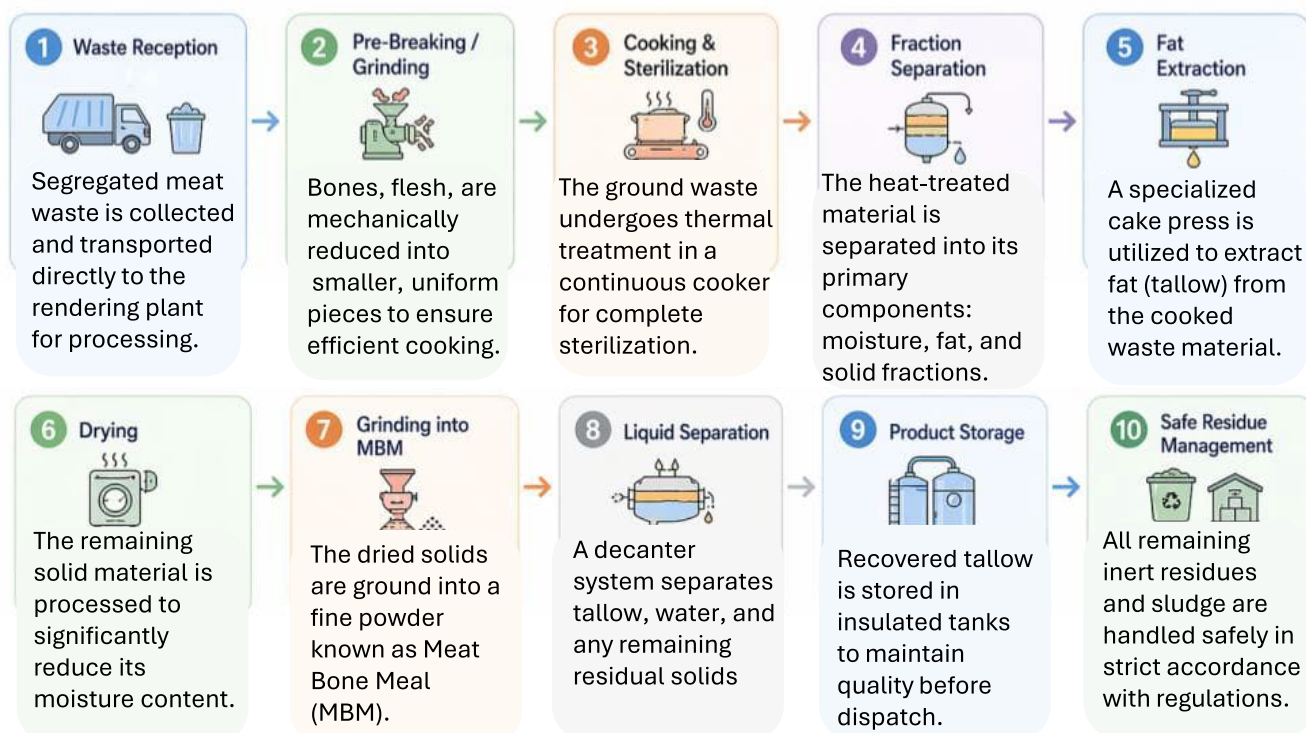
- A dedicated collection system for segregated meat waste.
- Waste was to be collected from identified generators through predefined routes.
- The city proposed closed refrigerated vehicles for safe transport.
- Each vehicle had an approximate capacity of 2.5–3 tonnes.
- These vehicles help reduce odour, leakage, and decomposition during transport.
- Waste was to be transported daily to the gyasur rendering plant.
- Gps tracking was included for route monitoring and operational control.

Contractual and Operational Outcomes

- **PPP Contract:** A 10-year exclusive Public-Private Partnership, extendable by 5 years based on performance.
- **Revenue Rights:** The concessionaire can market and sell products such as Meat Bone Meal (MBM), tallow, and pet food, retaining all revenues.
- **Infrastructure Ownership:** Civil and electrical infrastructure remain with the municipal corporation and are transferred back after the contract period.

Proposed Meat Waste Processing System in Ahmedabad

Ahmedabad planned to process segregated meat waste through a 7 TPD rendering plant using a scientific process for resource recovery and safe disposal.



The proposed system has several categories of penalty clauses designed to ensure the timely establishment, safe operation, and regulatory compliance of the meat waste rendering project.

Penalty Framework – Plant Operations

Offense	Penalty
Delay in Commercial Ops Date (COD)	Rs. 1 Lakh per day (Capped at 3 Cr). Delays >90 days trigger termination.
Plant Non-Operational (>5 days)	Rs. 20,000 per day
Backlog of Unprocessed Waste (>7 days)	Rs. 5,000 per day
Excessive Inert Disposal (>20% of input)	Penalized at 1.5x the quoted O&M rate per ton at the landfill
Unhygienic Premises / Bad Housekeeping	Rs. 5,000 per instance

Penalty Framework – Collection & Transit

Offense	Penalty
Spillage/Leaking on Roads	Rs. 1,500 per shift
UnAuthorised Dumping (outside plant)	Rs. 1,500 per event + potential contract termination
Missed POI / Route Deviation	Rs. 20 per unit/day (escalating to Rs. 100) or Rs. 25 per hour of delay
Unattended Vehicle Breakdown (>72 hrs)	Rs. 1,000 per vehicle, per day
Using Vehicle for UnAuthorised Work	Rs. 5,000 per incident

Conclusion

Ahmedabad's model demonstrates an integrated approach combining planned collection, monitored transportation, and rendering-based processing. It emphasizes hygienic handling, environmental compliance, and resource recovery, offering a replicable model for other urban local bodies, despite potential implementation challenges.

Notes

Notes

List of Abbreviations

AMC	Ahmedabad Municipal Corporation
APCD	Air Pollution Control Device
API	Application Programming Interface
BIS	Bureau of Indian Standards
BMC	Brihanmumbai Municipal Corporation
BOD	Biochemical Oxygen Demand
BCC	Behaviour Change Communication
BWG	Bulk Waste Generator
CBG	Compressed Biogas
CBWTF	Common Biomedical Waste Treatment Facility
CHW-TSDF	Common Hazardous Waste Treatment, Storage and Disposal Facility
C&D	Construction and Demolition
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CSR	Corporate Social Responsibility
CSWAP	City Solid Waste Action Plan
DHW	Domestic Hazardous Waste
EEE	Electrical and Electronic Equipment
EP Act	Environment Protection Act
EPR	Extended Producer Responsibility
ETP	Effluent Treatment Plant
EWBG	Extended Waste Bulk Generator
FCO	Fertilizer Control Order
GIS	Geographic Information System
GeM	Government e-Marketplace
GFC	Garbage Free City
GHG	Greenhouse Gas
GHMC	Greater Hyderabad Municipal Corporation
GIS	Geographic Information System
GMIS	Geospatial Management Information System

GPS	Global Positioning System
HDPE	High-Density Polyethylene
ICT	Information and Communication Technology
IEC	Information, Education and Communication
KPI	Key Performance Indicator
LPCD	Litres Per Capita per Day
MCF	Municipal Council Framework
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MoEFCC	Ministry of Environment, Forest and Climate Change
MoHUA	Ministry of Housing and Urban Affairs
NITI Aayog	National Institution for Transforming India
NGO	Non-Governmental Organization
NOC	No Objection Certificate
ODF	Open Defecation Free
O&M	Operation and Maintenance
PET	Polyethylene Terephthalate
PSSO	Private Sanitation Service Organization
PIBO	Producer, Importer and Brand Owner
PPE	Personal Protective Equipment
PPP	Public Private Partnership
RDF	Refuse Derived Fuel
SBM-U	Swachh Bharat Mission – Urban
SHG	Self Help Group
SPCB	State Pollution Control Board
SUP	Single Use Plastic
SWM	Solid Waste Management
TPD	Tonnes Per Day
TSDF	Treatment, Storage and Disposal Facility
ULB	Urban Local Body
VOC	Volatile Organic Compound
WTE	Waste to Energy

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**Download all the reference documents by
scanning the QR code.**

