Training on Waste Management Regulations: Solid Waste Management and Plastic Waste Management Rules

Gandhinagar Municipal Corporation

December 10, 2025

CWAS CENTER FOR WATER AND SANITATION | CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION | CEPT UNIVERSITY

GANDHINAGAR MUNICIPAL CORPORATION

City At A Glance

Total population as per 2011 **census – 3,24,486** across **11 wards**

GMC Existing Area: 57 sq.km.; **Total Area:** 195.6 sq.km.

The capital of Gujarat

Known as the "Green City"

The city subsequently became a **commercial and cultural center** in Gujarat

Overview of Gandhinagar's Solid Waste Management System

1. Generation
2. Collection
3. Storage
4. Transportation
5. Sorting & Processing
6. Disposal

Total Waste Generation ≈ 195 TPD

Total Waste Collection ≈ 195 TPD

- **Vermi** → *Vermicomposting Facility* =38 TPD
- **OWC** → *Organic Waste Converter* =4.5 TPD
- **MRF** → *Material Recovery Facility* = 13.5 TPD
- **Trommel** → *Trommel Screening Machine*= 90 TPD
- **Biomethanation** → *Biomethanation Plant* =2.5 TPD
- **Windrow** → *Windrow Composting Facility* = 50 TPD

Total Processing Capacity (Wet + Dry) = 198.5 TPD
Quantity of Plastic Waste Generated ≈ 8 TPD
Extent of Source Segregation = 100%

Source: Information shared by GMC

Gandhinagar's Performance under SBM - Swachh Survekshan

2019

Ranking of 100 ULBs on basis of total score
(More than 1 lakh population on)
Gandhinagar secured 22nd rank in Swachh survekshan 2019.
Cerftied with 3-star rating for garbage-free city program

2020

Best state / national capital Or UT in innovation and Best practices
Winning city : Gandhinagar
Ranking of 100 ULBs based on total score (more than 1 lakh population) - rank 15

2022

State rank -1

Total No. of Plants	
9	
Total No. of Solid Waste Plants	Total No. of FSTP Plants
5	0
Total No. of STP Plants	Total No. of C & D Plants
3	1

2023

State rank 4
In swachh survekshan 2023, gandhinagar ranked 8th among the cleanest cities in india.

2024

In swachh survekshan 2024-25 the city was awarded under the "**super swachh league**" category

State Rank OF GMC

SS2022	SS2023	SS2024
1st	4th	4th

Gandhinagar has consistently improved and sustained its cleanliness performance, emerging as one of the top-ranked cities in Swachh Survekshan.

Awarded as Super Swachh League City for SS 2024-25 under Big Cities Category

SWACHH SURVEKSHAN
Reduce | Reuse | Recycle 2024–2025

आवासन और शहरी कार्य मंत्रालय
भारत सरकार
MINISTRY OF HOUSING AND URBAN AFFAIRS
GOVERNMENT OF INDIA

स्वच्छ भारत
एक कदम स्वच्छता की ओर

Driving Cleanliness: Gandhinagar's Key Achievements

❑ **Model City for Cleanliness & Sustainability**
- Gandhinagar stands as a leading example of *Swachhata* in Gujarat, with strong commitment to the Swachh Bharat Mission and consistently proactive participation in Swachh Survekshan.

❑ **Strong Community-Led Cleanliness Culture**
- The city has nurtured a culture of cleanliness driven by active citizen involvement and continuous awareness efforts.

❑ **Zero Waste Week (Sept 2–7) High-Impact Community Outreach**
- Activities conducted across **25 strategic locations**.
- **600+ citizens** directly engaged through on-ground initiatives.
- **40,000+ people** sensitized through targeted social media campaigns.
- **Promotion of 3R Principles (Reduce–Reuse–Recycle)**
- All activities aligned with the 3R framework to encourage behavioural change within communities and schools.

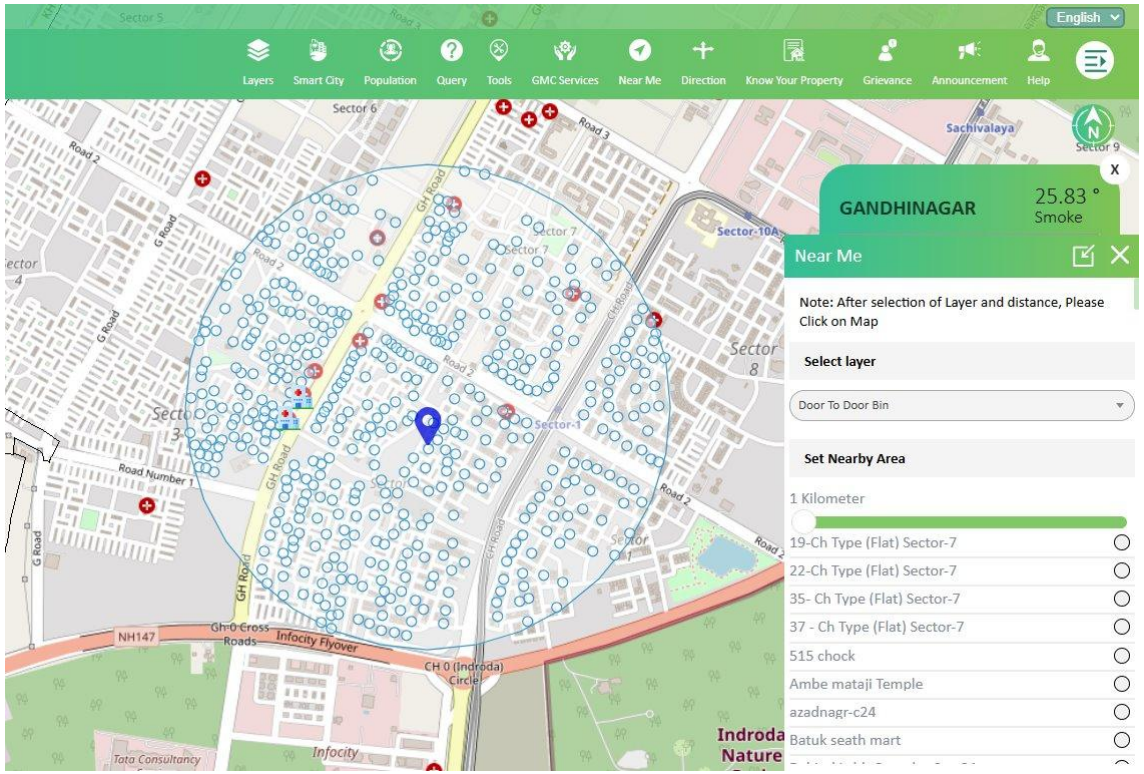
❑ **My Theli Stalls – A Sustainability Innovation**
- Set up at multiple locations to encourage donation of used clothes.
- Local women self-help groups (SHGs) upcycled old clothes into reusable carry bags.
- Helped reduce plastic usage while strengthening community bonding and women empowerment.

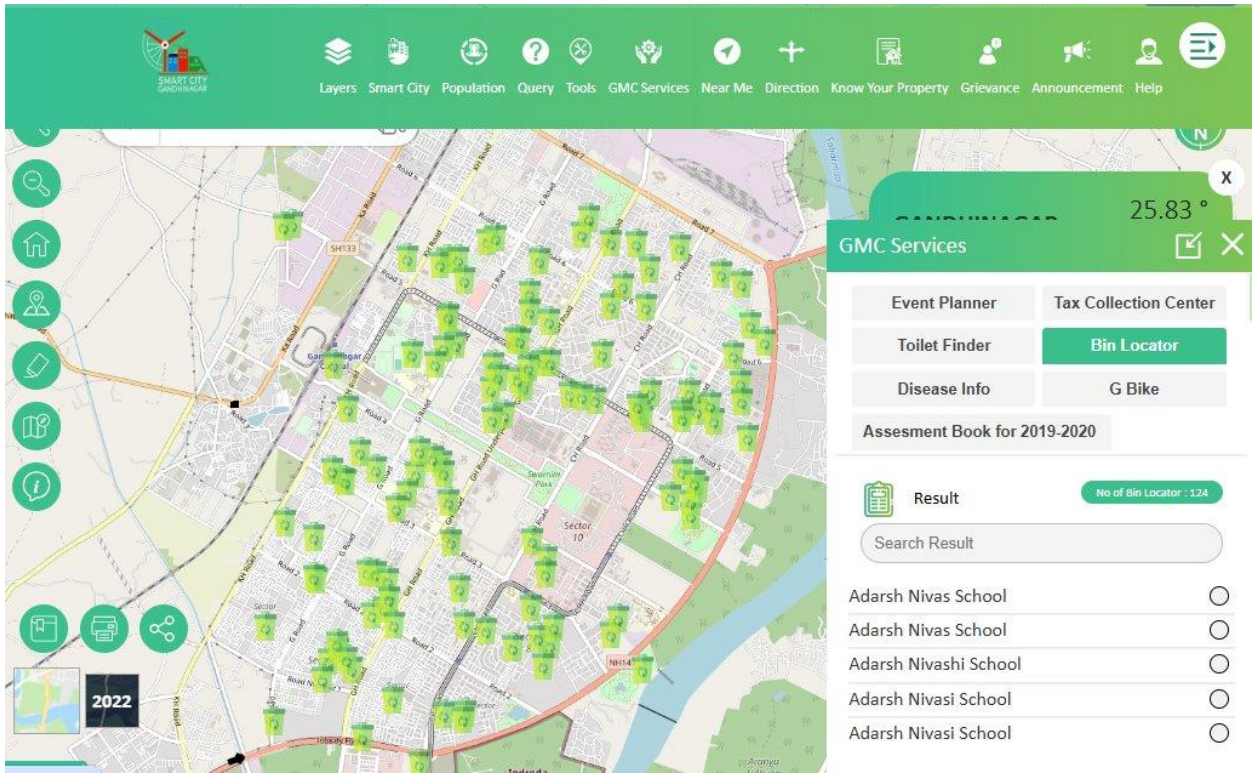
❑ **"Swachhata Se Shuruvat" - Engaging Students in Waste Responsibility**
- GMC introduced fun, interactive games to teach students about waste segregation and sustainable habits.
- Reinforced practical learning, making students ambassadors of cleanliness.

Digital approach adopted by Gandhinagar

A portal designed and developed under the Smart City Initiative for Government departments, Citizens of Gandhinagar and Tourists which enables access to a wide range of information using Geo-Spatial technology

- By adopting GIS through the Gandhinagar Smart City portal, Gandhinagar is leveraging technology to make urban governance smarter, more efficient, transparent and sustainable.
- It's not just mapping for the sake of maps - it's building a digital backbone for planning, services, citizen engagement, infrastructure, and future growth.
- In the long run, this can greatly improve quality of life, reduce wasteful development, and make the city more resilient and responsive.





Gandhinagar's Status for GFC Star Rating

Current GFC Star rating

★★★

SS 2024

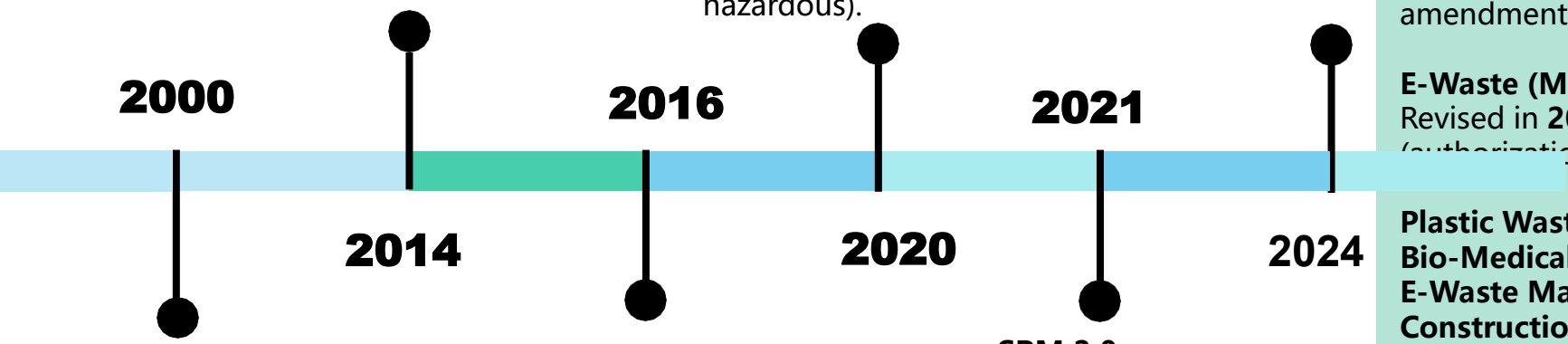
Key Component/ Condition	3 Star (Mandatory ODF+)	5 Star (Mandatory ODF++)	7 Star (Mandatory Water+)
Door to Door Collection (wards)	At least 70 %	At least 90 %	100%
Source Segregation (wards)	At least 60 %	At least 80 %	At least 90 %
Wet waste processing	At least 70%	At least 90%	100%
Dry waste processing	At least 70%	At least 90%	95%
Facility for collection of C&D waste	40% wards	80% wards	90% wards
Legacy dumpsite remediation	25% work completed	60% work completed	90% work completed
Single Use Plastic (SUP) ban	Notification and enforcement of SUP ban	Complete Ban	Complete Ban
IEC & Capacity Building	3 defined initiatives implemented	3 defined initiatives implemented	All defined initiatives implemented
Aspirational parameters	Aspirational parameters not mandatory	Compliance to aspirational parameters	All aspirational parameters to be met

The GFC Star Rating under SBM provides the framework, funding, and momentum for implementing the SWM rules

Session 1

Introduction to Solid Waste Management (SWM) Rules

History of Important Rules and Guidelines for SWM



MSW Rules 2000, MoEFCC
Designates Urban Local Bodies responsible for SWM and lays down the mandatory functions to be performed by various stakeholders

Swachh Bharat Mission, MOUD
Special focus on reorienting institutions as well as sensitizing citizens for developing citywide approach to sanitation including solid waste management through IEC and capacity building of the citizens and Workers.

SWM Rules 2016, MoEFCC
Emphasizes on Door-to-Door collection of waste and segregation of waste + CPHEEO Manual

SWM (Amendment) Rules, 2020: Focused on enhancing urban local body roles, ensuring door-to-door collection, and compartmentalized transport of segregated waste (wet, dry, hazardous).

SBM 2.0
Focus on integrated waste management systems with a mission to manage all municipal solid waste scientifically so no untreated garbage ends up in dumpsites.

Draft Solid Waste Management (SWM) Rules, 2024

Complimenting guidelines and Rules

Bio-medical Waste (Management & Handling) Rules, 1998
Amended in **2003 & 2011**, replaced by **Bio-Medical Waste Management Rules, 2016**. Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities 2025

Batteries (Management & Handling) Rules, 2001
Amendments focused on collection, recycling, and registration of manufacturers/importers.
Plastic Waste (Management & Handling) Rules, 2011
Revised as **Plastic Waste Management Rules, 2016** with amendments in **2018, 2021, 2022**.

E-Waste (Management & Handling) Rules, 2011
Revised in **2016** and updated to **2022**; enforced by GPCB/SPCBs (authorization, Form-2 records, EPR compliance).

Plastic Waste Management Rules, 2016
Bio-Medical Waste Management Rules, 2016
E-Waste Management Rules, 2016 (updated to 2022).
Construction & Demolition (C&D) Waste Management Rules, 2016 Applies to builders/ULBs; ULBs must set up C&D processing facilities.
Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016
Regulates industrial hazardous waste; GPCB authorises TSDFs, transport, and disposal.

2017Municipal Solid Waste Policy – Government of Gujarat (2017)
State-specific policy for 100% collection, segregation, composting, RDF, and biomining; guides ULBs on technology and targets.

Change in Approach for SWM Rules

The Solid Waste Management, Enacted by Ministry of Environment, Forest and Climate Change, effective from **April 8, 2016**. To streamline waste management practices across India. They aim to establish a comprehensive framework for the safe, hygienic, and environmentally sound disposal of solid waste.

SWM Rules are issued under the **Environment Protection Act (EPA), 1986.**

2000 Rules (Centralized Approach)

- Focused on end-of-pipe solutions
- Municipal governments handled collection, treatment, and disposal
- Waste transported to external treatment sites
- Led to accumulation at disposal sites

2016 Rules (Decentralized Approach)

- Waste segregation at source into wet (biodegradable) and dry (non-biodegradable)
- Decentralized processing at ward or community levels
- Scientific landfills with proper containment
- Extended Producer Responsibility (EPR)
- User fees for waste management services

- Aim to ensure **scientific handling, processing, and disposal** of solid waste.
- Applicable to:
  - **Urban Local Bodies**, Census towns
  - Areas under Railways, Airports, Defence, SEZs
  - **Every waste generator**
- Excludes: hazardous, biomedical, e-waste, battery waste.

Solid Waste Management (SWM) Rules, 2016 – At a Glance

Segregation at Source	Mandatory 3-bin system: biodegradable, non-biodegradable, domestic hazardous
No Littering / No Burning	Prohibits throwing, burning, or burying waste in public spaces
User Fees	Waste generators must pay service fees fixed by ULBs.
Bulk Generators' Responsibilities	RWAs, institutions, hotels must **segregate & process biodegradable waste on-site**.
Waste Processing Priority	Composting, biomethanation, recycling, and **waste-to-energy for non-recyclables**
Landfill Restrictions	Only inert, non-recyclable residual waste allowed in sanitary landfills.
Integration of Informal Sector	Mandatory recognition of waste pickers and recyclers.
Timelines for Infrastructure	ULBs must ensure **door-to-door collection, processing facilities, sanitary landfills** within prescribed timeframes.
Special Provisions	Additional rules for **hilly areas**, large gatherings, tourist zones, and construction & demolition waste.

Solid Waste Management (SWM) Rules, 2016 clearly defined different categories of waste

Biodegradable	Food, garden, organic matter
Construction & Demolition	Subject to separate rules (2016)
Sanitary	Diapers, pads, tampons
Dry/Non-biodegradable	Plastic, paper, metal, glass
Horticulture	Leaves, branches, garden waste
Recyclable	Paper, plastic, metal, glass
Domestic Hazardous	Batteries, paint, chemicals, CFLs
Residual	Rejects from processing plants
Combustible	Calorific value >1500 kcal/kg

Key Provisions of SWM rules 2016

Collection & Transportation

Bulk Waste Generators -

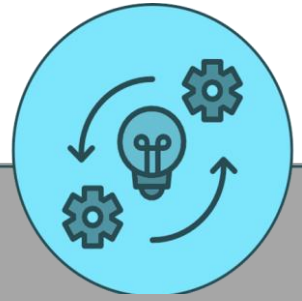
- Gated communities >5000sq.m area
- or >100 kg/day waste generation
- or x exceeding 200 dwelling

Plastic waste -

- Infrastructure for segregation, collection, transport, storage, processing and disposal - Engage agencies or producers.

Hazardous waste -

- Set up collection system, for once in 15 days or as required.
- One center per 20 sq km.



Processing

Waste to Energy
Non-recyclable waste having a calorific value >1500 K/ cal/kg can be used for RDF & shall not be disposed of at a landfill.

C&D waste

- ULB to have 50 sqm facility for storage and sorting of C&D waste.
- Generators with more than 20TPD or 300 tons per project.

Co-marketing of compost
Dept of Fertilised to comarket in the ratio of 3 to 4 bags: 6 to 7 bags by the fertiliser companies

Disposal

Regional Sanitary Landfill
State to form for a group of cities and towns falling within a distance of 50 km (or more) from the regional facility on a cost sharing basis

Hilly area Landfill
Suitable land shall be identified in the plain areas down the hill within 25 kilometers

Permitted Rejects
Inert waste (mostly street sweeping) and process rejects

Responsibilities of Waste Generators as per SWM Rules

Responsibilities of Waste Generators

1. Waste Prevention

Adopt measures to prevent or reduce waste generation

2. Waste Segregation at Source

Segregate waste into four categories: Wet, Dry, Sanitary and Special Care Waste

3. Handling of Sanitary Waste

Securely wrap used diapers & sanitary napkins in pouches provided by manufacturers

4. Storage for Specific Waste

Store C&D, garden & horticulture waste separately and dispose as per rules.

5. Prohibition of Unscientific Disposal

Do not throw waste in public spaces, burn or bury it, or dump it into drains or water bodies.

6. User Fee Payment

Pay user charges for waste management services as per ULB bye-laws.

7. Handling of Wet & Dry Waste

Use separate bins for wet and dry waste and give them to authorized collectors only.

8. Events/Gatherings

Notify the ULB 3 days ahead, for event of over 100 people, secure a license, and ensure on-site waste segregation of waste.

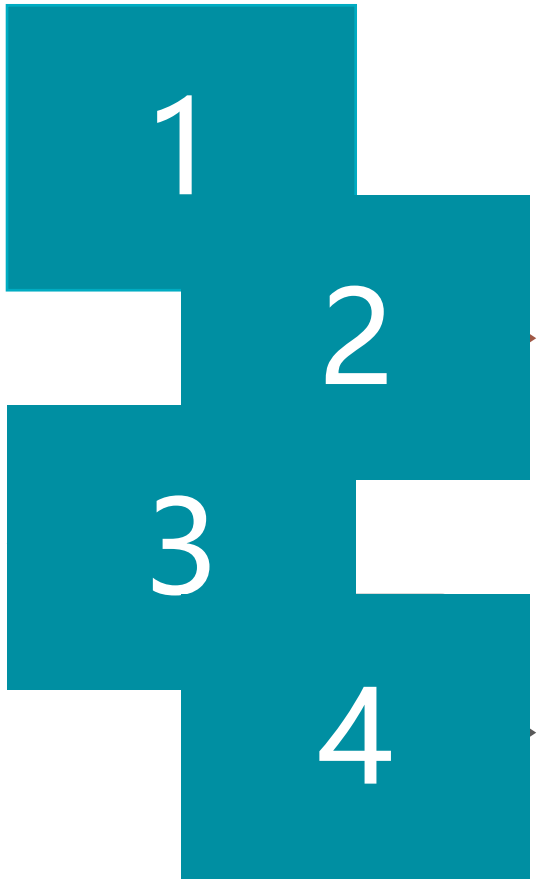
Role of ULBs in Waste Segregation

Source Segregation

ULBs shall ensure that all waste generators segregate waste at source and hand it over to third-party or local body/waste collectors authorized by the local body.

Transportation of Segregated waste

All local bodies shall ensure that segregated bio-degradable waste is transported to the processing facilities such as compost plants and bio-methanation plant for further processing.



Provision of Segregation Centers

ULBs shall ensure that the provisions for setting up of centers for collection, segregation and storage of segregated wastes.

Monitoring & Awareness

ULBs must monitor segregation compliance, penalise defaulters, submit regular reports to state boards and CPCB, and run awareness and training programmes to improve segregation.

Role of ULBs in Waste Collection and Transportation

Primary Collection

ULBs are responsible for organizing and managing daily door-to-door collection of segregated waste, by deploying adequate manpower along with suitable equipment to ensure efficient and systematic waste collection.

Transportation

ULBs arrange timely and regular transportation of waste from collection points to processing or disposal sites, while also planning efficient routes and schedules to optimize fuel and manpower.

Capacity Building

ULBs train sanitation workers and supervisors in safe waste handling and conduct public awareness campaigns to promote segregation and reduce littering.

Monitoring & Evaluation

ULBs monitor waste collection and transportation through inspections and GPS tracking, address non-compliance, and enforce by-laws to prevent littering and improper disposal.

Secondary Collection and Storage

ULBs must provide and maintain secondary storage facilities such as community bins in special areas, compartmentalized vehicles, and transfer stations.

Ensure Cost Recovery

Levy user fees through authorized agencies to fund services; enable local collection plans (daily/alternate sweeping).

Integration of Informal Sector

ULBs integrate informal waste pickers into the system and collaborate with private service providers, contractors, and NGOs involved in waste collection and recycling.

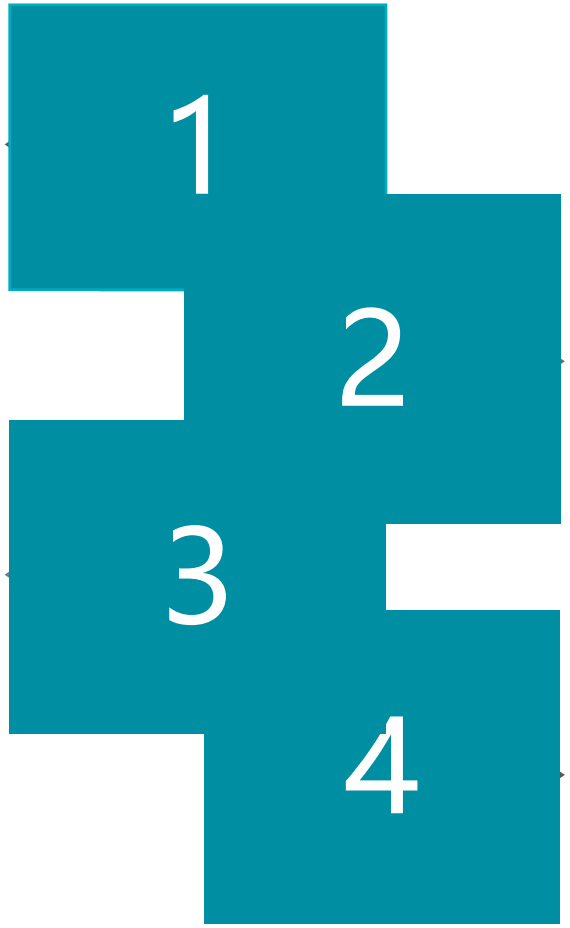
Role of ULBs For Waste Processing

SWM Plan and Infrastructure setup

ULBs shall prepare localized SWM plans in line with state policies, specifically including provisions for setting up processing facilities such as compost units, MRFs, sanitary landfills, and other waste-to-resource infrastructure.

Deposition Centres

ULBs shall develop special category waste deposition facilities, facilitating safe collection and processing of hazardous fractions like batteries, and electronic waste.



Operationalize Processing Facilities

ULBs shall establishing and operate necessary infrastructure for processing—including collection, segregation, transfer, resource recovery, and safe disposal systems.

Annual Reporting

ULBs shall submit an annual report on SWM performance—including processing metrics—to State Urban Development departments, District Collectors, and SPCBs by specified deadlines.

Other roles and responsibilities of ULBs

- **Infrastructure:** Maintain secondary storage, transfer stations, and scientific landfills.
- **Ban on Dumping & Burning:** Enforce zero littering and prevent open burning.
- **User Charges & Byelaws:** Notify and enforce user fees and penalties.
- **Worker Safety:** Ensure PPE, mechanized tools, and regular health check-ups.
- **Record Keeping & Reporting:** Submit annual reports to SPCB in prescribed format.
- **Waste Picker/SHG Integration:** Register and include waste pickers in collection/sorting systems.
- **Legacy Waste:** Undertake bio-mining or capping of dumpsites as per timelines.

Other roles and responsibilities of ULBs

As per the bye-laws of GMC, city can charge offenders as per below mentioned clauses for waste management

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Example of fines collected by AMC

As per the **Solid Waste Management Rules, 2016**, **Urban Local Bodies (ULBs) are empowered to levy fines** for improper waste management (such as littering, non-segregation, open dumping or burning), **through their municipal bye-laws**.

Agency fined Rs 1L for filth at Vasna biogas plant

Sep 16, 2025, 23:48 IST

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TOI AHMEDABAD NEWS

Ahmedabad: The solid waste management department of the Ahmedabad Municipal Corporation (AMC) on Tuesday fined an agency Rs 1 lakh for failing to maintain a biogas plant at the Vasna APMC premises, which had led to unsanitary conditions.

Officials said the department had received repeated complaints about filth caused by poor upkeep of the facility. Despite being served three notices, the agency failed to act, prompting authorities to seal its office on Sep 3.

WATER & WASTE

Ahmedabad Firms Fined for Illegal Construction Dumping

03 Jan 2025 | 1 Min Read | CW Team

The Ahmedabad Municipal Corporation's (AMC) solid waste management division imposed penalties amounting to Rs 2 million on four companies on Tuesday for illegally dumping construction debris on the road in the Gota area. The companies—Virasat Readymix, Krushnam Concrete, Triya Infra, and Krushnam Concrete—were each fined Rs 0.5 million.

Waste-to-energy (WTE) Guidelines as per SWM Rules

1

Types of Waste Allowed for WTE

Only non-recyclable, high-calorific value waste should be sent to WTE:
Waste with calorific value ≥1500 kcal/kg
High-calorific waste such as:
Mixed plastic waste
Multi-layered packaging waste
Combustible dry waste
Such waste must not be sent to landfill.

2

Allowed WTE Routes

Refuse Derived Fuel (RDF) – preparation of pellets/fluff from combustible waste
Co-processing in Cement Kilns – high-calorific waste substitutes fossil fuels
Feeding into Waste-to-Energy Plants – mass-burn incineration or advanced combustion

3

Authorisation Requirement

Any WTE plant with >5 TPD processing capacity must apply in Form-I to the State Pollution Control Board.
Permission must be provided within 60 days.

4

Industrial Co-processing Requirement
(As per Rule 18)

Industries within 100 km of any RDF/WTE plant must use at least 5% RDF in their fuel mix.

5

Objective of WTE Guidelines

Reduce landfilling of non-recyclables
Increase energy recovery
Reduce dependency on conventional fossil fuel
Promote circular economy in waste management

Time Frames and Monitoring Framework under SWM Rules

Activity / Requirement	Time Frame
(a) Landfill site identification	1 year
(b) Procurement of waste processing facilities	2 years
(c) Ensuring segregation of waste at source	2 years
(d) Implementation in cities up to 1 million population	2 years
(e) Implementation in million-plus cities	3 years
(f) Setting up sanitary landfills	3 years
(g) Bio-remediation / capping of old dump sites (legacy waste)	5 years

Authority / Level	Review Frequency
(a) MoEF&CC / Central Monitoring Committee	Every year
(b) District Collector – review of local authorities	Quarterly
(c) SPCBs / PCCs with DMA – review of implementation of Rules	Half yearly
(d) Secretary In-charge (UD) – State Level Advisory Committee	Half yearly

Draft Solid Waste Management Rules 2024 introduced

Monitoring and Compliance:

CPCB to establish centralized online registration and annual reporting system.

Circular Economy Focus

MoHUA is the apex coordinating body to drive circular economy initiatives while CPCB shall drive and monitor the circular economy initiatives

Waste Segregation into biodegradable and non-biodegradable

Safai Karamcharis authorized to fine violators and refuse unsegregated waste collection.

Extended Producer Responsibility (EPR)

EPR covers all waste generators including Bulk generators. Environmental compensation based on "polluter pays" principle

Agricultural Waste Management

Local bodies, including Gram Panchayats, mandated to prevent burning of agricultural waste.

Processing Requirements

Encourages on-site waste processing. Strict implementation timelines and responsibilities for local bodies.

SWM Rules 2016 vs. Draft SWM Rules 2024

2016 Rules = Urban waste management + basic segregation & processing

2024 Rules = All-India waste management + detailed segregation + recycling + energy recovery + strict compliance

Major Changes in SWM Rules 2016 vs. Draft SWM Rules 2024

Aspect	SWM Rule 2016	SWM Rule 2024
Scope and Applicability	Focused on urban areas, census towns, and notified regions within municipal boundaries.	Expanded to cover urban and rural local bodies, SEZs, food parks, railways, airports, defense areas, etc..
Waste Collection and Segregation	Segregation into three streams: biodegradable, non-biodegradable, and hazardous waste.	Segregation into four streams: wet, dry, sanitary, and special care waste.
Bulk waste generator	Entities generating over 100 kg/day, including institutions, markets, and gated communities.	Refined criteria, including floor area (20,000 sq. m.), water usage (5,000 liters/day), or waste volume.
Decentralized Waste Processing	Encourages decentralized units for biodegradable waste.	Mandates bulk waste generators to process waste locally or obtain EBWGR certificates.
Waste Disposal	Promotes use of sanitary landfills for residual waste.	Emphasizes use of advanced methods like Waste-to-Energy (WtE) and Refuse Derived Fuel (RDF).

Major Changes in SWM Rules 2016 vs. Draft SWM Rules 2024

Aspect	SWM Rule 2016	SWM Rule 2024
Monitoring and Reporting	Basic reporting to state authorities.	Introduces centralized online portals for quarterly and annual returns.
Enforcement Mechanisms	Penalties and fines for non- compliance.	Stricter measures, including environmental compensation and annual environmental audits.
Infrastructure and Technology	Develop composting and bio-methanation units.	Mandates use of tracking systems for collection vehicles and integration of advanced processing technologies.
Public Awareness and Capacity Building	Focus on basic training for ULB personnel and public awareness.	Comprehensive training, use of digital platforms, and integration of informal waste collectors.

Major Changes in SWM Rules 2016 vs. Draft SWM Rules 2024

Topic	SWM Rules 2016	Draft SWM Rules 2024
Coverage / Where Applicable	Mostly **urban areas**	Covers **urban + rural + slums + small commercial areas**
Focus Area	Segregation, composting, reducing landfills	**Circular economy**: reduce, reuse, recycle, energy recovery
Segregation of Waste	3 types: **Wet, Dry, Hazardous**	4+More detailed: **Wet, Dry, Sanitary, Special-care**
Bulk Waste Generators	Must segregate & compost on-site	**Stricter rules**, more categories, certification needed
Treatment & Processing	Composting, recycling, sanitary landfill	More advanced: **WtE, RDF, co-processing**, no landfilling of high-calorific waste
New Waste Streams	Mostly MSW + domestic hazardous	Adds **e-waste, sanitary waste, construction plastics**
Monitoring & Compliance	Local-level checks, basic fines	**Stricter monitoring**, online portal, registrations, stronger penalties
Role of Producers (EPR)	Basic responsibility for managing packaging waste	**Stronger EPR**: registration, targets, reporting, full lifecycle responsibility
Role of Local Bodies	Collection, segregation, MRFs, composting	Additional responsibilities: **digital reporting, advanced processing, rural coverage**
Public Participation	Awareness & segregation at home	More responsibility: **mandatory segregation, fines, behaviour compliance**
Approach to Landfills	Allowed for final waste	Only **final rejects** allowed; more focus on **energy recovery**
Key Aim	Better waste management in cities	**Nationwide waste management + sustainability + circular economy**

Challenges For Enforcing SWM Rules

01

Lack of quantification and characterization of waste to identify and setup processing and treatment infrastructure.

02

Insufficient Infrastructure
The lack of adequate waste collection, sorting, and processing facilities, particularly in smaller towns and villages, poses a barrier to effective waste management.

03

Lack of Awareness
Limited public awareness about the importance of waste segregation, recycling, and proper waste disposal remains a significant challenge.

04

Limited inter-departmental and regulatory coordination. Lack of coordination between ULBs, Pollution Control Boards, health departments, urban planning bodies.

05

Financial Constraints
Limited financial resources often hinder the implementation of comprehensive waste management programs, including investment in infrastructure, technology, and public awareness campaigns.

06

Lack of adequate staff for monitoring compliance. Limited training on SWM Rules reduces their ability to issue notices, penalties, or enforce byelaws.

Waste Quantification – Sampling Criteria for Current Quantification

Sampling

- Random sampling covering all designated sources including high, medium and low income HH level, commercial establishments, hotels, street sweeping, vegetable markets, etc.
- **100 samples per lakh population of city**
- **Cover 3 seasons (summer, winter & monsoon)**

Quantification at source

- Distribution of storage bags to identified sources for **collection of daily waste for 5-7 days**
- **Collection of daily waste by designated waste collectors**
- **Weighing of daily waste** immediately after collection

Quantification at Processing site

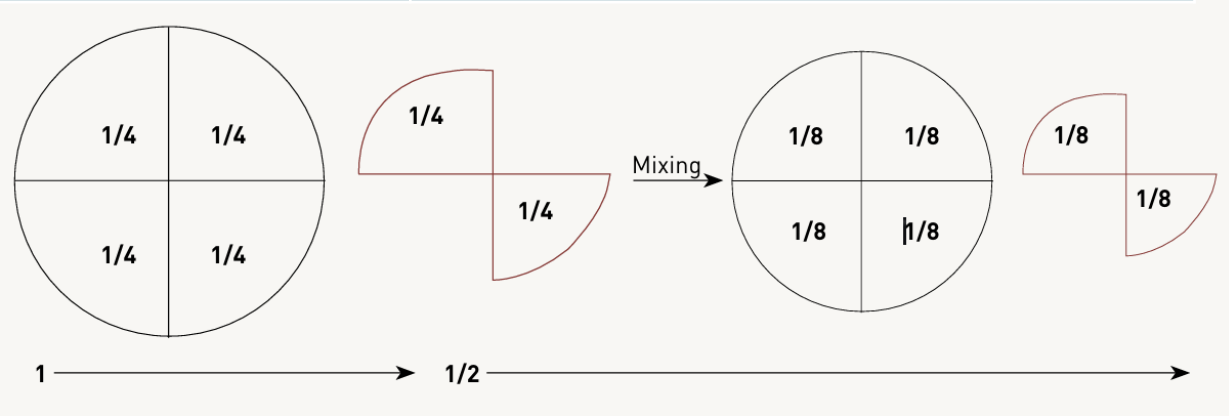
- Note the Weight and Volume of segregated waste. For each arrival. Summate and find out density.
- Summation of **total quantity of waste transported by primary collection vehicles at Final point/ transfer station** (number of vehicles x number of trips x capacity of vehicle x density of waste) for the collection ward/area

Source: Based on draft advisory of master guidelines for SWM, 2025

Waste Quantification – Sampling Criteria for Current Quantification

Sample Category	Recommended Locations	Sample Size	Sample duration
Residential Waste	Slums, low-income, middle- and high-income households	5–10 households per category ward	5-7 days including weekends
Commercial Waste	Shops, markets, hotels, restaurants, malls	2–5 establishments per category per ward	5-7 days including weekends
Institutional Waste	Schools, colleges, offices, etc.	Representative samples from each type of institution	3-5 days
Street Sweeping Waste	Roads, drains, public spaces	Representative collection points along major and minor roads	3-5 days
Bulk Waste Generators	Gated communities, offices, hotels generating >100 kg/day	100% coverage or sampling depending on number and type	5-7 days including weekends

Characterization of Municipal Solid Waste using quartering Method



Source: Based on draft advisory of master guidelines for SWM, 2025

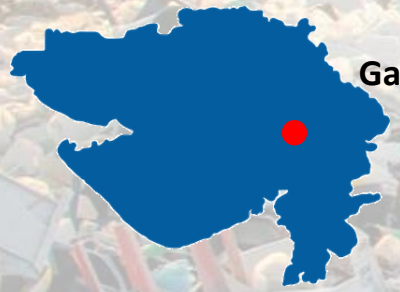
Session 2

Introduction to Plastic Waste Management (PWM) Rules

Plastic Waste Generation – India, Gujarat and Gandhinagar

~ 39 lakh TPA

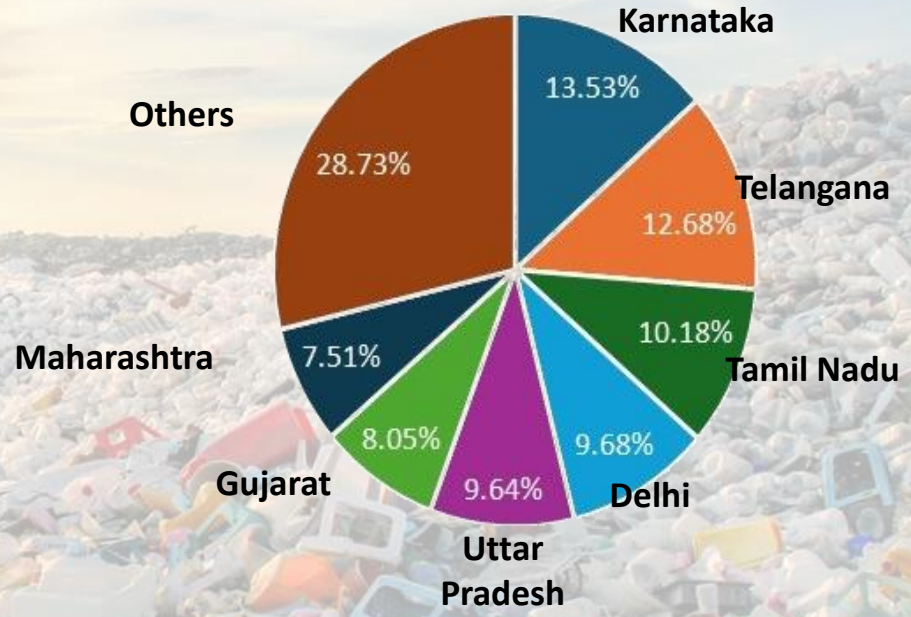
~ 3.14 lakh TPA



≈ 0.03 TPA(~8 TPD)

As per CPCB report - 2022-23,

- Every two minutes, Gujarat added one tonne of plastic waste
- Gujarat ranked 6th in the country for plastic waste generation



Source: CPCB Annual report 2022-23, Gandhinagar Municipal Corp.

Alarming Impacts of Plastic Waste on Ecosystem

- **83% of our drinking water contains plastic which could** lead to cancer and heart related issues.
- Plastics have been found **in the blood of newborn babies.**
- Over **600 marine species** are **affected** by **plastics.**
- Nearly **45,000 marine animals** have ingested plastics and **80% were injured or killed**.
- **As plastics travel with ocean currents,** an island of trash called the **"Great Pacific Garbage Patch" has been created.**
- Issue of **drain overflow and flooding** because of **plastic waste clogging the drains**

There are **8 million** tonnes of plastic waste entering the ocean every year

The total plastic in the ocean amounts to **150 million tonnes**

Plastic packaging accounts for **62%** of all items recovered in coastal clean-up efforts

In 2014, there was **1 kg of plastic in the ocean for every 5 kg of fish, and by 2050 there will be more plastic than fish**

Source: Plastic Waste Management, Issues, Solutions, Case Studies, MoHUA, March 2019

Plastic Waste Consumption Vs. Recycling

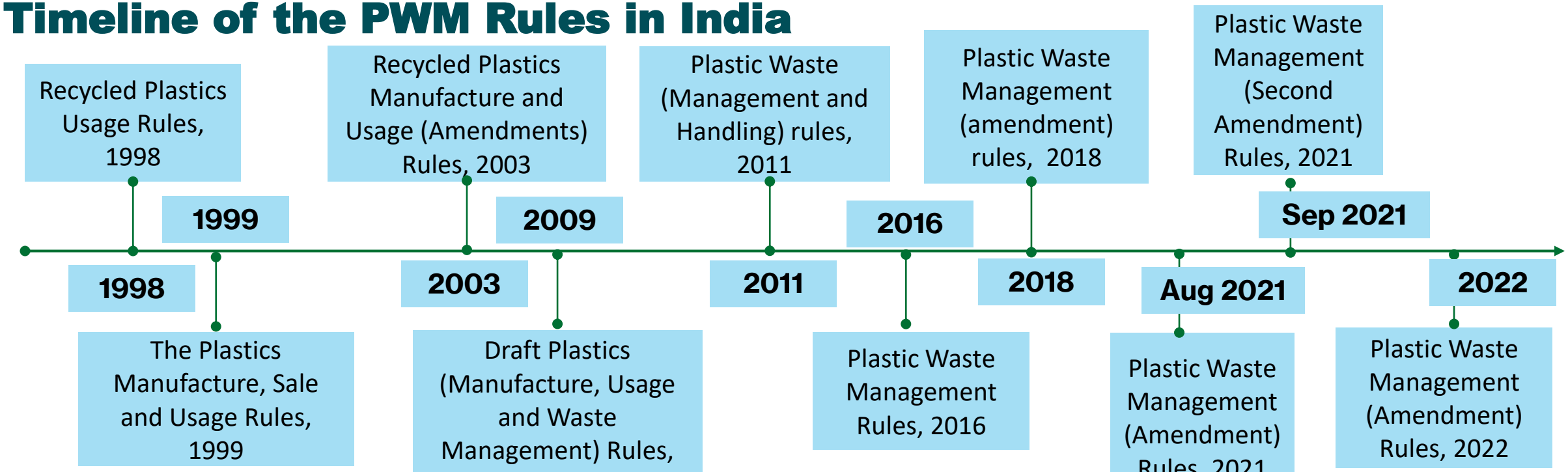
- Approximately **70% of plastic packaging** products are converted into plastic waste in a short span.
- **40%** of plastic generation remains uncollected or mismanaged
- Over **9,400 tonnes** of plastic waste is either landfilled or ends up polluting rivers, land or ground water resources.

Source: Plastic Waste Management - Issues, Solutions & Case Studies, MoHUA, March 2019

This creates the need of the PWM rules to manage plastic effectively

PLASTIC WASTE MANAGEMENT RULES

Timeline of the PWM Rules in India



- Restriction on manufacture, sale, distribution and usage of virgin and recycled plastic carry bags/ containers
- Minimum Thickness 50 microns

- Thickness of bag 40 Microns
- State Level Advisory assigned for monitoring
- Multilayered packaging prohibited
- Strengthening state level monitoring system
- Extended Producer Responsibility (EPR) on Producer, Importer, and Brand Owner and EPR shall be applicable ULBs responsible for setting up MRF (2016)

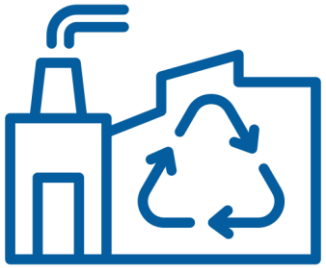
- Centralized registration system for producers, recyclers and manufacturers
- Explicit pricing of carry bags omitted
- Brand owner, plastic waste processors etc definition included
- Thickness of carry bags not less than 120 microns

2016: PWM Rules notified – segregation, EPR concept, ULB duties start
2018: Strengthening of EPR; expanded producer/brand owner responsibility
2021: SUP ban announced; carry bag thickness increased
July 2022: SUP ban enforced nationwide
July 2022: Second Amendment – certifications, ISO standards, EPR portal, strict enforcement

Provision in the PWM rules,2016

Responsibilities of Local Bodies (ULBs): ULBs are the primary enforcement authority for PWM systems

1. **Infrastructure Setup: ULBs must set up systems for** Segregation, Collection, Storage, Transportation, Processing, Disposal **[Rule 6(1)]**



2. **Operational Responsibilities: ULBs must**
   I. Ensure no environmental damage
   II. Ensure recyclables reach recyclers
   III. Process/dispose non-recyclables as per guidelines
   IV. Prevent open burning
   V. Run awareness campaigns
   VI. Engage civil society & waste pickers **[Rule 6(2)]**

3. **Producer Assistance:** ULBs may seek assistance from producers for building waste management systems. This was an early version of EPR before it became stricter in 2022. **[Rule 6(3)]**

3. **Bye-law Formulation:** All ULBs must frame bye-laws incorporating PWM Rules. **[Rule 6(4)]**

Provision in the PWM rules,2016

Responsibilities of Plastic Waste Generator:

- Take steps to minimize generation of plastic waste and segregate plastic waste at source
- Not litter the plastic waste and ensure segregated storage of waste at source and handover segregated waste to ULB
- All waste generators shall pay such user fee or charge as may be specified in the bye-laws of the local bodies for plastic waste management
- Every person responsible for organising an event in open space, which involves service of food stuff in plastic or multi-layered packaging shall segregate and manage the waste generated during such events in accordance with the latest SWM rules

Amendment In PWM Rules in 2022

Provision	PWM Rules, 2016	PWM (Second Amendment) Rules, 2022
Regulatory Approach	Framework-based, introductory rules for plastic waste management	Strong enforcement-oriented rules with measurable targets and scientific certification
Scope of Applicability	Applied to producers, importers, brand owners, ULBs, gram panchayats, recyclers, waste generators	Same scope, but with **mandatory CPCB registration** for all PIBOs and stricter compliance
Carry Bag Thickness	Minimum 50 microns	Increased to **120 microns** (phased: 50 → 75 → 120 microns)
Single-Use Plastic (SUP) Ban	No national SUP ban	**Nationwide ban on key SUP items** from 1 July 2022 (straws, cutlery, thermocol, etc.)
EPR (Extended Producer Responsibility)	Concept introduced; producers must collect waste generated by their products	Fully operationalised with **CPCB online EPR portal**, **annual targets**, recycling, reuse & end-of-life obligations
Plastic Packaging Categories	Not defined	Four categories created: (I) Rigid, (II) Flexible, (III) Multilayered, (IV) Compostable
Recycled Content Requirement	Not specified	Minimum recycled content mandated (material-specific percentages)
Biodegradable Plastic Definition	Limited; loosely defined	Scientifically defined + **mandatory IS/ISO testing** + certification by CPCB/BIS
Compostable Plastic Rules	Allowed if meeting IS 17088; minimal enforcement	Strict: **IS/ISO 17088:2021 certification**, NABL testing, QR-coded tracking

Amendment In PWM Rules in 2022

Provision	PWM Rules, 2016	PWM (Second Amendment) Rules, 2022
Registration Requirements	PIBOs must register with State SPCBs	PIBOs **must register with CPCB** : operation without registration is illegal
Waste Segregation	ULBs must implement source segregation	Stronger enforcement; plastic waste streams must be tracked and audited
Role of ULBs	Ensure collection, segregation, channelisation; prepare bye-laws	Clearer enforcement role: SUP raids, seizure registers, vendor monitoring, reporting to SPCB
Role of Retailers & Vendors	Cannot sell goods in non-compliant carry bags	Cannot sell **banned SUP**; must verify certified compostable bags; subject to fines & seizure
Waste Processing Options	Recycling, road-making, co-processing encouraged	Priority hierarchy defined: recycling → reuse → energy recovery → road-making → disposal
Reporting Requirements	Annual reports by ULBs, recyclers, SPCBs	Completely digital system through **CPCB EPR portal**, with traceable data
Penalties	General penalties under Environment Protection Act	**Environmental Compensation (EC)** for non-compliance; closure of unregistered operations
Monitoring Mechanisms	State-level monitoring committees	Stronger national-level oversight through CPCB portal & compliance audits
Multilayered Plastic (MLP)	To be phased out within 2 years	Clear obligations under EPR for recycling, end-of-life disposal, and reuse
Citizen Responsibility	Segregate waste; avoid littering	Avoid SUP; segregate waste; participate in reuse schemes; penalties in many states

Understanding Various Grades of Plastics

Symbol	Polymer	Common Uses	Properties	Recyclable?
1 PETE	Polyethylene terephthalate	Plastic bottles (water, soft drinks, cooking oil)	Clear, strong and lightweight	Yes; widely recycled
2 HDPE	High-density polyethylene	Milk containers, cleaning agents, shampoo bottles, bleach bottles	Stiff and hardwearing; hard to breakdown in sunlight	Yes; widely recycled
3 PVC	Polyvinyl chloride	Plastic piping, vinyl flooring, cabling insulation, roof sheeting	Can be rigid or soft via plasticizers; used in construction, healthcare, electronics	Often not recyclable due to chemical properties; check local recycling
4 LDPE	Low-density polyethylene	Plastic bags, food wrapping (e.g. bread, fruit, vegetables)	Lightweight, low-cost, versatile; fails under mechanical and thermal stress	No; failure under stress makes it hard to recycle
5 PP	Polypropylene	Bottle lids, food tubs, furniture, houseware, medical, rope, automobile parts	Tough and resistant; effective barrier against water and chemicals	Often not recyclable; available in some locations; check local recycling
6 PS	Polystyrene	Food takeway containers, plastic cutlery, egg tray	Lightweight; structurally weak; easily dispersed	No; rarely recycled but check local recycling
7 OTHER	Other plastics (e.g. acrylic, polycarbonate, polyactic fibres)	Water cooler bottles, baby cups, fiberglass	Diverse in nature with various properties	No; diversity of materials risks contamination of recycling

Ban on Single Use Plastic (SUP)

- **Nation wide SUP ban**
- **19 SUP items banned**

1. Ear buds with plastic sticks

2. Plastic sticks for balloons

3. Plastic flags

5. Ice-cream sticks

4. Candy sticks

Ban on Single Use Plastic (SUP)

6. Plates

7. Cups

8. Glasses

9. Forks

10. Straw

11. Trays

12. Spoons

13. Knives

14. Stirrers

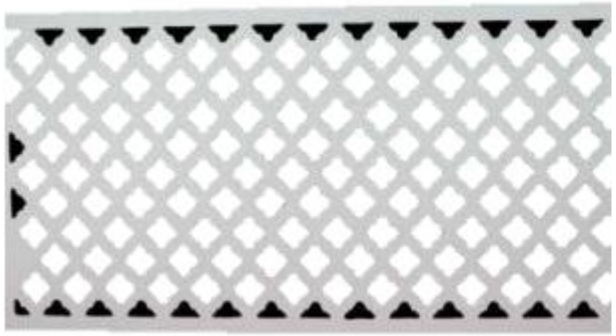
Ban on Single Use Plastic (SUP)

15. Wrapping or packaging films around sweet boxes

16. Wrapping or packaging films around invitation cards

17. Wrapping or packaging films around cigarette packets

18. Polystyrene [Thermocol] for decoration



19. Plastic or PVC banners less than 100 micron

Alternatives for SUP

Plastic Item	Alternatives
Plastic sticks used in balloons, flags, candy, ice-cream and ear buds	Bamboo & other wooden sticks for ear buds, flags as per the guidelines of concerned authority. 
Thermacol that is used in decorations	Decorations with flowers, cloth, papers, & other biodegradable material 
Items such as plates, cups, glasses	Glass, ceramic ware, earthenware, stainless-steel tableware for restaurants, dhabas hotels & other dining places as per the guidelines of concerned authority 

Plastic Waste Management Rules, IPCA, 2022 (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://environment.delhi.gov.in/sites/default/files/inline-files/pwm_epr_1.pdf)

Alternatives for SUP

Plastic Item	Alternatives
Cutlery such as forks, spoons, knives, straws, trays	Paper, bamboo, wooden, stainless-steel straws as per the guidelines of concerned authority 
Non-woven bags below 240 microns	• Paper bags for light weight products. Cloth bag for heavy products. Jute bag for heavy products. Reusable cotton bags or waste fabric bags 
Plastic banners less than 100 microns in thickness	• Cloth/fabric banner, canvas banner, paper banner • Eco banners that are PVC free and 100% recyclable as an alternative to traditional PVC Banners. 

Plastic Waste Management Rules, IPCA, 2022 (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://environment.delhi.gov.in/sites/default/files/inline-files/pwm_epr_1.pdf)

Alternatives for SUP

Compostable plastic bag

Plastic bag >120 micron

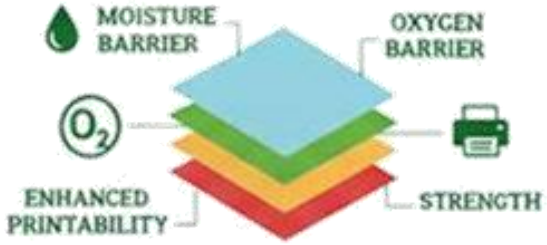
Micron testing machine

Video to check plastic thickness

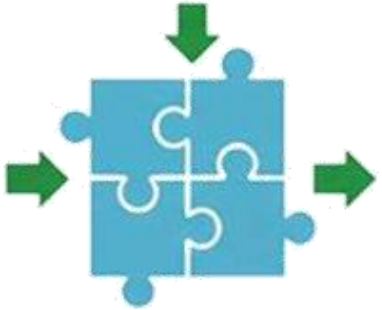
Understanding Multilayer Plastic

What are Multi Layer Plastics?

Multilayer Plastic refers to packaging material made up of **two or more layers** of different materials bonded together



Highly Engineered for Functionality



Designed for Indestructibility

Significant Recycling Challenge

These layers may include:

- **Plastic + paper**
- **Plastic + aluminium**
- **Plastic + polymer coatings**
- **Multiple plastic resins** (LDPE, PET, PP, Nylon, etc.)

Common examples: Chips packets, Biscuit wrappers, Shampoo sachets, Milk powder & coffee pouches, Instant noodles packets, Ready-to-eat food packaging, Detergent pouches, Chocolate wrappers

Multi Layer Plastics

https://www.banyannation.com/blog/multi-layer-plastic/#:~:text=Multilayer%20plastic%20is%20composed%20of,an%20oxygen%20and%20aroma%20barrier.

Understanding Multilayer Plastic

Why MLP is difficult to manage?

MLP is one of the hardest materials to collect, segregate, and recycle. The PWM Rules repeatedly highlight MLP because of its poor recyclability and high littering potential.

1. **Low or No Recyclability:** MLP has **multiple layers fused together**, making separation **technically difficult and economically unviable**.
2. **High Presence in Household Waste:** MLP is used heavily in FMCG, Snacks, Daily-use sachets, Small packaging
3. **High Littering Potential:** Because MLP is light weight, Often sachet-sized, Easily windblown. It becomes street litter, blocks drains, and pollutes lakes, rivers, and natural areas.

Why MLP Is a Major Problem for ULBs ?

No Market Value → No Buyer → Stays with ULB

Recyclable plastics like PET, HDPE, PP have high demand.
But MLP:

- Has **no resale market value**
- Cannot be baled and sold
- Requires **ULBs to bear the full cost** of handling

Piles Up at Material Recovery Facilities

Since no recycler wants it, MLP:

- Accumulates at MRFs
- Takes huge storage space
- Requires frequent evacuation
- Leads to operational inefficiencies

Contaminates Other Recyclables

When mixed with high-value plastics, MLP reduces the value of the entire bale.(If PET bottles are mixed with dirty snack packets, buyers reject the whole batch)

This **reduces recovery rates,** revenue **for ULB, interest of recyclers**

Plastic Waste Management Rules, IPCA, 2022 (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://environment.delhi.gov.in/sites/default/files/inline-files/pwm_epr_1.pdf)

Extended Producer Responsibility (EPR) in Plastic Packaging

What is EPR?

EPR, **responsibility of a producer** for the **environmentally** sound **management** of the **product** until the **end of its life**.

Producer ensures **waste** is **safely managed**

Mentioned PWM Rules **2022**

How EPR evolved?

2017 — National Committee formed

2020 — Uniform EPR Framework drafted

2022 — Plastic Packaging Rules Notified

EPR covers four areas

Reuse

Using an object or resource material again for either the same purpose or another purpose without changing the object's structure

Use of Recycled content

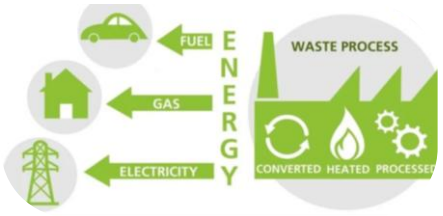
Use of recycled plastic, instead of virgin plastic in the manufacturing process.

Recycling

Process of transforming segregated plastic waste into a new product or raw material for producing new products.

End of life Disposal

Only those plastics, which cannot be recycled, used in road construction, WtE, waste to oil, as per relevant guidelines issued by Indian Road Congress or CPCB from time to time.



Types of Plastics Covered Under EPR

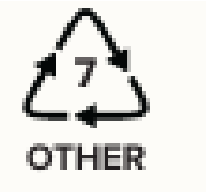
Category I -> Rigid Plastic Packaging

Utilization of Common Plastic Material code:

Category II -> Flexible Plastic Packaging

(more than one layer with different types of plastic)

Utilization of Common Plastic Material code:



Category III -> Multi-Layered Packaging

(atleast one layer of plastic and one layer of any other material)

Utilization of Common Plastic Material code:

Category IV -> Compostable Plastics

Plastic sheet or like used for packaging as well as carry bags made of compostable plastics

Materials as per Indian Standard IS / ISO 17088:2021 titled as “Specifications for Compostable Plastics”, as amended from time to time

Source: Advisory for implementation of EPR for plastic packaging in UP, June 2023

Obligated Entities

Producers

manufacture plastic packaging

Importers

of all imported plastic packaging and/or plastic packaging of imported products.

Brand Owners

including online platforms/marketplaces and supermarkets/ retail chains other than those, which are micro and small enterprises as per the criteria of Ministry of Micro, Small and Medium Enterprises, GoI.

Plastic Waste Processors (PWPs)

involved in processing of plastic waste through recycling, using plastic waste for energy (waste to energy), converting it to oil (waste to oil) and utilizing compostable/ biodegradable plastic in industrial composting.

Process code to be selected from the drop-down menu to register as "PWP" on Centralized EPR Portal by CPCB

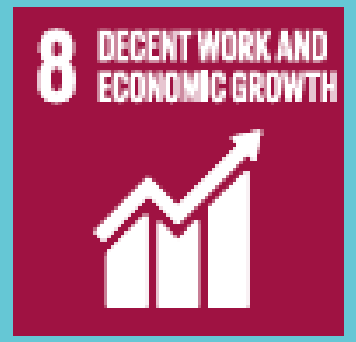
- R1: Recycling of CAT-: I PW to Pellet/Chips
- R2: Recycling of CAT-II PW to Pellets/Chips
- R3: Recycling of CAT-III PW to Pellets/Chips/fibers
- R4: Recycling of CAT-I PW to Products
- R5: Recycling of CAT-II PW to Products
- R6: Recycling of CAT-III PW to make Products
- C1: Processing CAT-IV PW for industrial composting
- E1: End of life PW co-processing in cement plants
- E2: End of life PW co-processing in steel plants
- E3: End of life PW processing in Waste to Energy plants
- E4: End of life PW processing in Waste to Oil Units

Source: Advisory for implementation of EPR for plastic packaging in UP, June 2023

Benefits of EPR Implementation for ULB

- Closing loops for plastic entering landfill and waterways.
- Reduction in GHG emission resulting in improved air quality.

- Improvement in waste circularity.
- Improved packaging design for greater plastic recycling & reusability rate.



- Improved segregation leads generating higher revenue.
- Job creation through integration of the informal packaging value chain.

- Waste Management Cost sharing with private sector.
- Improved accountability, traceability, and transparency in plastic waste value chain.

Role of ULBs in EPR Implementation under PWM Rules

Waste Collection, Segregation and Transport

- Engage informal sector for primary & secondary collection and segregation.
- Ensure proper transport routes and storage.
- Ensure recyclable plastic goes to registered recyclers only.

Partnership and Coordination

- Engage multiple PIBOs to strengthen waste collection.
- Collaborate with and enroll WMAs.
- Support PIBOs across all zones and tiers.
- Coordinate with recyclers, PWPs, and co-processing facilities.

Documentation and Regulatory support

- Issue engagement letters to PIBOs.
- Provide enrolment certificates to WMAs.
- Map all registered WMAs/ PWPs/Recyclers/WtE facilities within 100 km (with SPCB).
- Register as a PWP on portal if it operates any plastic processing facility (WTE, PTF, recycling, etc.).

Channelization & Recycling Linkages

- Send plastic waste to authorized recyclers/PWPFs.
- Ensure all facilities used are registered with SPCB/PCC.
- Ensure non-recyclable plastic is disposed in co-processing, WtE, roads, etc.

Support for MRF & Processing Infrastructure

- Facilitate/operate MRFs, RDF units, and segregation sheds.
- Provide land/support infrastructure where required.
- Setup decentralized Plastic Collection Facilities.

Compliance Monitoring & Field Oversight

- Monitor daily operations of workers, vehicles, WMAs & recyclers.
- Ensure compliance with segregation, transport and validate PIBO meet standards.

Data Reporting & Verification

- Provide verified data on collected, segregated, recycled plastic.
- Verify PIBO claims and support CPCB reporting within deadlines.
- ULB can procure EPR certificates/credits from PWPs and sell them to PIBOs.

Awareness, Capacity Building & Public Engagement

- Create awareness among citizens, traders, RWAs, shopkeepers jointly with PIBOs.
- Conduct regular capacity building & training programs for all stakeholders.
- Promote segregation, reduce plastic use, and improve material recovery.

Source: Advisory for implementation of EPR for plastic packaging in UP, June 2023, SOP for Registration of PIBOs Under PWM Rules 2016

Challenges of EPR Implementation

- Poor segregation at source.
- Inadequate awareness and knowledge of guideline and waste flow among consumers & stakeholders.
- Lack of formalized take-back logistics, as setting up a collection network could be extremely complex and expensive.
- Rapidly growing waste volumes generated within states and imported from other states.
- Difficulty in plastic waste processing due to inadequate infrastructure, distance, and lack of connectivity to recycling/processing facilities.
- Resistance of stakeholders to participate; especially reluctance of PWPs to register and participate in EPR program
- Lack of technical standards
- Lack of data and monitoring mechanisms

EPR Implementation Models

Model 1: Decentralized Revenue Generation Model

Small ULB/GP population ≤ 3 Lakhs
Plastic waste generation and PIBOs ≤ 10 TPD

- Door-to-door segregated collection.
- Set up manual/semi-mechanized MRF/PCF.
- Engage SHGs for MLP/SUP waste recycling/upcycling.
- Link SHGs with Skill India Mission.
- Facilitate Deposit Return Schemes
- Sell waste & RDF to PWPs; procure EPR certificates
- Use non-recyclable waste in road construction.

- Map PWPs/Recyclers within 100 km.
- Engage informal sector for collection & segregation.
- Registration of SHG as PWP on EPR Portal.
- Ensure processing/disposal through registered PWPs.
- Awareness campaigns on 3R.
- Revenue through selling waste/EPR credit

Model 2: Integrated EPR Credit Trading Model 1

Medium ULB population = 3.1-10 Lakh
Plastic waste generation and PIBOs =10.1 - 25 TPD

- Partner with multiple PIBOs.
- Set up decentralized semi-mechanized MRF/PCF (up to 5 TPD).
- Conduct compositional survey & min. support price (MSP) study.
- Set up PTF/WTE (up to 2 TPD) if disposal facility unavailable.
- Implement Deposit Return Schemes.
- Use non-recyclable plastic

- Register as PWP on CPCB EPR portal
- Map PWPs/Recyclers,etc. within 100 km.
- Engage informal sector
- Collect & transport segregated plastic with PIBOs/PWPs

Model 3: Integrated EPR Credit Trading Model 2

Large ULB population >10.1 Lakhs
Plastic waste generation and PIBOs >25 TPD

- Engage multiple large PIBOs with high EPR targets.
- Set up multiple fully mechanized MRF/PCF in PPP model.
- Fully mechanized collection & transport.
- Conduct compositional survey & MSP study.
- Implement Deposit Return Schemes & promote refillable models.
- Set up multiple WTE/PTF/ Gasification facilities
- Use non-recyclable plastic

- Registration of SHG as PWP on EPR Portal.
- Awareness on 3R
- Revenue via selling waste/EPR credits

Source: Advisory for implementation of EPR for plastic packaging in UP, June 2023

Session 3

Moving towards circular economy: Learning from case studies and good practices

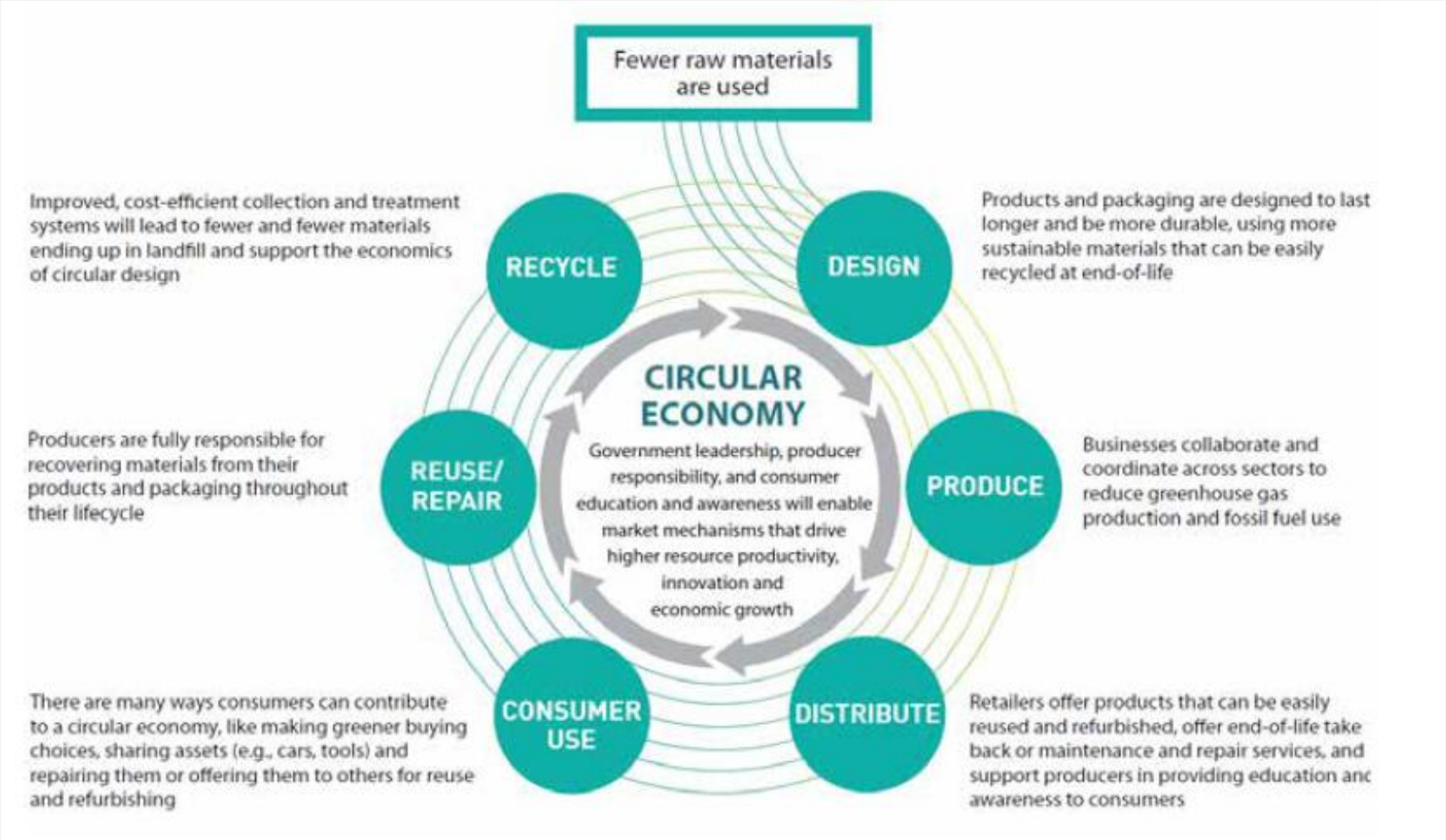
There is a need to shift from linear model to circular economy in waste management

What is linear economy?

A linear economy is the "take-make-dispose" model, where resources are extracted, used to produce goods, and then discarded as waste.

What is circular economy?

Circular economy goes beyond recycling. The value of products and materials is maintained for as long as possible. Waste is minimized and resources are kept within the economy when a product has reached the end of its life, to be used again to create further value.



Source: Plastic Waste Management, Issues, Solutions, Case Studies, MoHUA, March 2019

5Rs under the circular economy

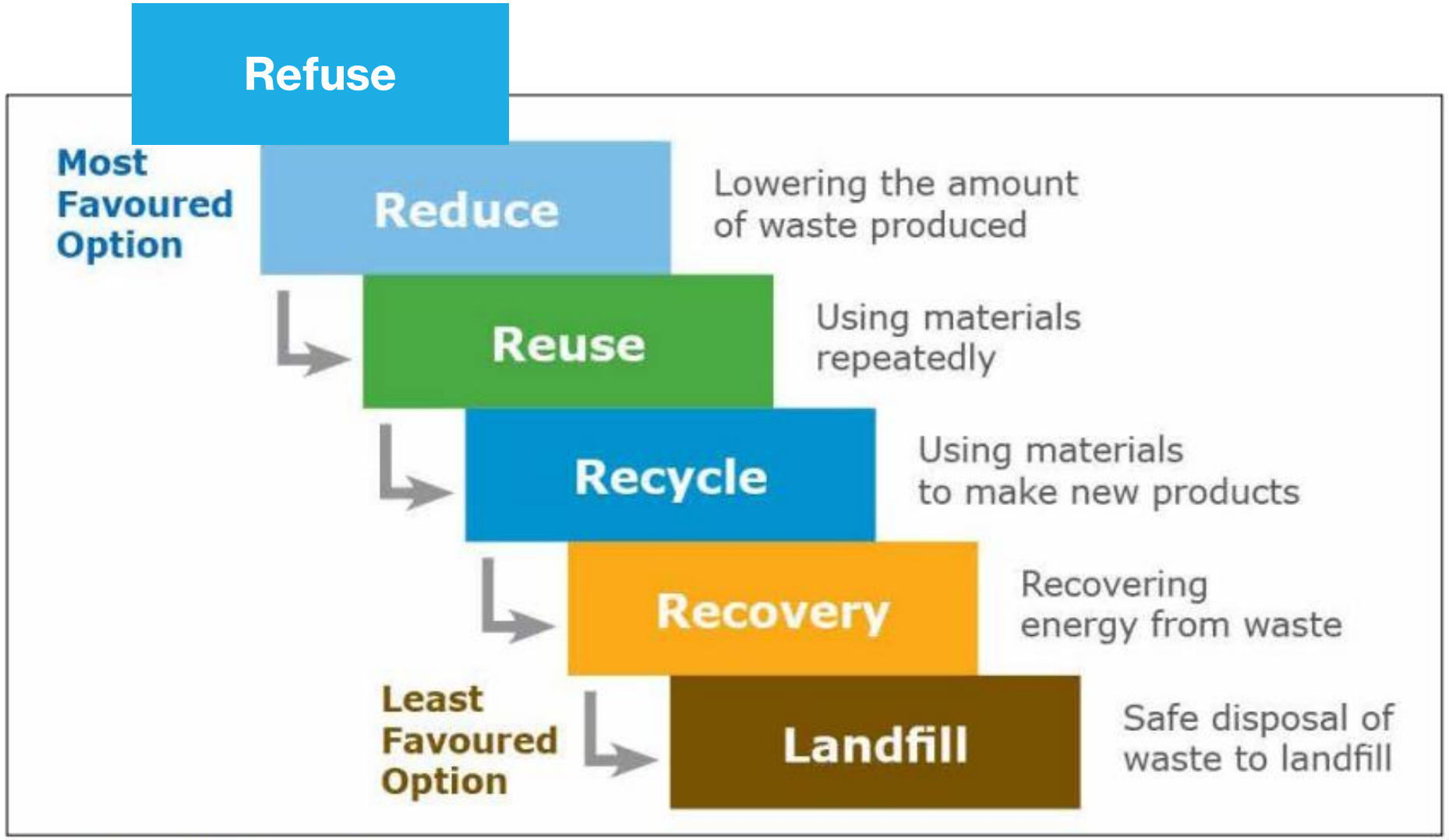


Figure: Management of Plastic Waste

All the aspects providing support to move towards circular economy

1. Refuse: Avoid or say no to products that generate waste or are not environmentally friendly.

2. Reduce: Minimize the amount of waste you create by choosing options that generate less waste.

3. Reuse: Use items more than once instead of throwing them away. This extends their life and reduces waste. It diverts plastic and takes pressure off the recycling services.

4. Recycle: Process waste materials into new products to prevent the use of fresh raw materials.

5. Recover energy or resources from waste that cannot be reused or recycled.

Use of cloth bags, steel plates and more

Discourage the use of disposal plastics, minimize use of Plastics Cutlery, Support a bag Tax or Ban

plastic grocery bags for small trash bags, re-use plastic silverware, refillable plastic containers

Plastic to Liquid RDF, Road Construction, pavement blocks, toilet blocks

Plastic to Alternate Fuel, Energy

Various business models for circular economy

Circular Supply Chain Model	Recovery and Recycling Model	Product Life Extension Model	Sharing Platform Model	Product as a Service Model
Provide renewable energy, bio-based or fully recyclable input material to replace single- lifecycle inputs	Recover useful resources/energy out of disposed products or by-products	Extend working lifecycle of products and components by repairing, upgrading and reselling.	Enable increased utilization rate of products by making possible shared use/ access/ ownership	Offer product access and retain ownership to internalize benefit or circular resource productivity

Five Business Models for Circular Economy

https://mohua.gov.in/pdf/627b8318adf18Circular-Economy-in-waste-management-FINAL.pdf

Benefits of adopting circular economy

- Reducing **raw material dependence** by optimising manufacturing processes and designing products for longevity.
- CE can significantly lower carbon emissions. recycling 1 tonne of plastic could **reduce emissions by 1.1 to 3 tonnes** of CO2e compared to producing the same tonne of plastics from virgin fossil feedstock.
- **Reduce** the annual volume of **plastics entering our oceans by 80%,** reduce **GHG** emissions by **25%**, create **700,000+ new jobs.**
- By reducing landfill waste, the circular economy mitigates land pollution and helps **restore soil health**.
- A study shows a loss of almost USD 133 billion worth of plastic material value till 2030 due to unsustainable packaging in India. **CE based interventions** have the potential of **recovering almost 75% (USD 100 billion)** of this projected loss value.

It takes about 185 liters of water to produce 1 kilogram of plastic. This is more than the amount of water to be supplied per capita per day in India, which is 135 liters.

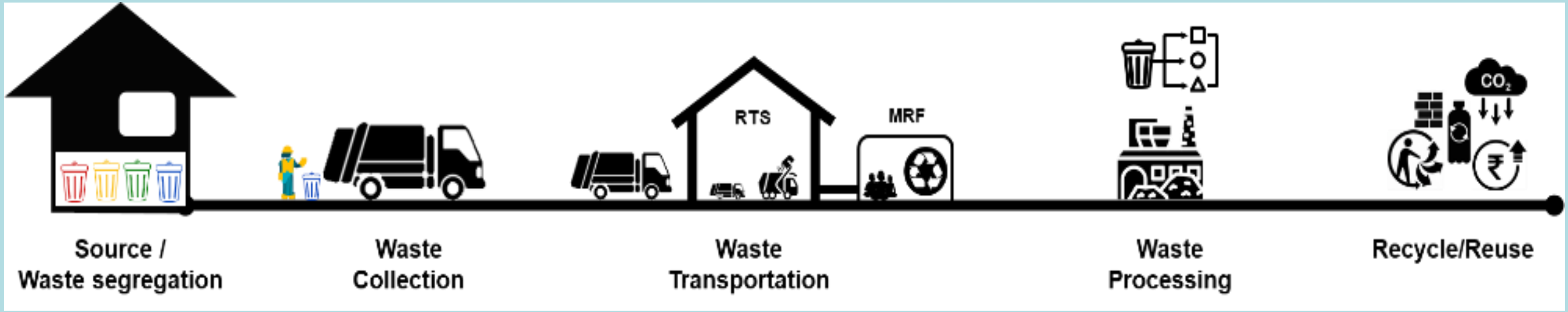
Source: Plastic Waste Management, Issues, Solutions, Case Studies, MoHUA, March 2019

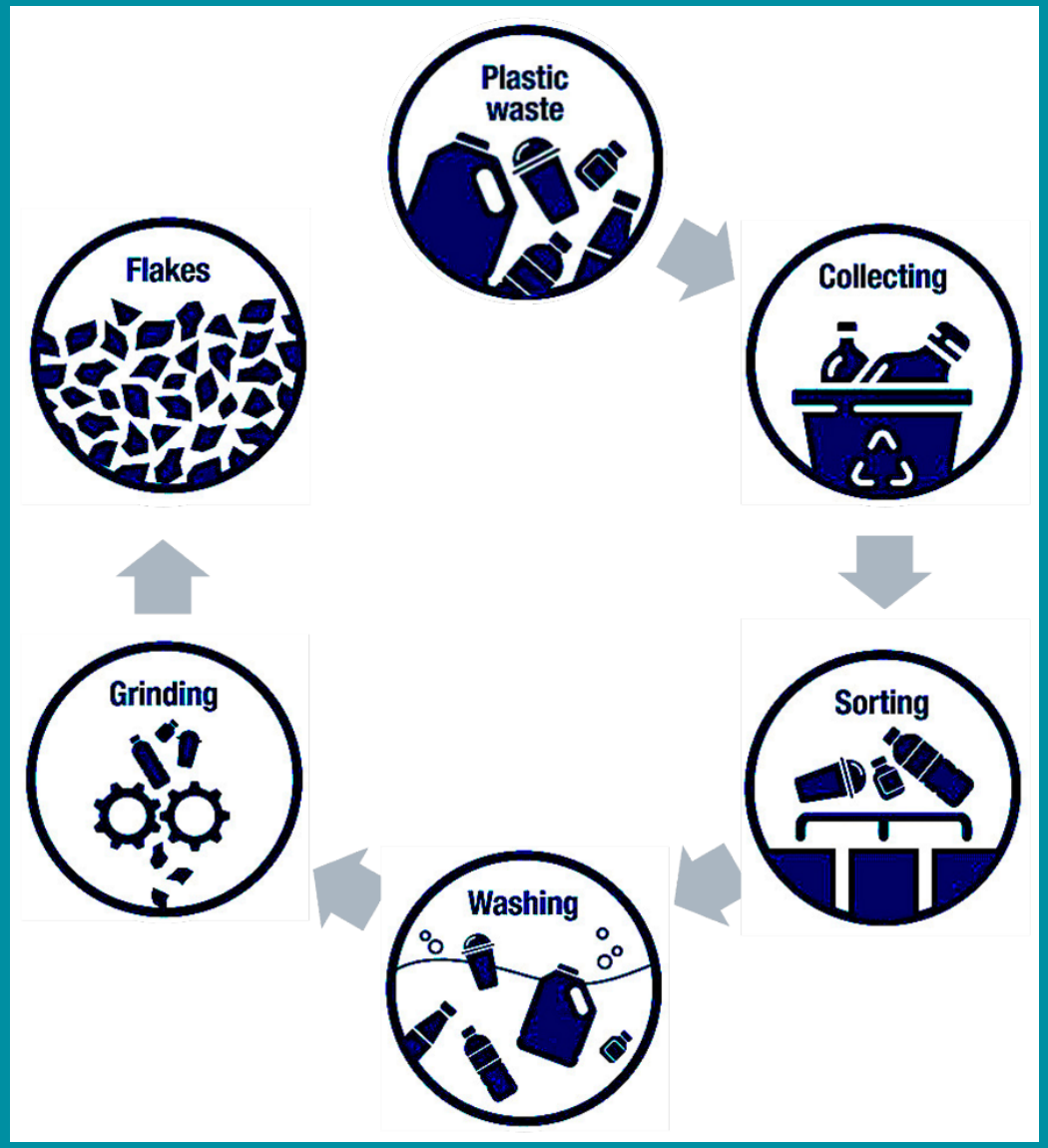
Challenges of Adopting Circular Economy in Plastic

- Limited segregation of plastic waste at city level
- Lack of strict enforcement of single use plastic ban
- Open dumping and clogging of drains with plastic waste is still prevalent
- Lack of funding to set up proper waste processing and recycling infrastructure
- Lack of market-based instruments and regulatory measures for effective functioning of business models
- Economically challenging to set up standard prices of plastic waste as raw material and market for recycled products
- Proper recycling requiring large investments for recycling of plastic waste
- Lack of corporation among stakeholders across the plastics value chain
- Awareness and knowledge gaps within the plastic users
- EPR implementation is more like a CSR initiative

Source: Circular Economy for Plastics in India: A Roadmap, TERI, 2021

To move towards circular economy it is significant to enhance each aspect of the solid waste management chain





Cases of good initiatives in improving segregation and door to door collection

Door-to-Door collection strengthening model

State/UT	Uttar Pradesh
Urban Local Body	Lucknow Municipal Corporation
Department/ Organisation	Environment Division, Lucknow Municipal Corporation
Duration	12 Months

- Lucknow faced irregular waste collection timings, followed by frequent overflow of community bins.
- High dependence on open dumping.
- Lack of route discipline and monitoring.
- Poor worker safety and lack of formal systems.

Steps taken by the ULB:

Strengthened **primary collection system and** Improved **transfer points** and transportation chain

- Zones were divided into **micro-collection routes** with fixed schedules. Workers were assigned defined beats and responsibilities.
- Focus on eliminating dependence on roadside bins

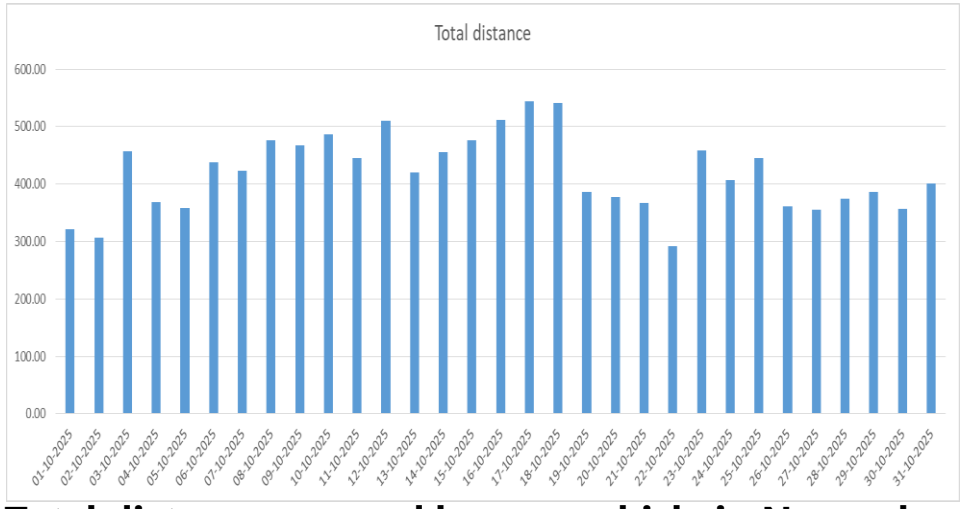
- **Vehicle Tracking & Monitoring**
  - Collection vehicles tracked through GPS.
  - Supervisory system for real-time route monitoring.
  - Attendance and performance linked to route completion.

- **Workforce Strengthening**
  - Large sanitation workforce trained.
  - Formalized roles and safety practices.

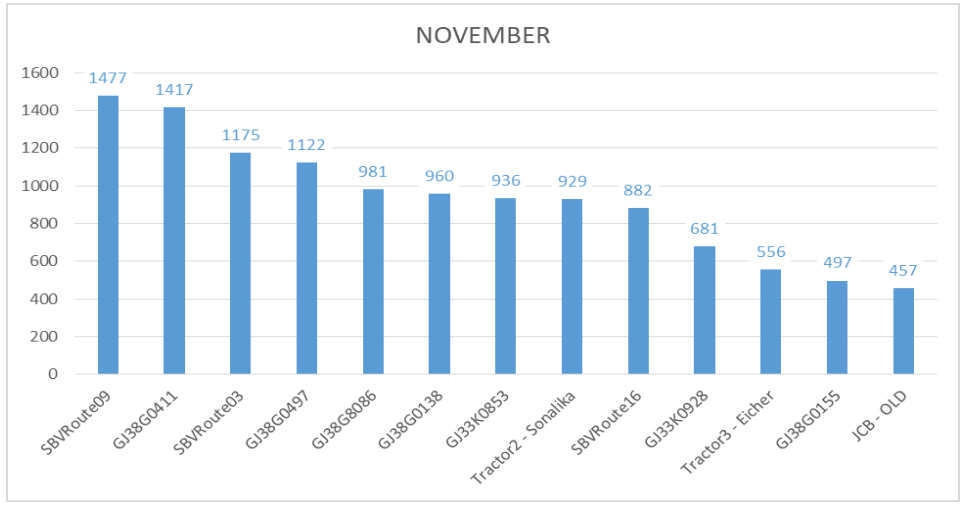
Impact

- D2D collection can be strengthened with **better planning and monitoring**, not only large investments.
- More than **2,800 employment opportunities created** for sanitation and collection workers.

Improving D2D collection by regularizing and GPS based monitoring with alert systems



Total distance covered by one vehicle in November



Total distance covered by all vehicles in November

A city faced challenges with regularizing (daily uniform time collection) its D2D collection. This resulted in inefficient D2D collection, GVPs and poor visible cleanliness

Even with GPS tracking present the vehicles were not been monitored

Steps taken by ULB to enhance D2D collection:

- Private operator strictly follows the collection routes given by ULB, as the vehicles were not adhering to any defined route earlier
- Along with GPS tracking, added a feature of alert on detour of vehicle to the monitoring authority
- Organised a virtual training session by monitoring app developer for ULB officials, agency representatives

Smart monitoring and tax rebates for collection and segregation by Navi Mumbai

Navi Mumbai – Smart Monitoring for C&T Efficiency

Navi Mumbai faced high waste generation, insufficient coverage in informal settlements, and limited accountability of contractors.

Steps taken by ULB:

- The NMMC rolled out **near-universal door-to-door collection** using GPS-enabled vehicles, smart bins with RFID tags, and a centralized command-control system.
- Dedicated fleets were assigned to bulk waste generators, and waste transfer stations were modernized for efficient transport.
- NMMC also incentivized segregation through **property tax rebates** and community recognition:
  - **5% General Tax Rebate:** For buildings segregating wet, dry, and other waste on-site and handling maximum quantities.
  - **5% General Tax Rebate:** For buildings handing over maximum dry waste for recycling.

Impact

Navi Mumbai now maintains **>95% door-to-door collection coverage** and **>90% C&T efficiency**, with transparent monitoring of staff and vehicles. It consistently ranks among India's cleanest cities, with smart monitoring as its key strength.

Indore's key success because of segregation of waste...

https://www.youtube.com/watch?v=nYW

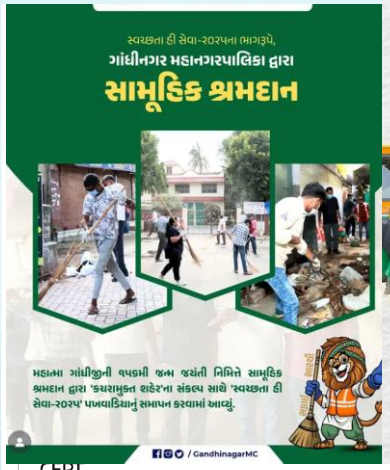
Gandhinagar Municipal Corporation conducting various drives and campaigns for promoting waste segregation

IEC waste segregation activity at school

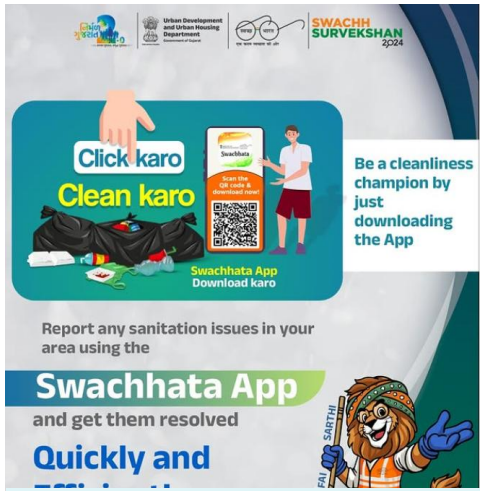
My theli campaign

'Ending Plastic Pollution' initiative, the women of the Sakhi Mandal at Dholakuva were informed about single-use plastic and the harm it causes. Conducted across various shops in the Gandhinagar Municipal Corporation area against banned plastic, and administrative penalties were collected.

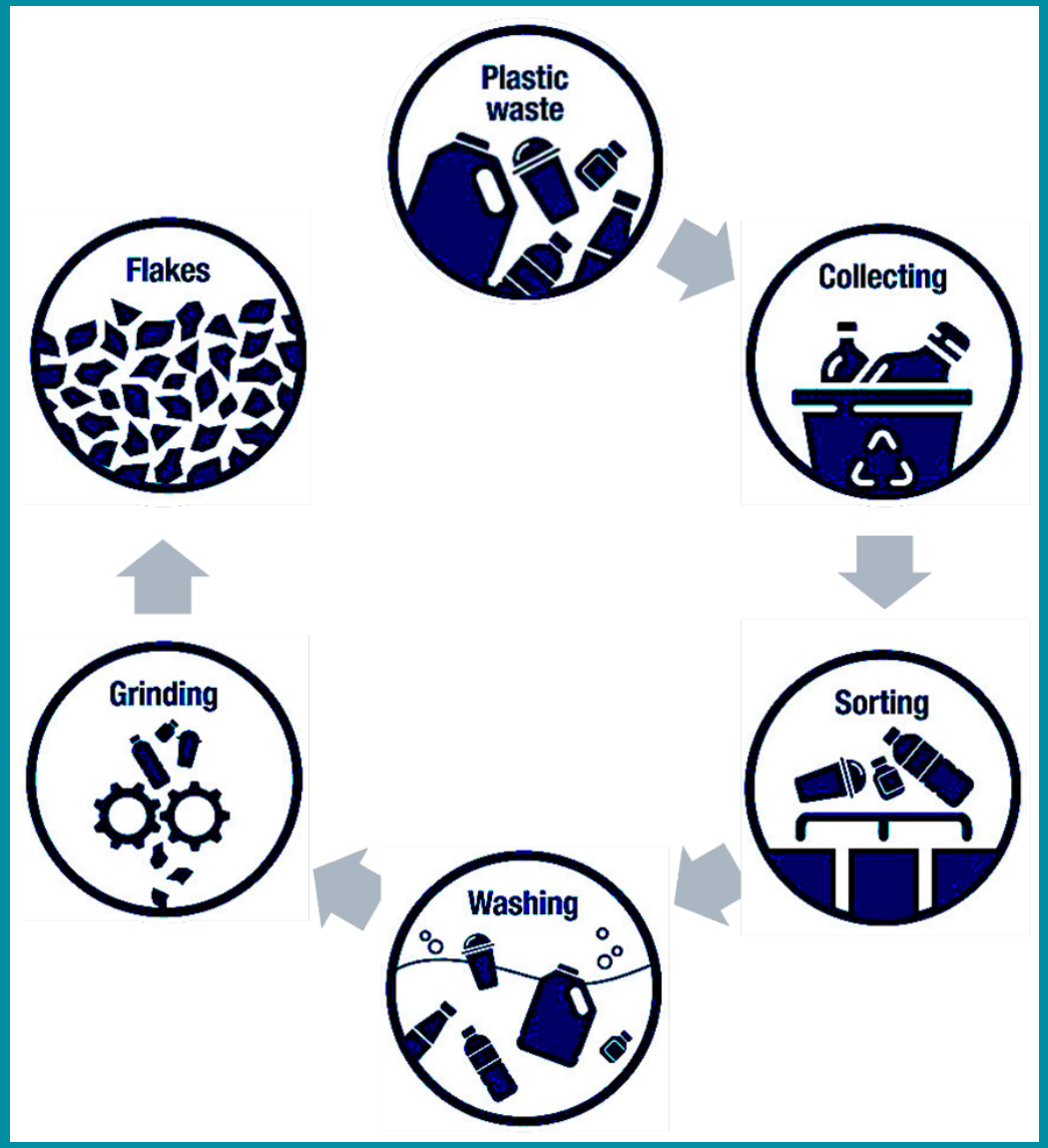
Multiple Clean-up drives and pledges for keeping city clean.



Clean-up Campaign - cleaning in Kudasan, 25th Sept 2025 under "Ek saath ek divas ek kalak sathe Swacchta mate Shramdan"



Report cleanliness issue on Swachhata App - SBM-U



Cases of good initiatives under decentralized waste management and segregation at centers

Adopting Circular Economy by Engaging SHGs

- Engaging Self Help Groups (SHG) for creating awareness such as impacts of plastic pollution, ban on SUP, alternatives of SUP etc.
- Engaging SHG for operation of MRF centers for proper segregation of plastic waste
- Creating enterprise of SHGs for making cloth bags, acting as Bartan bank (renting steel/glass utensils for making zero waste events) etc.
- Engaging for monitoring of enforcement of plastic ban in the city

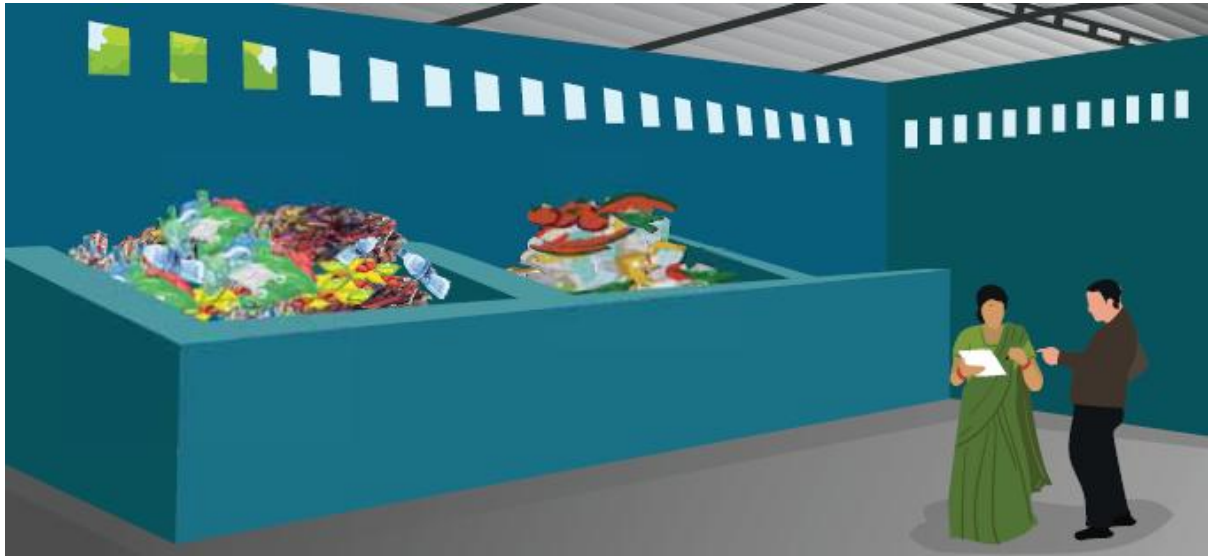


Image source: Toolkit: Plastic Waste Management, MoJS, 2021

Introducing Zero Waste Management (ZWM) units to reduce load on centralized systems

WASTE TRASPORTATION

WASTE SEGREGATION

COMPOSTING

DRY WASTE STORAGE

Mysuru Corporation faced increasing organic waste and faced challenges in managing the waste. Sending mixed waste far away was expensive

Steps taken by ULB

- Zero Waste Management (ZWM) units were introduced in the town
- Rollout of 9 ZWM units (zone-wise) maintained by local SHGs / federations for neighbourhood segregation, composting and dry-waste storage.
- 2.Decentralized collection system using pushcarts and auto-tippers to reduce mixing and transport cost.
- 3.Central composting facility treats overflow from ZWMs and mixed waste (windrow + screening). Proposed expansion with two larger compost plants (150 & 200 TPD) is in planning.
- 4.Small biogas units & shredders (procurement under SFC grants) to increase local processing capacity and energy generation potential.

Impact

- Employement of SHG members
- Reduced landfill load
- Reduced transport emissions

Decentralised collection and transportation model of Ambikapur

Ambikapur, like many medium cities, struggled with uncollected waste, open dumping, and inefficient transportation.

Steps taken by ULB:

- The city adopted a decentralized, community-driven C&T system. It eliminated community bins, introduced 100% door-to-door collection of segregated waste, and divided the city into 17 wards managed by women self-help groups (SHGs).
- Ambikapur engaged citizens through awareness campaigns, household-level demonstrations, and consistent IEC activities. The empowerment of SHGs created local ownership and accountability. Incentives were given for segregation compliance.

Result

Ambikapur achieved 100% door-to-door collection and over 90% C&T efficiency. Transportation costs reduced due to decentralized centers, and waste was processed locally into compost, recyclables, and RDF. The model ensured women' s livelihood security, enhanced sustainability, and positioned Ambikapur as a national best practice city under Survekshan.

Decentralised collection and transportation model of Ambikapur

- Source segregation system
- Tricycle and e-rickshaw collection vehicles
- Composting units at SLRM centres
- Vermicomposting & biogas units
- Segregation of dry waste into 22 categories
- Reuse-based zero landfill model

Segregation at Source by SHGs


Tricycle for collection driven by women

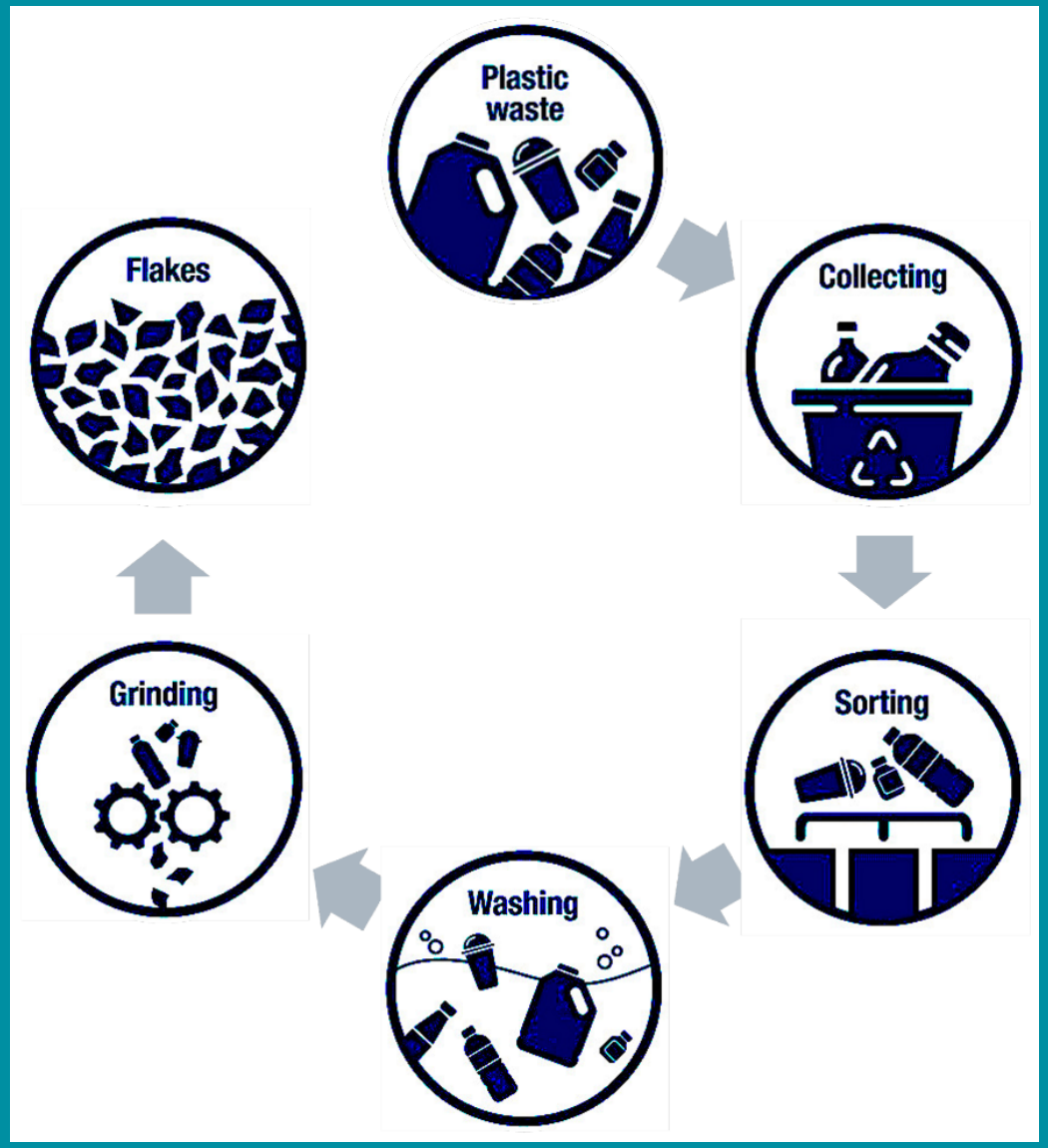

Tertiary segregation center at sanitation park

Segregation at SLRM center


Women SHGs successfully managing SWM

Bengaluru’s decentralized dry waste management system

https://www.youtube.com/watch?v=c1E03-stZ8s



Cases of Good Initiatives for waste processing

Pune's MRF–RDF Model – Waste Pickers Driving Decentralized Resource Recovery

Pune, generating over **2,000 TPD of solid waste**, faced challenges of managing its growing dry waste stream, especially low-value plastics and non-recyclables that had no market and were often dumped in landfills.

Steps taken by ULB:

- PMC, in partnership with **SWaCH Cooperative** developed a decentralized **network of MRFs** across the city.
- Waste pickers collect dry waste door-to-door, sort recyclables for sale, and send the combustible fraction to RDF units, which supply cement kilns as fuel.
- PMC institutionalized the role of waste pickers by signing agreements with SWaCH, giving them recognition, identity cards, and collection fees. Cement industries were engaged to use RDF.

Impact

Pune' s decentralized MRF network diverts **hundreds of tonnes of dry waste daily**, saves PMC an estimated **₹15–20 crore annually** in landfill transport and tipping fees, and provides income to **3,000+ waste pickers**.

Indore's Centralized Composting Plants – Converting Wet Waste into a Branded Resource

Indore, generating over 1,200 TPD of solid waste, earlier relied on open dumping at Devguradia, creating leachate, odor, and methane emissions. With more than 50% organic waste in its daily load, landfill diversion was urgent.

Steps taken by ULB:

- The IMC, set up Devguradia centralized composting facility (400–500 TPD capacity) along with smaller decentralized units.
- Segregated wet waste, collected through 100% door-to-door collection, is processed through windrow composting and mechanical systems.
- The compost is branded as "Indore Compost" and marketed to farmers.
- Bulk waste generators (markets, hotels, institutions) were mandated to supply wet waste directly. IMC introduced monitoring apps, penalties, and incentives to ensure compliance.

Impact

The city produces **hundreds of tonnes of compost monthly**, supplying both local agriculture and horticulture. This reduced landfill dependency by over **70%**, revived degraded farmlands.

Surat's Anjana Bio-CNG Plant – Integrating Wet Waste and Sewage for Green Fuel

Surat generates over 1,800 TPD of municipal solid waste, with a large wet waste fraction from households, hotels, and markets.

Steps taken by ULB:

The Surat Municipal Corporation (SMC), in collaboration with private partners, established the Anjana Bio-CNG Plant adjacent to the Anjana Sewage Treatment Plant (STP).

The facility processes wet waste + sewage sludge to produce Compressed Bio-Gas (CBG), which is bottled and used to fuel SMC city buses and waste collection vehicles.

Bulk waste generators (markets, hotels, institutions) were directed to supply segregated wet waste directly to the plant. Municipal staff were trained to ensure reliable waste feedstock flow.

Impact

The plant processes around 125 TPD of wet waste and sludge, producing ~6,000–8,000 kg of Bio-CNG daily. This fuel powers hundreds of SMC buses, replacing diesel and saving fuel costs.

Saswad processing its wet waste and utilizing as a compost generating monthly 4 lakh revenue (1/2)

Dry waste

Conveyor system for Loading, Sorting(manually)

Trommel to separate waste material size wise

Storage cages for type wise materials

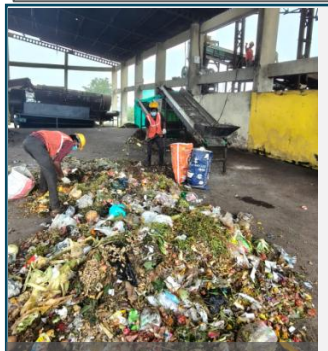
Bailing Machine for Plastic and Paper pressing

Machines operation, Maintenance, Human resource managed by
Contractor – SJ Envocare

World Envocare collects the bailed materials and carry t Sangli to distribute to the manufactures to recycle the materials

Final Dry waste disposal ,for recycling, material distribution is carried by -
SJ Envocare subcontracted with World Envocare

Wet waste



Manual sorting for the Wet waste by sanitation workers

Sorted waste is shredded by the shredding machine

Shredded material is settled up for windrow composting

Bioculture sprayed on windrows for effectively reducing waste volume, minimizing odors, destroying pathogens and weed seeds

After looping period of 30 days, windrowed waste is shredded for fine quality and selling purpose

Machines operation, Maintenance, Human resource management, composting and selling done by
Contractor – SJ Envocare

सासवडला कंपोस्ट खतविक्री केंद्र

नगर परिषदेच्या प्रकल्पास जर्मन परराष्ट्र मंत्रालयाच्या अधिकाऱ्यांची भेट

सासवड (ता. पुरंदर) : नगर परिषदेच्या कंपोस्ट खत प्रकल्पास भेट देताना अधिकारी व मान्यवर.

- **Wet composting sale :**
- Monthly generation of wet waste is 6500 kg Approx.
- Bulk quantity of compost is sold for Rs.3000/- per ton – Consumers are Farmers, Nursery operators, for ULB institutes purpose max.
- Small Quantity of compost sold for Rs.3/- per kg – consumers are local Gardeners, Residents with HHs plants

Saswad processing its wet waste and utilizing as a compost generating monthly 4 lakh revenue(2/2)

HARIT – Compost Branding (Saswad Municipal Council)

- **Steps Taken by Council**

- Established **19 TPD Windrow Composting Plant** at Kumbharvalan for wet waste processing.
- Achieved **100% processing of wet waste** with *zero landfill model*.
- Registered under **MahaCity Compost App** for branding & transparent sale of compost.
- Created a **city compost outlet** for direct farmer access.
- Regular **logbook maintained** for compost production & sales.
- Partnerships built with farmers to ensure sustainable compost usage.

- **Positive Impact**

- Generated **₹4.23 lakh revenue** in just six months through compost sales.
- Supplied compost directly to farmers at **affordable ₹3,000/MT**, reducing dependency on chemical fertilizers.
- Promoted **circular economy** – waste turned into value-added product (Harit Compost).
- Enhanced **soil health & sustainable farming** in the region.
- Recognition through **Harit Brand Certification**, strengthening city' s green image.

Last Three Month Wet Waste sale Receipt /Sale Logbook

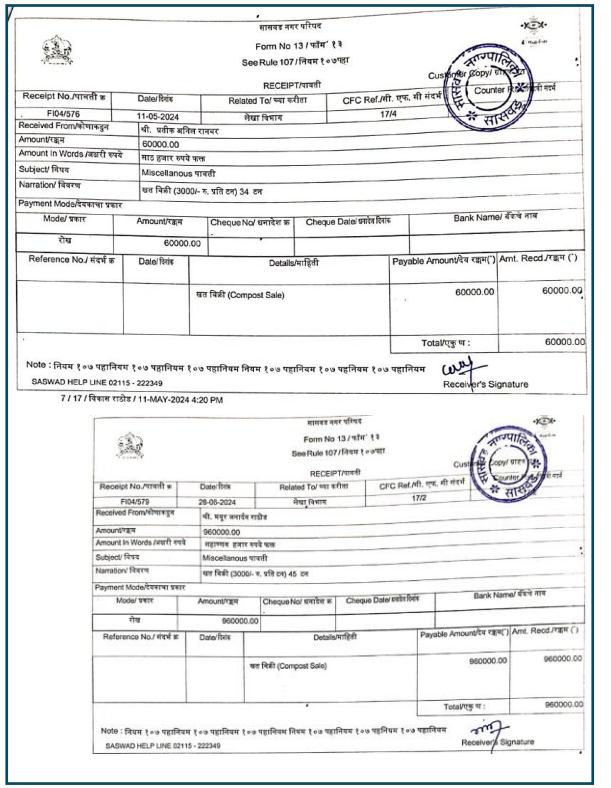
Sr.No	Month	Compost Generated (MT)	Nmae of Farmer	Compost Used By ULB	Sold Compost (MT) (Rs.3000Per MT)	UnSold/S Utilized
1.	May-2024	34+76(Previous stock)=110	Pratik Anil ranvar	14	20	76
2.	Jun-2024	47	Mayur J. Rathod	15	32	
3.	July-2024	35	Rejashree S.Sapkal	15	20	
4.	Aug-2024	34	Rajesh P.Ambule	10	24	
5.	Sep-2024	33	Satish G. Kale	13	20	
6.	Oct-2024	35	Dyaneshwar A.Kambale	10	25	
Total Amount (Rs)					4,23,000	

Summary sheet of Compost Sale Receipt:-

Sr. No.	Name	Receipt	Amount	Date Of Receipt Collection
1	श्री. प्रतीक अनिल रानवर	FI04/576	60000.00	11-05-2024
2	श्री. मयूर जनार्दन राठोड	FI04/579	96000.00	28-06-2024
3	तेजश्री सतीश सपकाळ	FI04/580	60000.00	29-07-2024
4	श्री. राजेश पांडुरंग आंबुले	FI04/590	72000.00	28-08-2024
5	श्री. सतीश गोपाळ काळे	FI04/625	60000.00	29-09-2024
6	श्री. ज्ञानेश्वर अरुण कांबळे	FI04/521	75000.00	12-10-2024

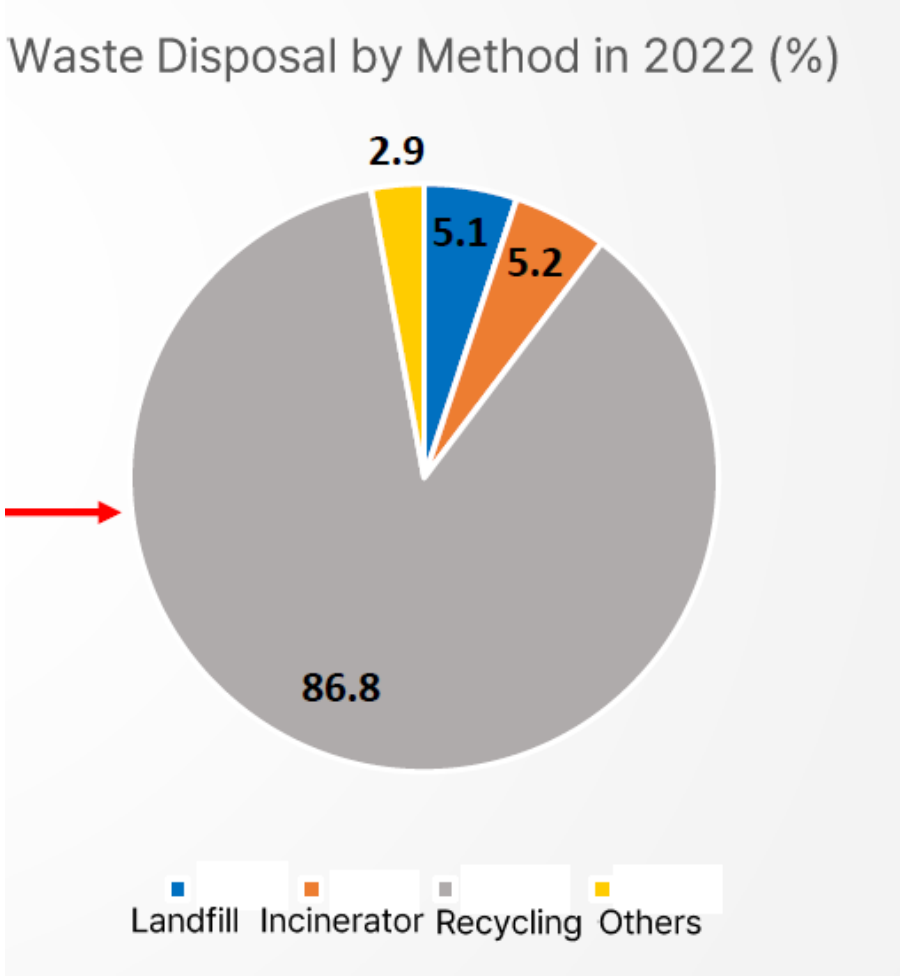
Water Supply And Sanitation Engineer
Saswad Municipal Council

Chief Officer
Saswad Municipal Council

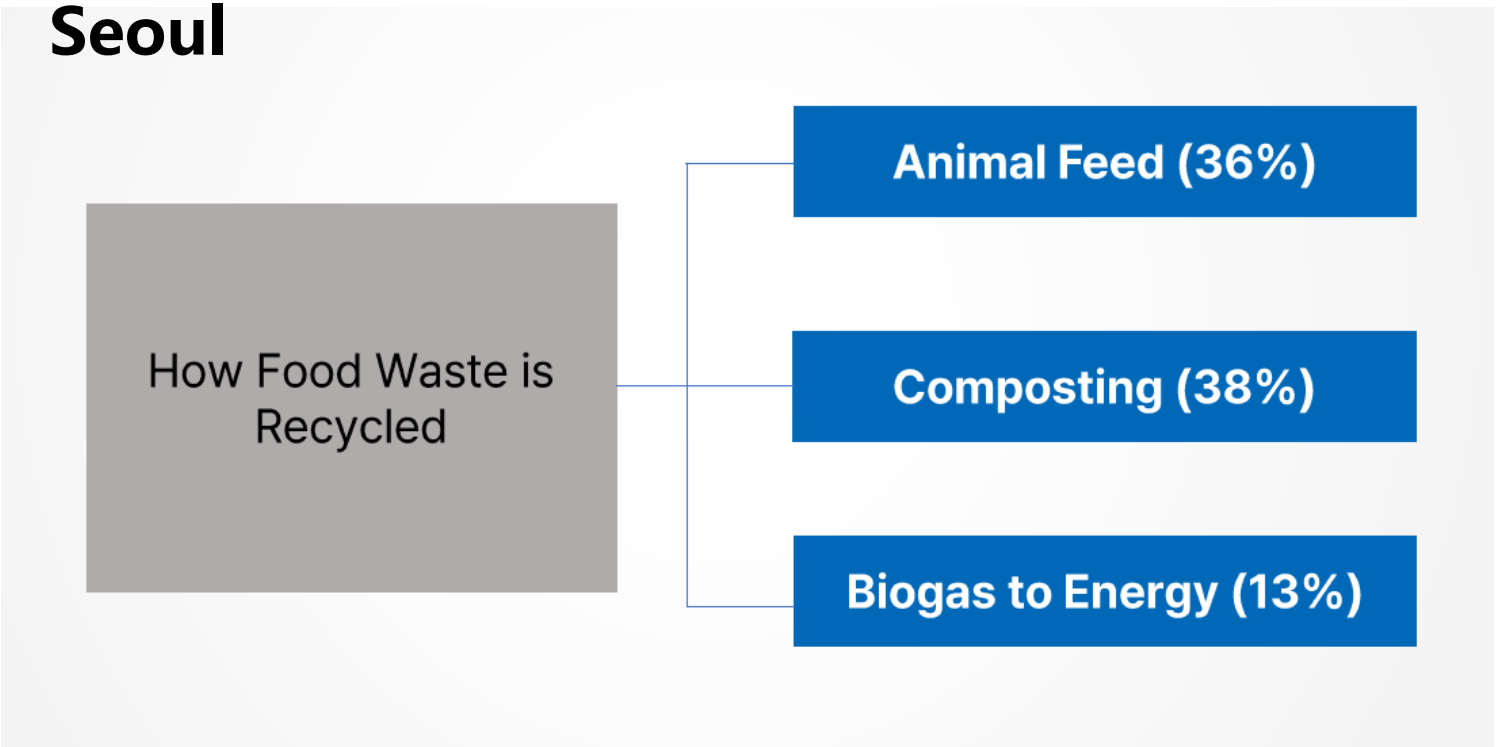


Seoul, South Korea segregating waste and processing all its waste

All waste disposal in Seoul



Wet waste disposal in Seoul



Approaches how wet waste is collected by Seoul Council

Dedicated bag:
Volume-rate garbage bag
55%

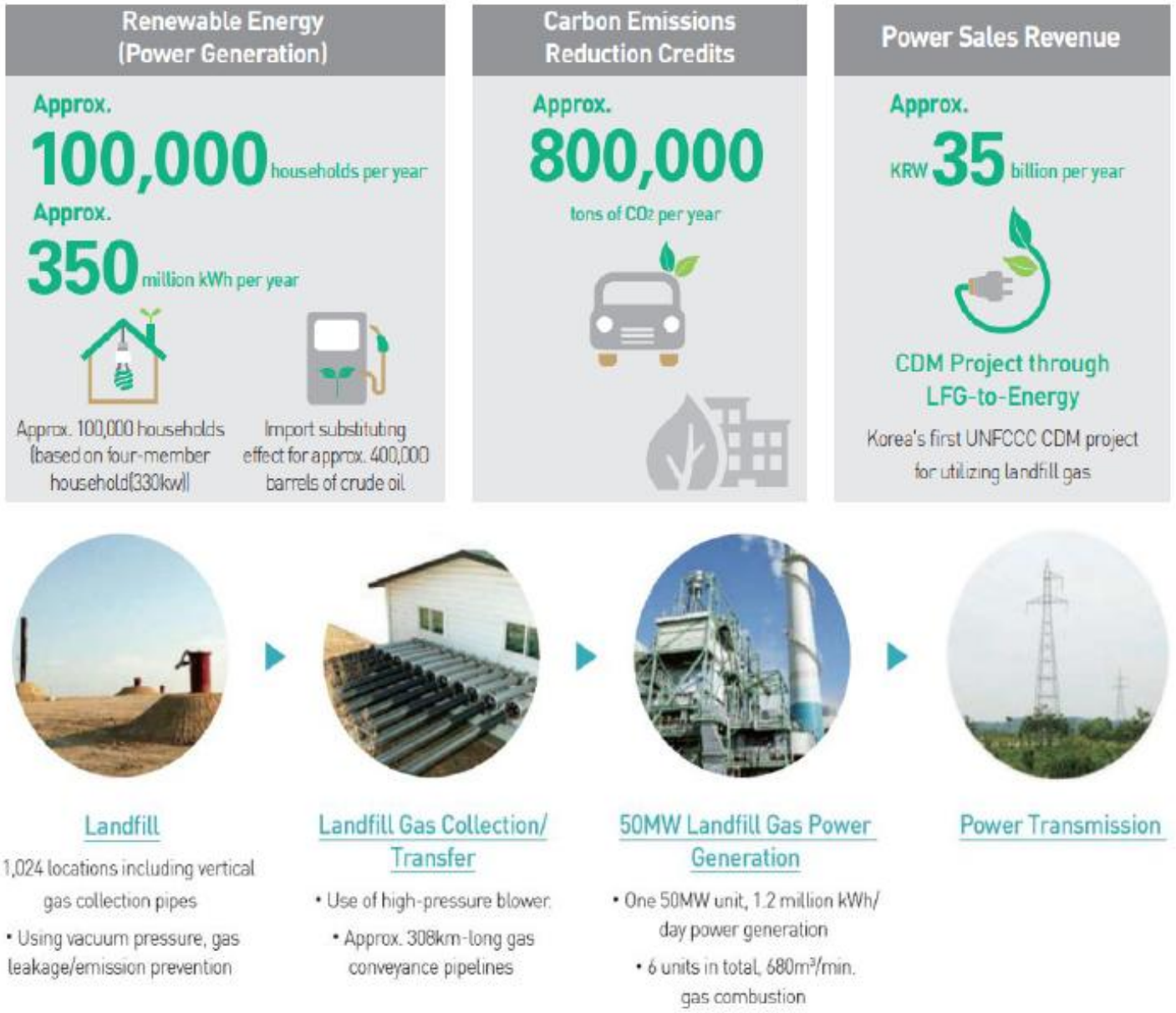
Dedicated container: Payment stickers and chips
32%

Radio-Frequency Identification (RFID)
14%

Food Waste Disposal Methods - RFID

Usage: Tap the dedicated RFID card → Lid opens → Dispose of food waste → View weight and cost on screen.

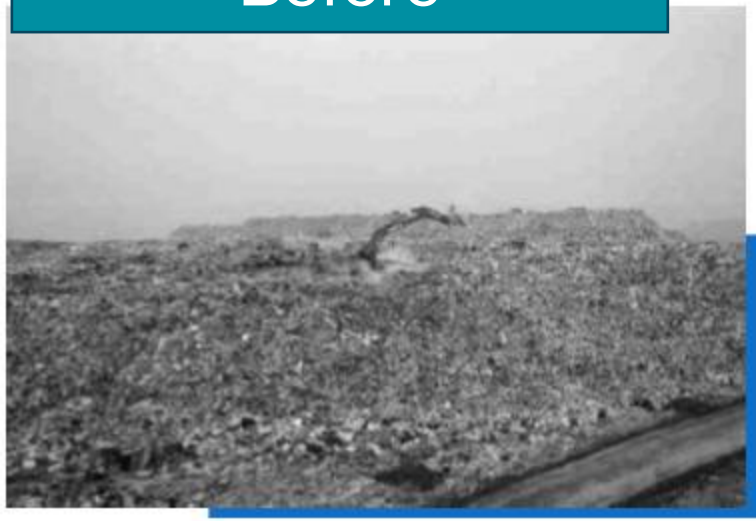
Seoul, South Korea's 40 years journey...



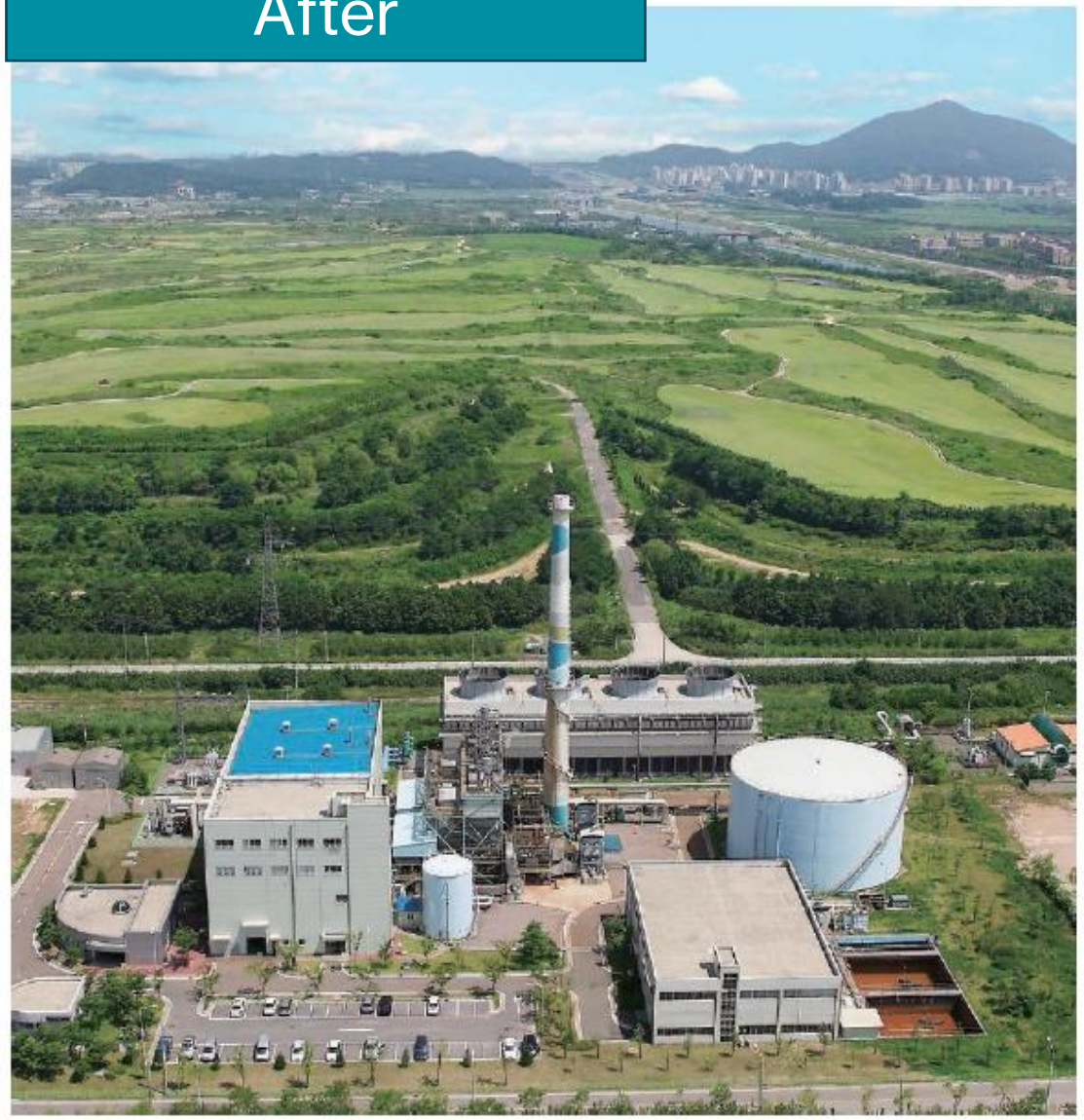
- Seoul manages Asia largest landfill site
- The landfill is now converted into a golf course
- Seoul manages its landfill site and recovers its resources through various mechanisms:
  - Power generation and sales revenue
  - Carbon credits

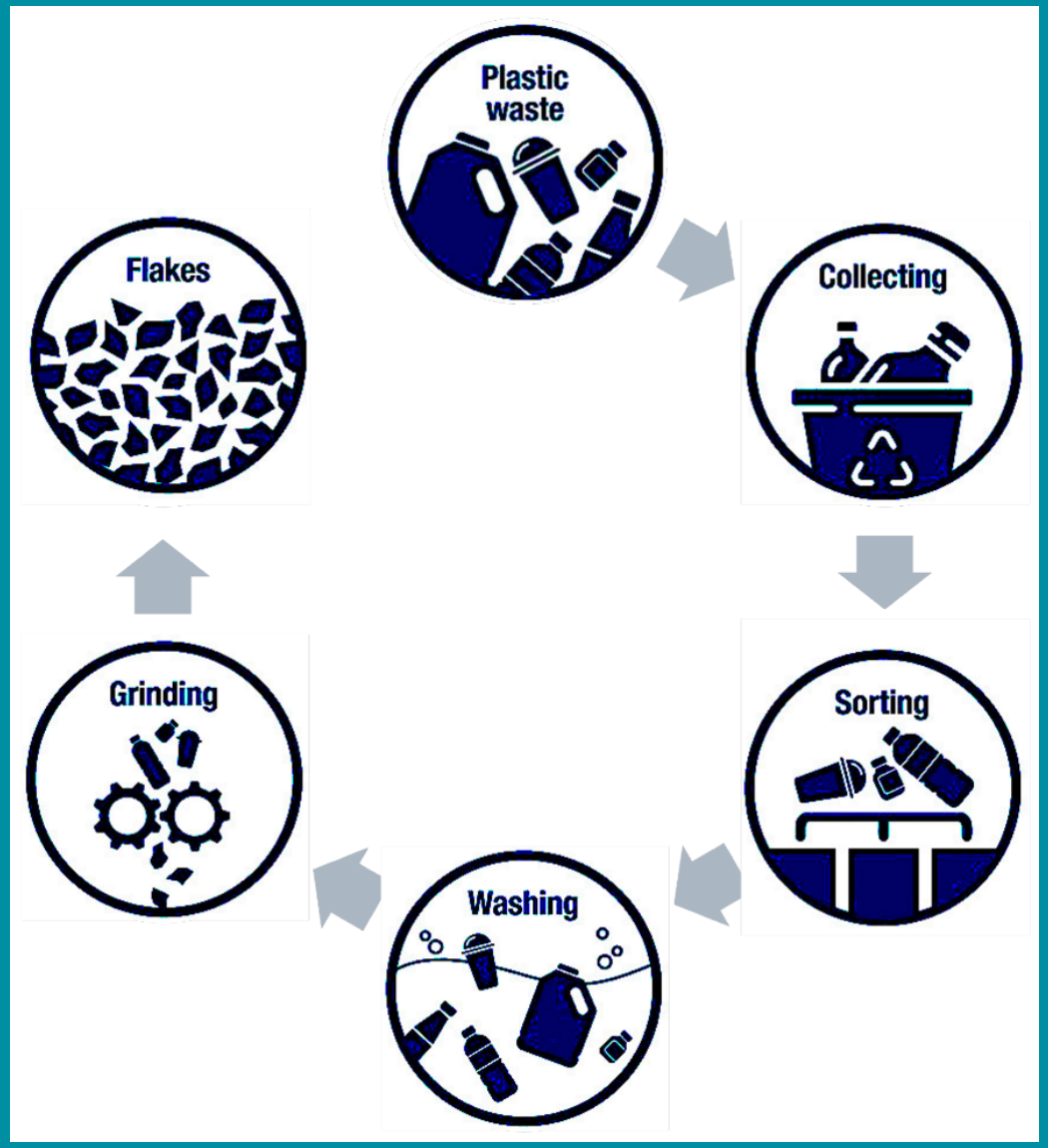
Seoul, South Korea's 40 years journey...

Before



After





Cases of Good Initiatives in Plastic Waste Management

Tackling Multi-Layer Plastics: Punjab's Plastic to Chipboard

- Patiala has established Plastic Recycling Facility (PRF) under CSR initiative
- Facility recycles multilayered plastic (MLP) and converts into chipboards.
- These chipboards offer an environmentally friendly alternative to plywood, furniture, roofing sheets, temporary shelters, and damp-proof walls.
- Plastic waste is sorted and cleaned, then it is shredded into flakes of around 10 mm in size. These plastic flakes are then further processed to make a durable chipboard which is resistant to water, termites, and rust.
- The facility operates with a processing capacity of 10 tonnes of waste per day, producing around 75 to 100 chipboards daily.

Source: INDIA'S CIRCULAR SUTRA, A COMPENDIUM OF GOOD PRACTICES, NIUA, 2025

Bhavnagar Corporation – Eco Bricks from Plastic Waste

- Citizens were asked to fill one-liter PET bottles with around 350 grams or more of non-recyclable plastic waste, including wrappers from snacks, milk bags, gutkha, chocolate, and other similar plastics.
- Paid Rs. 10 for every three such filled bottles, or the equivalent of 1 kilogram of plastic waste.
- Implemented in collaboration with schools.
- 14 tons of plastic waste was used in developing a garden.

Junagadh Corporation – Prakrutik Cafe

- 'Prakrutik Plastic Cafe' - innovative approach to plastic waste management by offering food in exchange for plastic waste.
- Started in June 2022 and serves snacks and beverages to customers who bring in plastic items.
- The customers served with juices for 500 grams of plastic, *Dhokla*, *Thepla*, *Poha*, and *Aloo parathas* for 1 kg of plastic.
- Managed SHG named Sarvoday Sakhi Mandal and the government provided infrastructure to SHG for setting up cafe.
- Not only promotes recycling but also emphasizes healthy eating by using organically grown vegetables and serving food in clay utensils.
- The collected plastic is sold to recycling companies which generates further income for the SHGs.

Junagadh Corporation – PET bottles to Art Installations

- Junagadh Corporation has collected plastic PET bottles and used it for creating a tree
- This initiative catered to both protecting environment and also reusing plastic waste

Eliminating Single-Use Plastic: Chhattisgarh's Innovative Steps

- Ambikapur' s innovative approaches such as the Bartan Bank and Jhola Bank for eco-friendly alternatives to single use plastic
- Bartan Bank initiative - enables residents to rent steel utensils, under the 'ask-use-wash-return' model, at a minimal cost for community gatherings, marriages, and other social functions.
- Run by SHGs. Total 8 Bartan banks are being run empowering 89 women.
- The Bartan Banks generated a total revenue of INR 16.78 lakhs since 2017, significantly reducing the consumption of single-use plastic utensils.
- The Jhola Banks have sold thousands of cloth and jute bags, amounting to a revenue of INR 3.5 lakhs.

Source: INDIA'S CIRCULAR SUTRA, A COMPENDIUM OF GOOD PRACTICES, NIUA, 2025

Plastic Waste Recycling in Itarsi, Madhya Pradesh

Recycled Plastic Bench, Weight: 40 Kg

Quality: Excellent

Strength: 500 Kg

Water Proof

Rust Proof

Light Weight

Long Lasting

Rate: Low as compared to Cement/Iron Benches

Recycled Plastic Bench, Weight: 50 Kg,

- Pioneering initiative to manage plastic waste while generating economic and environmental benefits.
- Converts plastic waste into usable items, reducing landfill burden and promoting sustainable urban development
- Plastic waste is collected through MRF Centers and it is then sorted into categories like PET, HDPE, and LDPE before shredding and melting
- Converted into products such as benches, chairs, and paver blocks.
- These recycled plastic items are installed in public spaces like parks and temples.
- A recycled plastic bench costs INR 4,500 compared to INR 8,000 for a cement bench.

Source: INDIA'S CIRCULAR SUTRA, A COMPENDIUM OF GOOD PRACTICES, NIUA, 2025

Government order for the Use of Plastics in Road construction

- The Ministry of Road Transport & Highways, Government of India has made it mandatory for road developers to use waste plastic along with bituminous mixes for road construction to overcome the problem of disposal of plastic waste in India' s urban centres.

- The road developers will now have to use waste plastic along with hot mixes for constructing bitumen roads within 50 km of periphery of any city that has a population of over 5 lakh.

- More than 1031 Kms of rural roads have been laid by DRDA, Tamil Nadu, distributing a minimum of 40 Kms for each district. This was extended to all the 29 districts of Tamil Nadu

R. Vasudevan, who gave his patent for the system to the government for free

Utilization of Plastic Waste in Road Construction in Bengaluru

Location	Road Length in Km	Period of Laying
Outer Ring Road of Bangalore	14	2008-09
Bangalore University Road	8	2013-2014
Under PMGYS in Karnataka	80	2014-2015
Major Roads in Bangalore	20	2017-2018

- Bruhat Bengaluru Mahanagara Palika (BBMP) has worked with a Bangalore based company, KK Plastic Waste Management Ltd. in providing innovative solution by reusing non-recyclable plastics in construction of roads.
- The technology has been patented and certified by the Centre for Transportation Engineering (CTE) and the Central Road Research Institute (CRRI). Since 2002, The Company has been successful in laying 3000 Km of road length successfully in Bangalore city by using 12,000 Tonnes of the plastic waste collected from city's garbage.
- A Memorandum of Understanding (MoU) was signed with BBMP since 2004-2005 to till date for collecting plastic waste from city's garbage and mixing KK Poly Blend in Bitumen while constructing roads at a rate of Rs. 27/Kg.
- The manufacturing units with a potential of 20 tonnes per day are located in: 1. Yelchenahalli: Kanakpura Road 2. Anjanapur, Kanakpura Road
- BBMP also helped in establishing the network with the bulk generators for collecting the plastic waste from the source of its generation within the city. Following are the roads being laid in recent time: 2018

Tirupati's Solar Shift: Giving Old Panels A New Life

- Rapidly rising solar panel waste from homes, industries & solar farms.
- No organized system for **collection, tracking, and recycling**.
- Need for environmentally safe handling of PV waste.

Steps taken by ULB

- Tirupati MC partnered with **APEMCL** + private recyclers to introduce first-of-its-kind **digital solar panel waste recycling system**.
- Uses **APEMCL Online Waste Exchange Portal** to track & recycle end-of-life solar panels.
- Collected old panels from households, industries & solar farms.
- Registered all waste generators on a **digital portal**.
- Panels transported to certified recyclers for material recovery.

Impact

- Reduces electronic waste, conserving critical resources.
- Strengthens waste management through digital tracking and accountability.
- Enhances economic viability of solar panel recycling, making it a sustainable industry.

Impact

Recovers **up to 90% materials** (glass, silicon, metals).

Plastic to Alternate Fuel: Co-Processing of Plastics Waste in Cement Kiln- ACC Cement Limited (Gagal Cement Works)

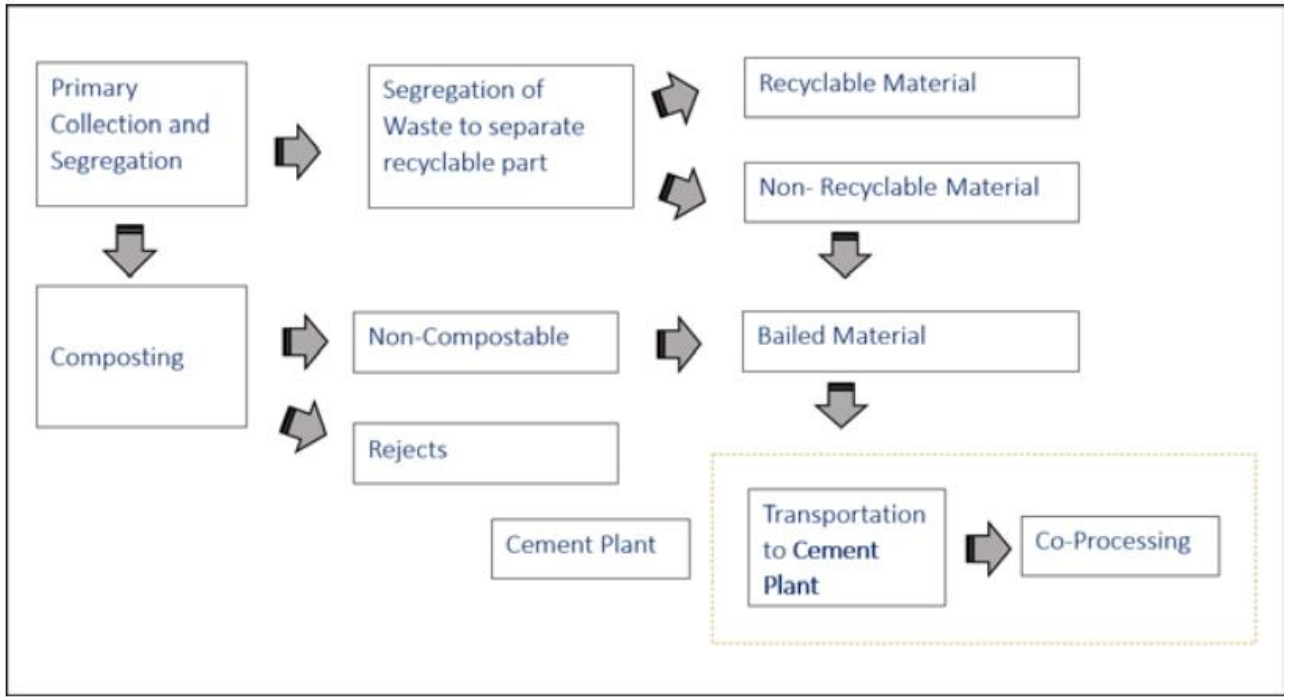


Figure: Co-Processing of Plastic Waste

The Initiator: ACC Limited is India' s foremost manufacturer of cement and concrete. Gagal Cement Works is one of cement plants in ACC Group.

The Preparation: Green Soldiers from Gagal Cement works launched first project titled 'Making Gagal Plastic Free' . Segregation is the essence of effective waste management and hence, a workshop was organized for the stakeholders. All colony and local village residents were invited for a discussion on the strategy. The Green Soldiers team collected about 53 Tonnes of plastic waste, which was successfully co-processed in Gagal cement kiln.

The initiative: The drive started with collection of 50 kgs/week, which is presently recording approximately 2 Tonnes of collection per week. This gave a clear indication that the stakeholders were increasingly becoming more aware about segregation and concerned about their environment.

Results:

- Co-processing of waste at cement kiln is the best disposal option than conventional options of landfilling and incineration. It also substitutes fossil fuel.

- The initiative can be replicated across other industries and companies countrywide, as well as at a global level. The beauty of the initiative is that, keeping the ideas intact, the projects can easily be moulded to suit the climate, topography and biodiversity of any area across the world.

Greener Kedarnath - India's First Digital Deposit Refund System

A litter-free Kedarnath Yatra was facilitated by India's first Digital Deposit Refund System (DRS), a highly effective, community-owned joint initiative.
This initiative involved the Nagar Panchayat, Vyapar Mandal, Safai Karamchari, Pittu Sabha, Mule Union, Yatri, and local residents. In this system, QR codes were affixed to plastic bottles, which were sold to customers with a nominal surcharge, refundable upon deposit. Customers returned these bottles and received a refund, while the municipality collected and forwarded the bottles for recycling.

Problem Statement

The significant footfall in Kedarnath, a prominent tourist destination, generated a considerable amount of plastic waste. To address this issue, a Digital Deposit Refund System was implemented by the Kedarnath Municipal Council.

Project Highlights

1. Bottles were labeled by the brand owner, USI and sold to distributors.
2. A distribution network collected and sold USI-labeled bottles to retailers.
3. Retail outlets purchased USI-labeled bottles from distributors at ₹X per bottle and sold them to consumers.
4. Consumers purchased the product, paying ₹X per bottle to retailers.
5. Customers returned USI-labeled empty bottles to the Reverse Vending Machine (RVM) and received ₹X per bottle from an Escrow Account.
6. A mobile application was developed to efficiently manage the Digital Deposit Refund System (DRS), facilitating collection and payment mechanisms, complemented by back-end solutions for operations and scheme management..

Project Impacts

Environmental Impact:

- Clean material was utilized for reuse and recycling.
- A total of 1200 kg of legacy waste was collected and recycled.
- The Nainital High Court issued a directive through Writ Petition (PIL) 93 of 2023 to implement the scheme statewide.

Social Impact:

- A behavioral shift toward responsible disposal was promoted.

Personal Impact:

- Local green jobs were generated.
- A national award was instituted by the Ministry of Electronics, Information, and Technology (MeiTY) for the first Digital Innovation on the Deposit Refund System implemented in Uttarakhand.

Technological Impact:

- Unique Serial Identification (SUI) was implemented for verification and authenticity.
- System transparency and data security were assured.
- Traceability for recovered material was established, facilitating reuse, refill, and recycling efforts.

Raising awareness on plastic waste in Dehradun

To enhance the Plastic Waste Management rules at Dehradun, India, Earth5R, an Environmental Organization based in India initiated a project called **‘Know Your Plastics’ .** The project aims at **raising awareness about plastic waste** and also **aspires to increase recycling rates of products**.

Clean-Up And Classification Of Plastic Waste

Volunteers visited 10 locations in their neighbourhood to collect the maximum amount of plastic waste

Waste Data Utilised For Research Work And Creating Awareness

10 clean-up sessions, analysed the waste collected
246 plastic waste items were collected
150 Multi-Layer Packaging(MLP)Products
48 Low Density Polyethylene Products (LDPE) waste
19 Tetra Packs
9 High Density Plastic (HDPE) Products
5 Polyethylene terephthalate (PET)Products

- **Based on this Plastic waste management awareness drives were conducted**
- **Reduction of Single Use Plastic (SUS)**
- **Recyclable and reusable plastics**

A holistic IEC campaign to promote behavioural change on waste management: Jammu

Jammu has undertaken extensive citizen engagement initiatives, including clean-up drives, river restoration projects, nukkad nataks, segregation drives, Swachhta Rath (mobile messaging vehicle), etc., as part of its IEC campaign that was launched in 2019.

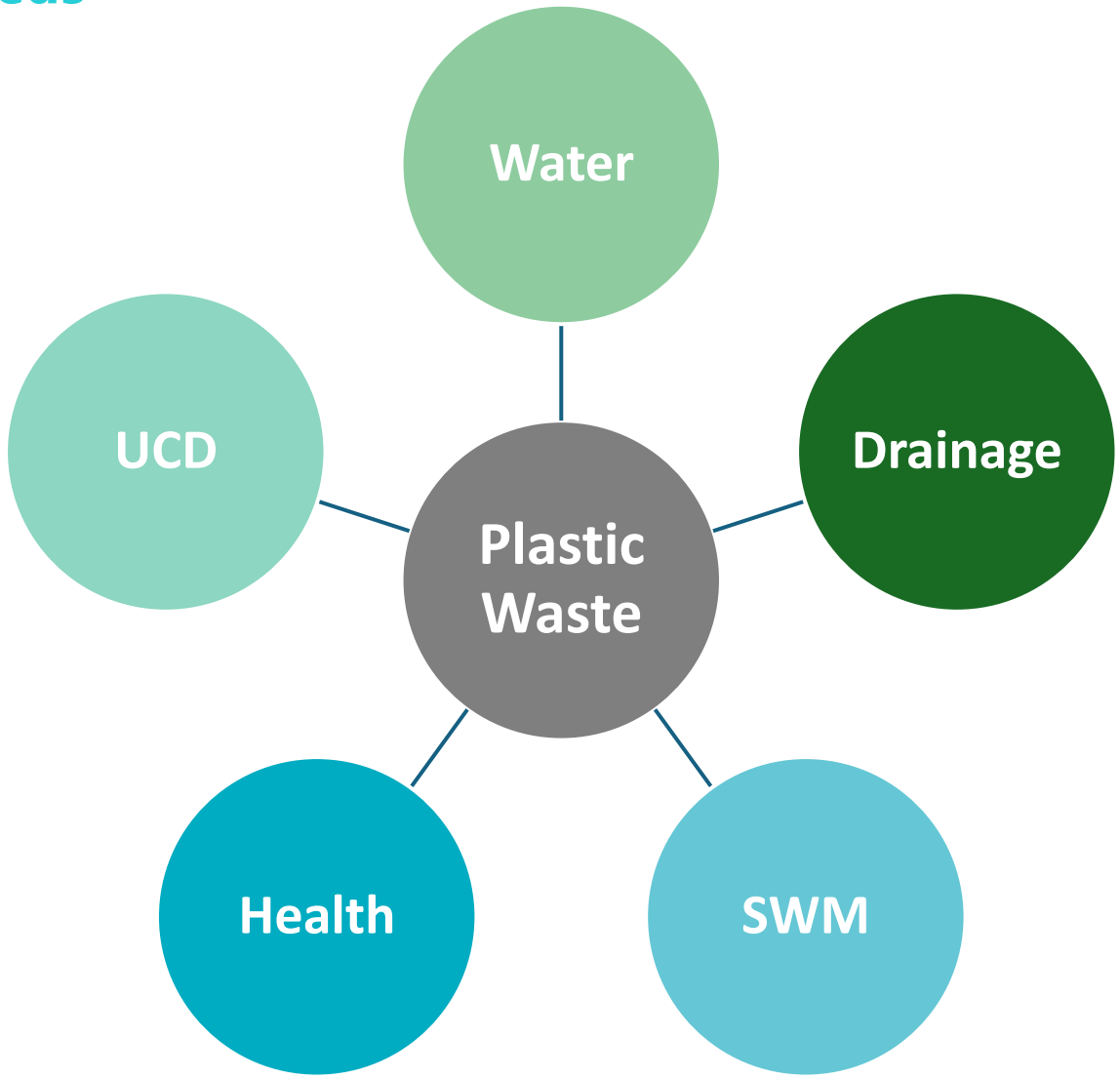
- The Jammu Municipal Corporation (JMC) engaged with Regional and Urban Development Agency (RUDA), a consulting firm in Jammu supporting sustainable development, to plan an IEC campaign identifying the threats caused by improper waste disposal like public health and environmental degradation.
- The JMC and RUDA mapped the stakeholders responsible for the waste management process. They also focussed on BWGs while designing the campaign and devised a special strategy to reach out to these institutions.

IEC initiative	About the initiative
Plastic Lao Thaila Pao Campaign	This campaign is a part of an ongoing effort to spread awareness of the need for responsible plastic use and its disposal. A mini material recovery stall has been set up in a prominent market location to promote sustainable waste management practices as part of the campaign. Under the campaign, citizens are encouraged to deposit their household plastic waste at the stall in exchange for reusable & recycled cloth bags (1 kg of plastic waste = 1 cloth bag).
Save Tawi Campaign	RUDA initiated a massive campaign, 'Save Tawi' at Har Ki Pauri temple, collaborating with Jammu Municipal Corporation. The purpose of the campaign was to sensitize people who visit the temple to offer reverence in an eco-friendly manner and not throw plastics or other kinds of waste in the Tawi river. Volunteers were deputed to instruct people to follow physical distancing norms and throw waste, basis the categories. Awareness was created through public announcements and jingles in the temple premises. The campaign collected 1,220 kg of dry waste.
Swachhta Rath -Bin It Right Campaign	A vehicle, mostly a three-wheeler, is fitted with a speaker playing jingles and runs through the streets of Jammu to sensitize residents for segregation of their household waste and motivating them to put the right waste in the right dustbin.

Holistic Approach for Addressing Plastic Waste Issue

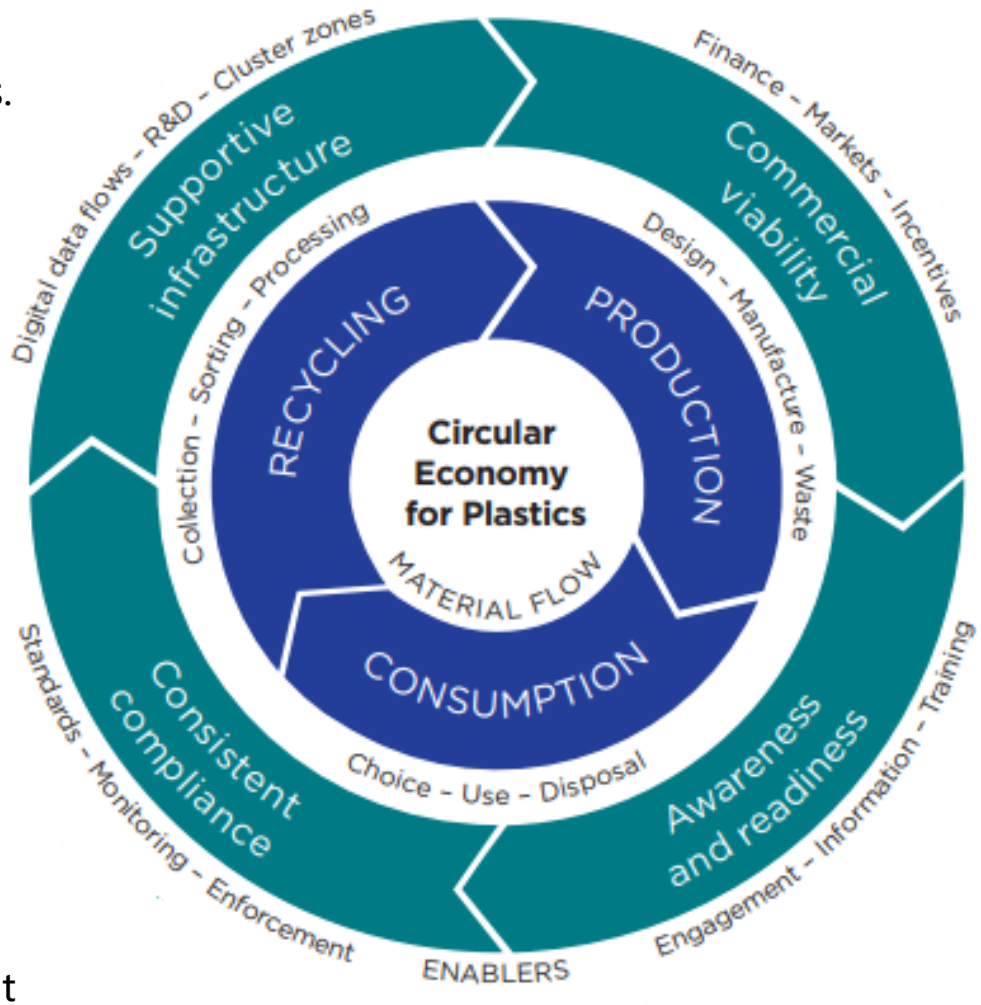
Plastic waste should not be seen in silos, but it needs holistic approach

- **Water Supply Department -** Plastic littering pollutes lakes and microplastics threaten drinking water quality.
- **Drainage & Sewerage Department -** Plastic waste clogs drains and sewers, leading to urban flooding and sewage overflows
- **Health Department -** Burning and dumping of plastics cause respiratory and environmental health issues.
- **Urban Community Development (UCD)** - Engage communities and generate awareness among them on issues due to plastic waste
- **Cross-department coordination** essential for effective plastic waste reduction.
- Joint planning, monitoring, and awareness campaigns needed to tackle the issue of plastic waste management



Way Forward and Next Steps...

- **Create infrastructure –** Establish MRF centers having proper mechanisms for segregating and storing plastic waste for recycling of various grades of plastics.
- **Effective Recycling -** Build sorting facilities with adequate capacities, with mechanical and chemical processing infrastructure to push for effective recycling of plastic waste. There are many start-ups in this sector, whom ULBs can tie up with.
- **Compliance -** Monitor and comply with targets by state on plastics reduction, re-use and recycling. Ensure enforcement of EPR and respective industries are registered for EPR.
- **Collaborative production and design for circularity -** Reduce virgin materia' and engage with start-ups to design for circularity throughout the value chair
- **Forward linkages with viability –** Market assessment and tie up with industries for selling recycled materials to generate adequate revenue. Market the recycled materials and generate demand for the same
- **Awareness and readiness -** Establish and promote a 'zero-waste' culture within Govt. offices and among the citizens. Educate stakeholders about the initiatives taken for circular economy in plastic with a focus on simple tools that are available on phones and devices using digital information.



Discussion on areas to explore with Gandhinagar Municipal Corporation team

THANK YOU

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About us

The Center for Water and Sanitation (CWAS) is a part of CEPT Research and Development Foundation (CRDF) at CEPT University. CWAS undertakes action-research, implementation support, capacity building and advocacy in the field of urban water and sanitation. Acting as a thought catalyst and facilitator, CWAS works closely with all levels of governments - national, state and local to support them in delivering water and sanitation services in an efficient, effective and equitable manner.

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