
Source: https://earth5r.org/

Circular Approach for Cities: Transforming solid waste into resources

Experts group meeting

Center for Water and Sanitation (CWAS), CRDF

Faculty of Planning, CEPT University

Ahmedabad

January 06, 2026

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Source: Google Image

Session 1:
Welcome remarks

Circular Approach for Cities: Transforming solid waste into resources

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Session 2:
Enabling circular economy in urban Solid Waste Management: Opportunities and Challenges

Circular Approach for Cities: Transforming solid waste into resources

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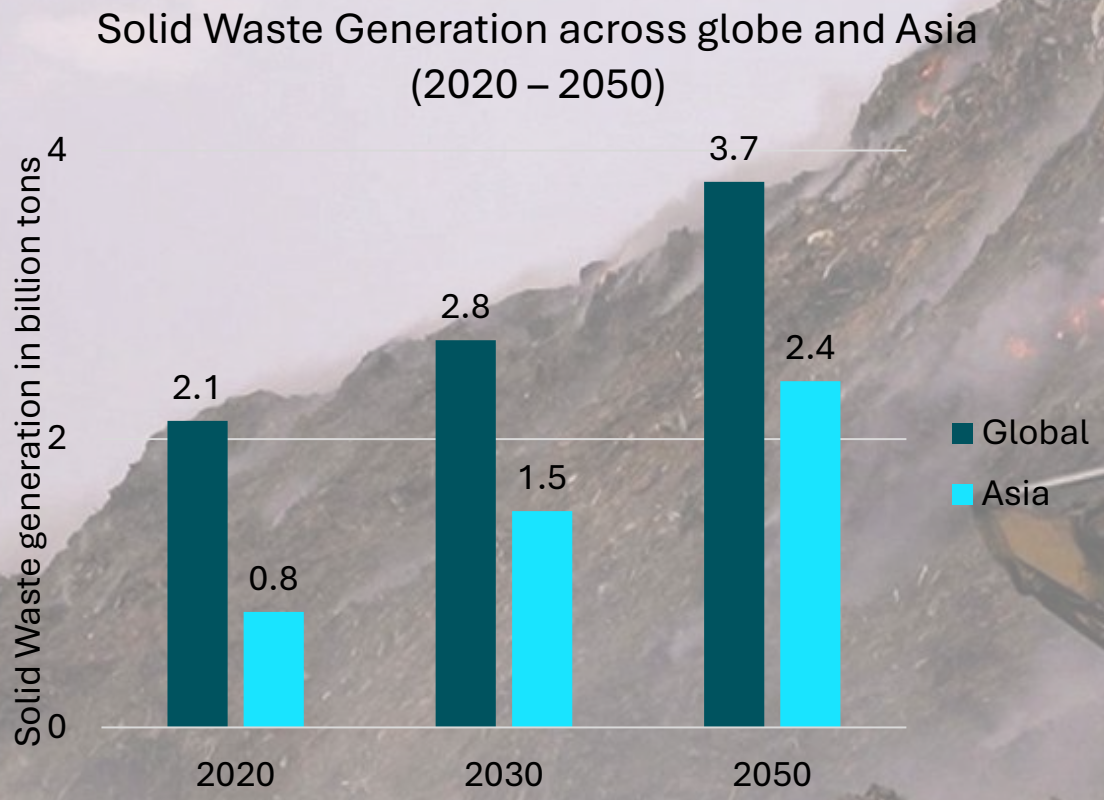
Alarming need to address this.....



Uncontrolled waste dumping

Plastic waste

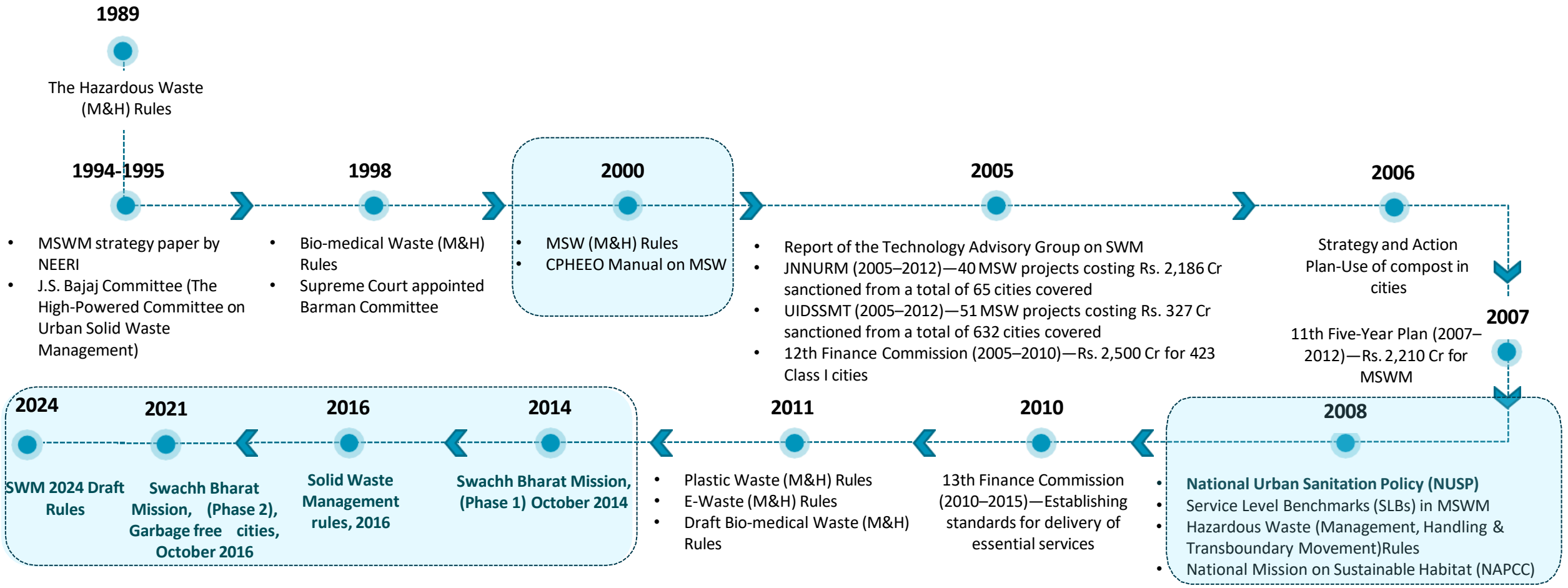
Organic waste

Per capita waste generation is very low in Asian countries as well as varying waste characterization

The global waste crisis and its **environmental impacts** have prompted the need for innovative solutions to address the challenges of waste management.

UNEP report predicts city waste will rise two-thirds by 2050, raising servicing cost to $600 bn

Important National level policy landmarks and initiatives by Government of India for Solid Waste Management



MSW Rules, NUSP and Swachh Bharat Mission key milestones for SWM . . .

Source: Part2_SWM_CPHEEO.pdf

Current trend of Municipal Solid Waste Management in India

98% Wards with 100% Door to Door Collection

1,62,188 Tonnes per day
Waste generates

1,30,777 **(81%)** Tonnes per day
Waste processed

To incentivize cities for performing well, star rating protocol came into action under the aegis of Swachh Bharat Mission

Shift from waste management to resource management

Focus is on segregation, decentralization, circular economy

2423
Total number of Dumpsite

712
Remediation complete

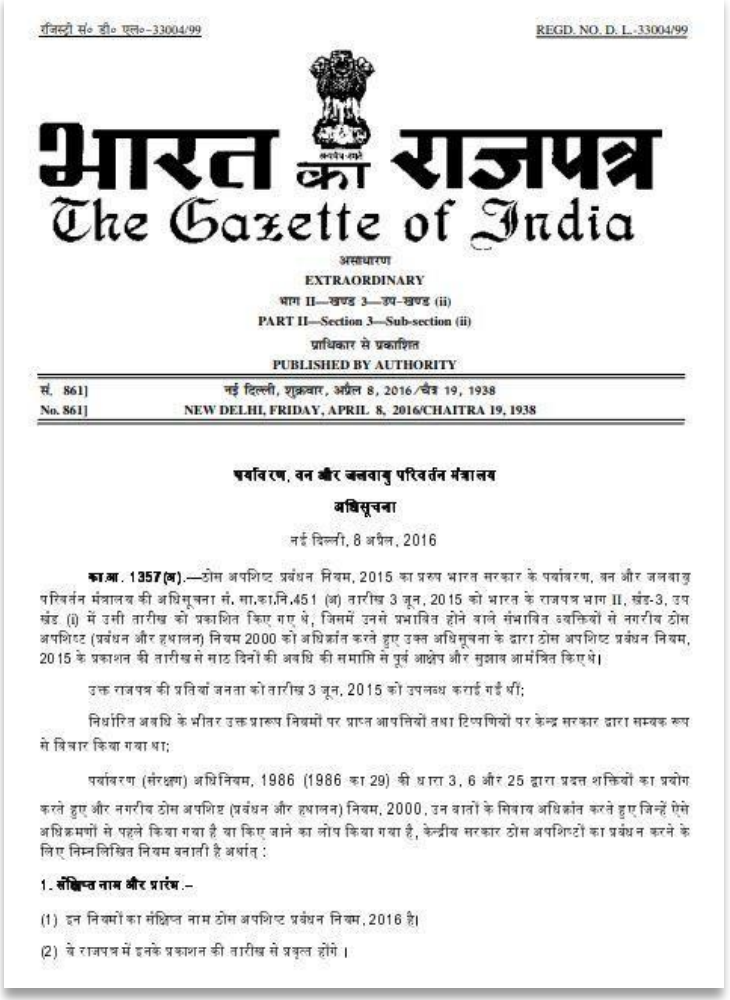
1169
Remediation approved & on-going

Source:, : Retrieved from Swachh Bharat Mission Urban Website, dated on June 2025

India's SWM Rules (2016) provided a focus on recycle and reuse…

Focus of Solid Waste Management Rules (2016) on the following aspects -

- **Segregation at source level** with an intend of focusing on circular economy
- **5% of the total plot area or minimum 5 plots/sheds are required** to be dedicated **for recovery and recycling facility.**
- **Manufacturer of disposable products** (such as tin, glass, plastic packaging etc) are required to provide **financial assistance** to the ULBs **for establishing proper waste management facility.**
- SWM rule promotes **construction of compost plants** which will provide high nutrients fertilizers to the farmers.
- **Industrial units** who are depended on fuel and **located within 100 km from any solid waste-based RDF plant**, shall **replace 5% of their fuel requirement by the RDF produced fuel.**
- **SWM 2024 (draft rules)** also focus on **bulk waste generators** and their links for circular economu



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भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

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No. 861] NEW DELHI, FRIDAY, APRIL 8, 2016/CHAITRA 19, 1938

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 8 अप्रैल, 2016

का.आ. 1357(अ).—ठोस अपशिष्ट प्रबंधन नियम, 2015 का प्रस्ताव भारत सरकार के पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय की अधिसूचना सं. सा.का.नि.451 (अ) तारीख 3 जून, 2015 को भारत के राजपत्र भाग II, खंड-3, उप खंड (i) में उसी तारीख को प्रकाशित किए गए थे, जिसमें उनसे प्रभावित होने वाले संभावित व्यक्तियों से नगरीय ठोस अपशिष्ट (प्रबंधन और हथालन) नियम 2000 को अधिक्रांत करते हुए उक्त अधिसूचना के द्वारा ठोस अपशिष्ट प्रबंधन नियम, 2015 के प्रकाशन की तारीख से साठ दिनों की अवधि की समाप्ति से पूर्व आक्षेप और सुझाव आमंत्रित किए थे।

उक्त राजपत्र की प्रतियां जनता को तारीख 3 जून, 2015 को उपलब्ध कराई गई थीं;

निर्धारित अवधि के भीतर उक्त प्रारूप नियमों पर प्राप्त आपत्तियों तथा टिप्पणियों पर केन्द्र सरकार द्वारा सम्यक रूप से विचार किया गया था;

पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3, 6 और 25 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए और नगरीय ठोस अपशिष्ट (प्रबंधन और हथालन) नियम, 2000, उन बातों के सिवाय अधिक्रांत करते हुए जिन्हें ऐसे अधिक्रमणों से पहले किया गया है या किए जाने का लोप किया गया है, केन्द्रीय सरकार ठोस अपशिष्टों का प्रबंधन करने के लिए निम्नलिखित नियम बनाती है अर्थात् :

1. संक्षिप्त नाम और प्रारंभ.–

(1) इन नियमों का संक्षिप्त नाम ठोस अपशिष्ट प्रबंधन नियम, 2016 है।

(2) ये राजपत्र में इनके प्रकाशन की तारीख से प्रवृत्त होंगे।

Source: Solid Waste Management Rule (2016); Solid waste management rules, draft (2024)

Moving from linear to circular economy

Cities concentrate waste generation, infrastructure, markets, and labour—making them ideal laboratories for circular solutions.

The circular economy has emerged as a promising approach to transform the linear "take-make-dispose" model into a more sustainable and efficient system.

Dimension	Key Benefits
Environment	Reduced waste, pollution, and land degradation
Climate	Lower GHG emissions, methane avoidance
Economy	Value creation, resource efficiency
Urban Finance	Lower SWM costs, new revenue streams
Jobs & Livelihoods	More jobs, informal sector inclusion
Public Health	Cleaner cities, safer workers
Resilience	Reduced material dependence, local supply chains

Source: Solid Waste Management Rule (2016)

SBM focused on concept of 3R (Reduce, Reuse, Recycle), now evolving to 5R

- **To ensure maximum resource recovery by converting waste to wealth**
- The theme of **Swachh Survekshan**, **for 2024 is Reduce-Reuse-Recycle**
- Under the campaign **"Meri LiFE, Mera Swachh Seher"** thousands of **RRR (Reduce-Reuse-Recycle) centres have been set up** in India
- **Encouraging community participation as citizens contribute towards** reuse or recycling
- There are **other unique RRR initiatives** such as making murals, artefacts and reusable products, generating energy etc **engaging local governments, Self help group, private organizations etc.**

SBM 2.0 already supports several **5R principles**

Aspiring to move towards **7R: Systemic Circularity**

Rethink – Refuse – Reduce – Reuse – Repair – Repurpose – Recycle

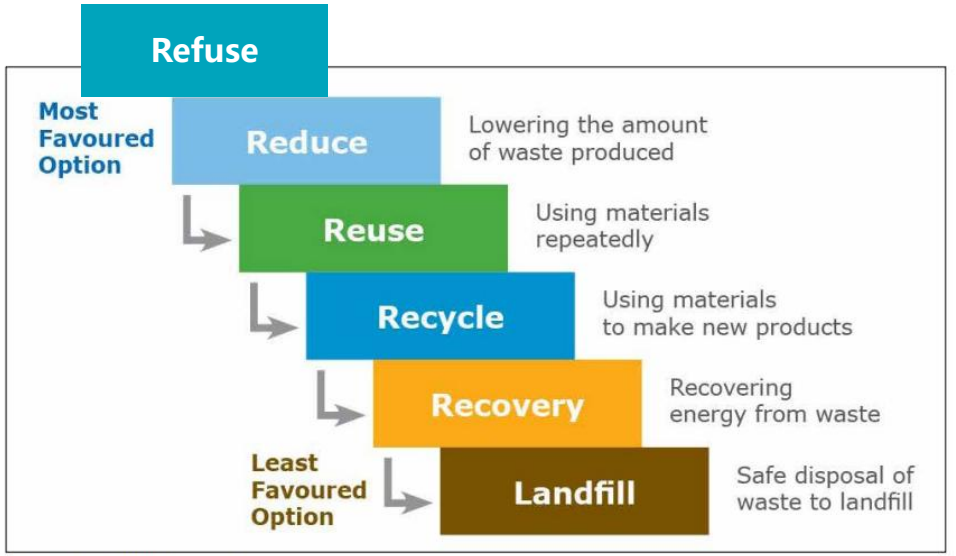


Figure: Management of Plastic Waste

Source: https://sbmurban.org/storage/app/media/Meri_LiFE_Mera_Swachh_Shehar_documentation.pdf

CWAS is supporting as a Swachhta Knowledge Partner (SKP), GoG and also three cities of Gujarat to move towards climate resilient waste management services with focus on circularity

Support as SKP

59
Total Trainings

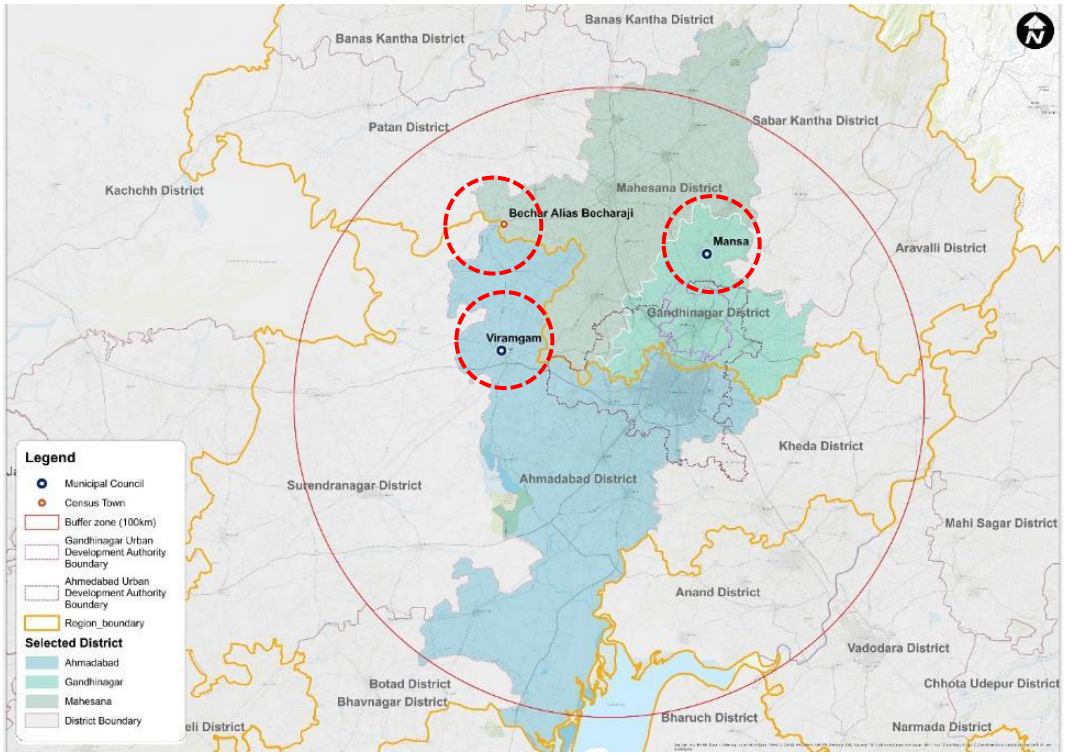
07
Municipal corporations
157 Municipal Councils

38
Districts and RCM level trainings

3800+
ULB officials trained

- A platform to share challenges and feedback of ULB officials to state level officials
- Strengthened capacity of urban and rural officials for implementing SBM 2.0

Support to three cities



Waste (wastewater and SWM) Management Action Plans


Solid waste management poses distinct challenges in small and medium towns compared to larger municipal corporations

Challenges of solid waste management in small and medium towns of India

Source

- **Lack of segregation at source**, manually segregation by ragpickers at dumpsite.
- **Limited Infrastructure** for segregation at city level.

Collection

- **Cities have sufficient infrastructure** for D2D collection.
- **Operational challenges** in management of D2D even faced by private operator.
- **Lack of accountability and monitoring** in D2D contracts

Waste Processing and Treatment

- Lack of processing infrastructure
- Few cities have MRF Centres and equipment for waste processing but **face operational challenges.**
- **Lack of capacity** of private operator.

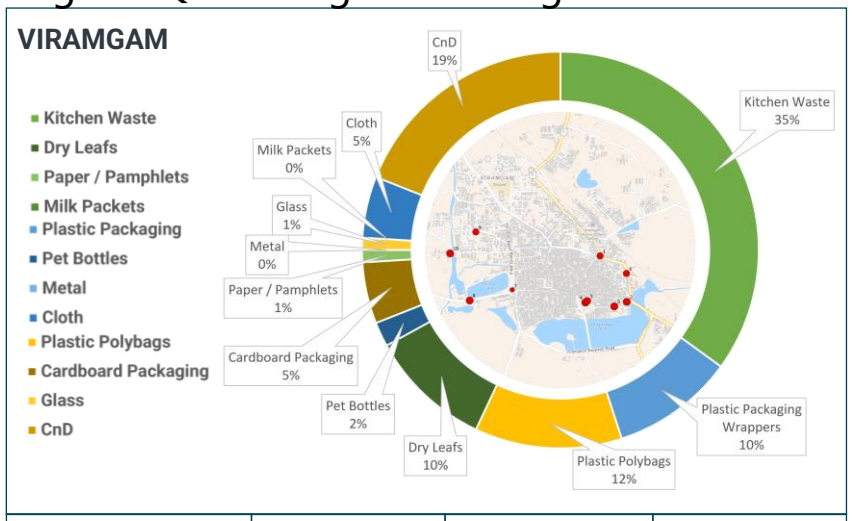
Recycle/ Reuse

- **Presence of informal market** for selling waste to recyclers.
- Missing market for forward linkages
- **Plastic waste and C&D waste management** are main problem due to lack of quantification.
- Very few cities have functional C&D waste management sites and lack of demand of reusing the waste.

Need for waste characterization at GVP and dumpsite is crucial




Using the Quartering and coning method at SWM processing site, waste composition was derived for the city



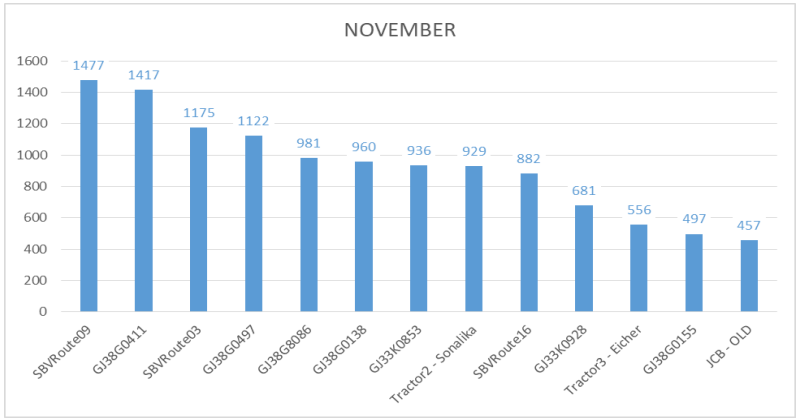
Kitchen Waste is in Majority with 35% followed by Plastic i.e. 24%	Only 9% of the waste is Recyclable	Only 8.3% of the plastic waste is recyclable	19% of total waste is CnD waste

	Type of waste	Weight (kgs)	Percentage (%)
1	Organic (kitchen & garden waste)	1.6	26.7
2	Textile	1.28	21.3
3	Inert	1.2	20.0
4	Low density plastic	1.17	19.5
5	Glass	0.4	6.7
6	High density plastic	0.18	3.0
7	Paper	0.17	2.8
	Total Waste	6.0	100.0

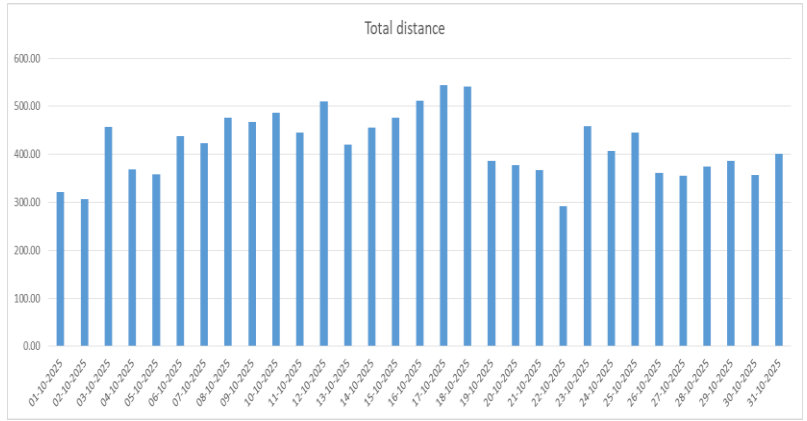
Waste characterization at GVP

Waste characterization at dumpsite

Door to door services present, however irregular collection as well as uneven distribution of collection services across fleet



Total distance covered by all vehicles in a month



Total distance covered by one vehicle in a month

- Door to door services cover 90-90% of urban wards, however their efficiency in collection is lacking
- Irregular timings of collection leads to GVP formation
- No consistent allocation of vehicle with route
- Small lanes mostly lack collection services
- Lack of monitoring system at local level..

Small and medium cities face operational challenges with lacking financial, technical and human resources capacity

Infrastructure available though operational challenges

Lack of technical and human resource capacity

Post contract management challenges, poorly designed contracts; Delayed payment issues

Recovered material at MRF but no forward linkages established

Continuing the tradition practices and absence of innovation in the sector faces significant occupational hazards to sanitation workforces

National Action for Mechanised Sanitation Ecosystem (NAMASTE)

National Safai Karamcharis Finance & Development Corporation
नेशनल सफाई कर्मचारी फाइनेंस एंड डेवलपमेंट कॉर्पोरेशन
(A Government of India undertaking under the Ministry of Social Justice & Empowerment)
ISO 9001:2015

Occupational Hazards for all the workers
Informal workers face more health impacts due to working in deteriorating conditions
Improvement in services and integration informal workers will support in improving the health of the workers
Existing schemes and policies in place but capacity building is required to implement on ground.

The challenge for moving towards circular economy is not policy absence, but execution and incentive alignment

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

03 **Lack of Awareness**
Limited public awareness and other stakeholder awareness of understanding aspects of circular economy

04 **Limited inter-departmental and regulatory coordination**

05 **Financial Constraints**
Limited financial resources for capital and particularly for operations cost hinder the sustainability of the services

06 Lack of **adequate staff** for monitoring compliance

Initiatives have been taken by cities to improve the services across the service chain

Incentivized segregation through **property tax rebates** and community recognition: **General Tax Rebates**

Real time monitoring of door to door collection: Along with GPS tracking, added a feature of alert on detour of vehicle to the monitoring authority

Decentralised waste collection- Involvement of SHGs and informal workers to collect segregated waste and sell dry waste to industries

Collecting and Processing wet waste and utilizing as a compost generating monthly revenue in lakhs

Zero Waste Management (ZWM) units were introduced in the town
Small biogas units & shredders installed at ZWM units

Converting plastic waste into usable items such as benches, chairs, and paver blocks. These recycled plastic items are installed in public spaces like parks and temples

Series of awareness campaigns conducted on various themes of promoting segregation, ban of single use plastic, sanitation workers safety conducted by various stakeholders

These are these leading initiatives, need to identify approaches to scale them up across various small and medium towns of India

- What does a realistic and scalable circular economy model for solid waste look like for small and medium cities in India?
- What can be done immediately versus what requires systemic reforms for local governments?
- How should success be institutionalised beyond individual projects or leadership tenures?

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Partnership and collaboration to attain scale

सत्यमेव जयते
Urban Development
&
Urban Housing Department
Government of Gujarat

स्वच्छ भारत
एक कदम स्वच्छता की ओर

GUJARAT URBAN DEVELOPMENT YEAR 2025

निर्मळ गुजरात 2.0
સ્વચ્છ ગુજરાત, સમૃદ્ધ ગુજરાત

सत्यमेव जयते
DISTRICT ADMINISTRATION MEHSANA
GOVT. OF GUJARAT

શ્રમયોગ • સંગઠન • સમૃદ્ધિ

માણસા નગરપાલિકા

Viramgam
Nagarpalika

બેચર-બેચરાજી ગ્રામ પંચાયત
તા.બેચરાજી

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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.

cwas.org.in
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Source : Google Image

Session 3: Discussion on opportunities and challenges to promote circular economy in solid waste management

Circular Approach for Cities: Transforming solid waste into resources

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Acknowledging the significance of segregation is essential to improving recycling operations

KEY CHALLENGES

Institutional & Governance
- Weak enforcement of segregation by-laws
- Limited ULB capacity for monitoring and compliance

Infrastructure & Service Gaps
- Insufficient decentralized wet-waste processing
- Limited MRF capacity for segregated dry waste

Systemic Challenges
- Lack of incentives and penalties at source
- Inadequate data on waste quantity and composition

Occupational & Operational
- Health risks to sanitation workers from mixed waste
- Limited training of frontline staff

Awareness & Behavior Change
- Low public awareness and weak segregation habits
- Informal recycling driven by mixed waste

What incentives can encourage residents and other stakeholders to practice waste segregation?

Ensuring regular and timely door to door collection and sweeping

Service coverage

- Incomplete coverage, especially in slums, peri-urban areas, and informal settlements
- Narrow lanes and unplanned layouts restricting vehicle access

Operational Challenges

- Irregular timings of collection
- Collection timings not matching with the needs of stakeholders

Systemic challenges

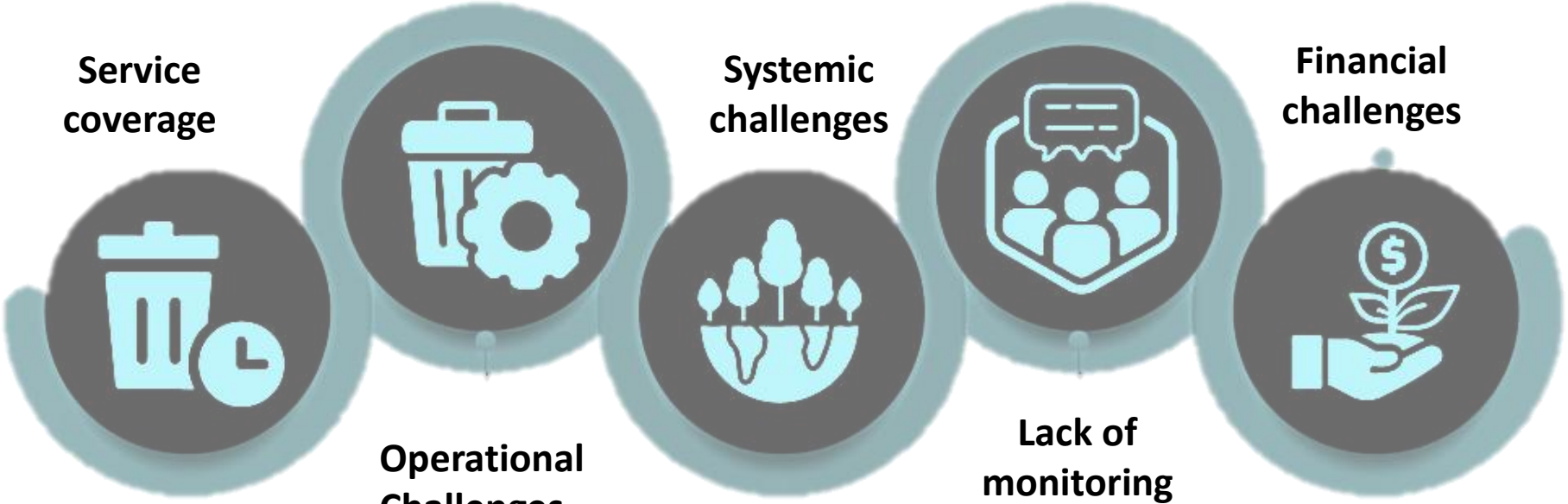
- Lack of a standardized benchmark or guideline set by municipal authorities for sweeping (road length, areas, etc.)

Lack of monitoring

- GPS systems installed in vehicles but not monitored
- Limited capacity of ULBs to monitor and ensure compliance

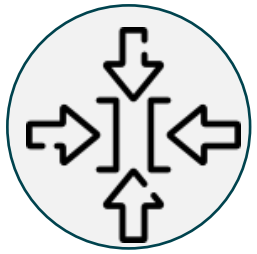
Financial challenges

- High recurring costs for fuel, human resources, and maintenance
- Low cost recovery due to weak user-charge collection



How to ensure regular, timed, monitored door to door collection???

Processing and treatment at small scale is daunting



Scale & Feedstock Constraints

•Insufficient quantity and inconsistent supply of segregated waste
•High seasonal variation in waste composition

Operational & Financial Challenges

•High O&M costs relative to waste quantity
•Limited skilled human resources to operate and maintain facilities
•Delays in payments affecting plant performance

Planning & Technical Gaps

•Limited understanding of appropriate, low-cost technologies for small towns
•Technology selection driven by vendors, not waste characteristics

Contracting & Governance

•Contracts often focus on tonne of waste treated rather than quality of processing and recovery
•Short contract tenures discouraging long-term efficiency

Land & Infrastructure

•Limited land availability for decentralized facilities
•poor access sites roads and utilities (power, water) at processing

Regulatory & Compliance

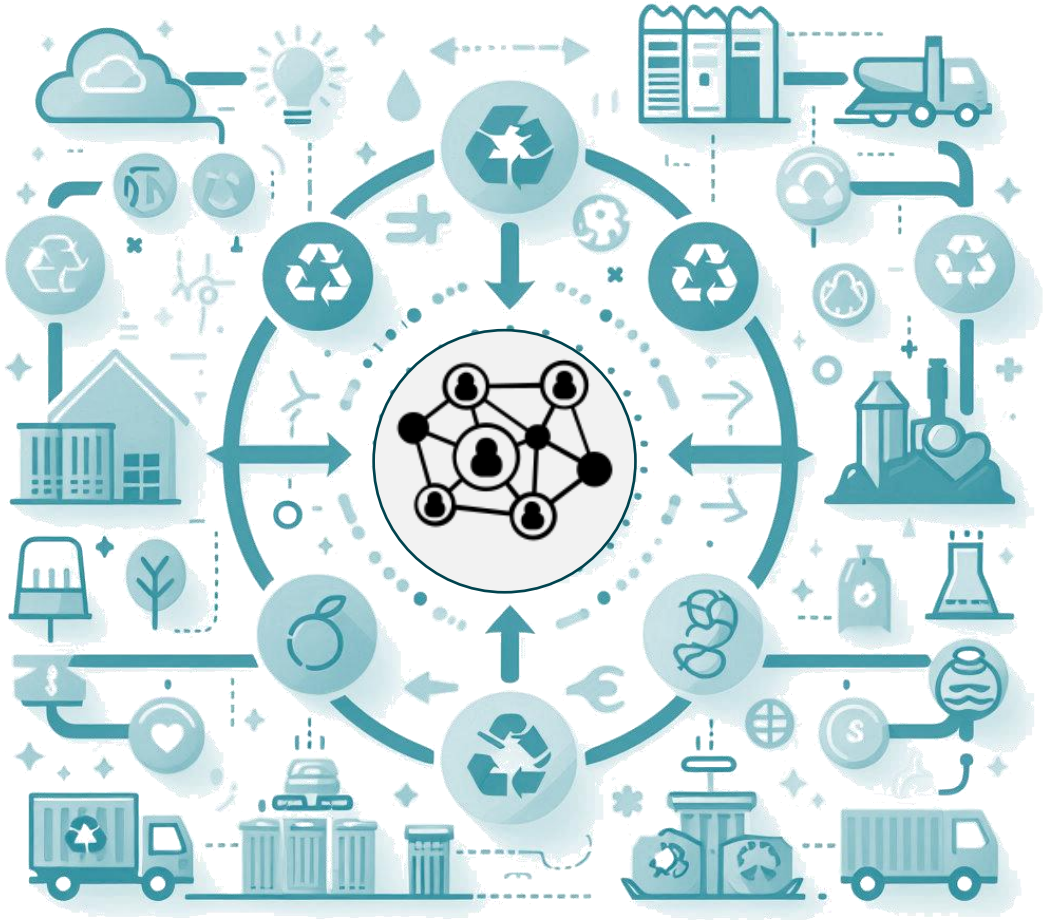
•Inadequate monitoring of environmental standards
•Poor documentation and reporting from facilities

Should cluster based approach be explored for processing?

Do integrated contracts help in improving the processing of waste?

Missing forward linkages for promoting circular economy

What kind of pre-processing will be required to attract private markets for small scale?



Is Waste to Energy an option for small and medium towns??

Can regional or cluster-based approaches reduce costs and improve efficiency? What role should state governments play in aggregation and capacity support?

Plastic Waste Consumption Vs. Recycling

Only **60%** plastic waste is recycled, most of it is done by informal sector.

KEY CHALLENGES

Generation & Consumption
- Rapid growth of single-use plastics
- High use of low-value, multilayered plastics

Institutional & Systemic
- Poor data on plastic waste generation and flows
- Limited coordination among ULBs, producers, and recyclers

Recycling & Processing
- Limited capacity for low-grade and MLP recycling
- Informal sector dominates, with unsafe practices
- Downcycling instead of true recycling

Policy & Enforcement
- Weak enforcement of Plastic Waste Management Rules
- Inconsistent implementation of EPR across states

Market & Economics
- Low and volatile market value of recyclables
- Virgin plastic often cheaper than recycled plastic

How to formalize the informal workers in plastic waste management?

What measures can strengthen the enforcement of existing rules?

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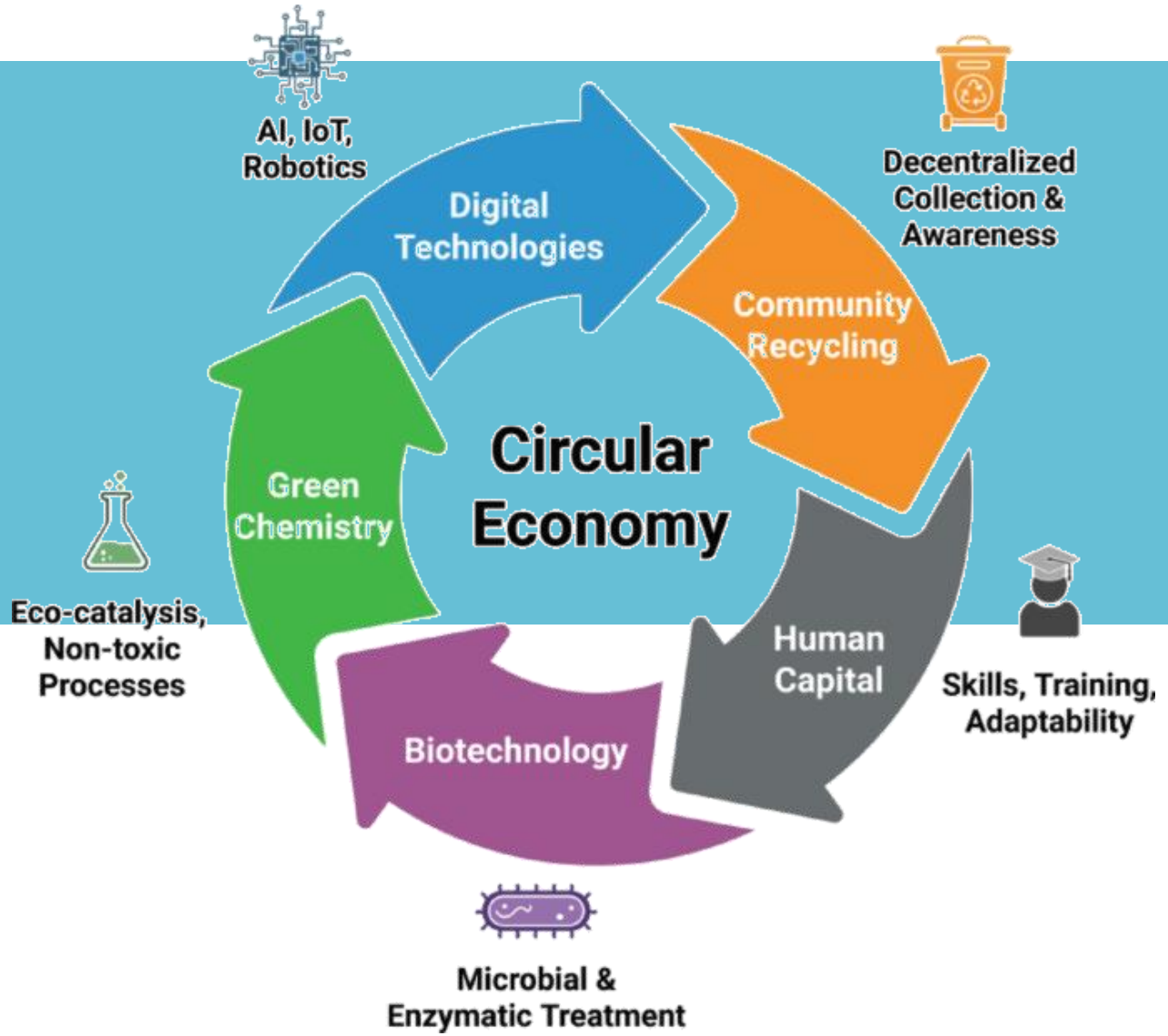
Source: Plastic Waste Management - Issues, Solutions & Case Studies, MoHUA, March 2019

Discussion on opportunities and challenges to promote circular economy in solid waste management

Source	Collection	Waste Processing and Treatment	Recycle/ Reuse
Is segregation necessary or identifying ways to process mixed waste a way forward??? What incentives can be offered to residents and other stakeholders to follow segregation practice???	How to ensure regular, timed, monitored door to door collection???	Should cluster based approach be explored for processing? Do integrated contracts help in improving the processing of waste??	What kind of pre-processing will be required to attract private markets for small scale? Is Waste to Energy an option for small and medium towns??

What institutional and governance efforts can be enhanced to improve SWM???

How to formalize the informal workers in plastic waste management?



Source: Google Image

Session 4: Discussion on innovations and technology for promoting circular economy

Circular Approach for Cities:
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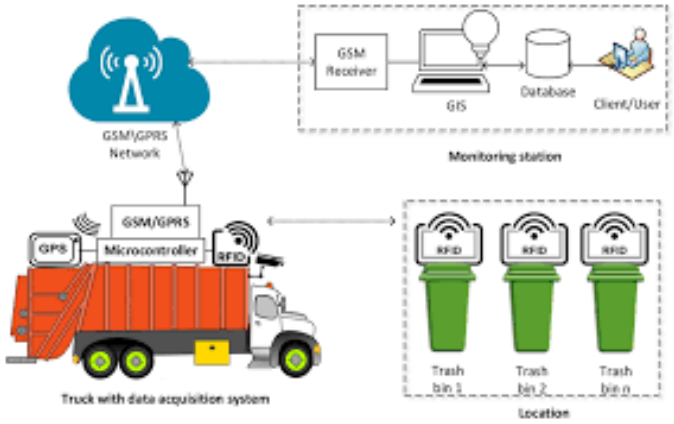
Technologies for supporting segregation of waste and waste collection

IoT and RFID enabled smart bins



Segregation using size and density detection sensors

E-waste Kiosks

Segregation using thermal sensors

Source: Trashcon.in

Technologies for Processing Reuse/Recycle of Solid Waste

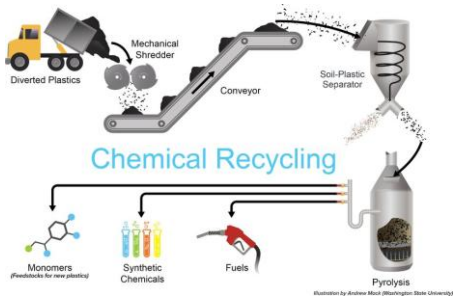
Bio methanation and Biogas Plant

Fully automated MRFs

Camera and AI vision-based sorting

Geofencing and alerts: Virtual boundaries around routes and dumping sites to flag route deviations, unauthorized dumping, or skipped areas

Plastic recycling innovations



Chemical recycling to convert low-value plastics and multilayered packets into oil or feedstock, Plastic roads (bitumen modified with waste plastic), Textile recycling into insulation, mats, and yarn

RDF use in cement kilns

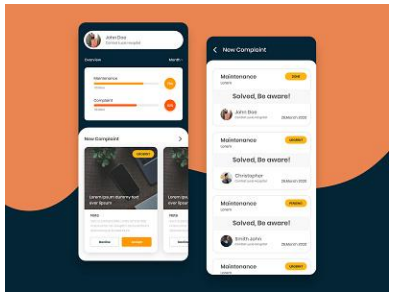
EPR-linked systems

Tech platforms that connect ULB-collected plastics, e-waste, etc., with Producer Responsibility Organizations

Technologies for monitoring of Solid Waste Management services

GPS tracking on vehicles

Citizen complaint and feedback apps



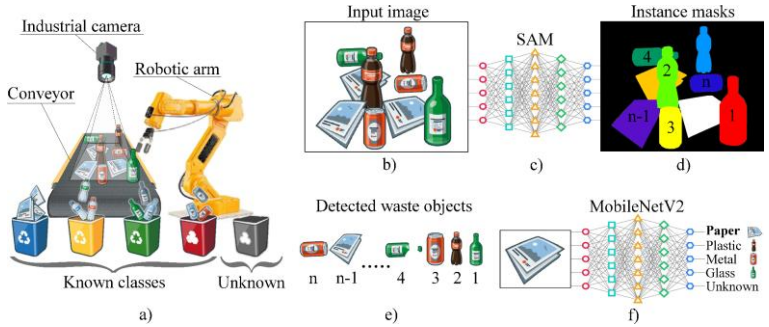
POI Route based route monitoring system

Geofencing and alerts: Virtual boundaries around routes and dumping sites to flag route deviations, unauthorized dumping, or skipped areas

Central databases and dashboards

Central databases and dashboards (often cloud-based) that integrate GPS, RFID/QR, weighbridge, and complaint data

AI/vision-based classification



Camera and AI models at MRFs or transfer stations for automated waste-type recognition, composition estimation, and quality checks on segregated streams

Source: Trashcon.in

Discussion on innovations and technology for promoting circular economy

Source Segregation	Processing and Recycle/Reuse	Monitoring
Are innovative technologies for segregation viable for small and medium sized cities??	Do advanced waste processing technologies work well in small and medium towns? How can small and medium towns create steady demand for compost and recyclables?	How to strengthen monitoring of SWM services? Are there new innovations or technologies available which small and medium scale cities can adopt? What low-effort, non-tech or light-tech monitoring approaches can ULBs adopt for daily solid waste management oversight?

What policy and governance efforts are required for promoting innovations and technologies in circular economy???

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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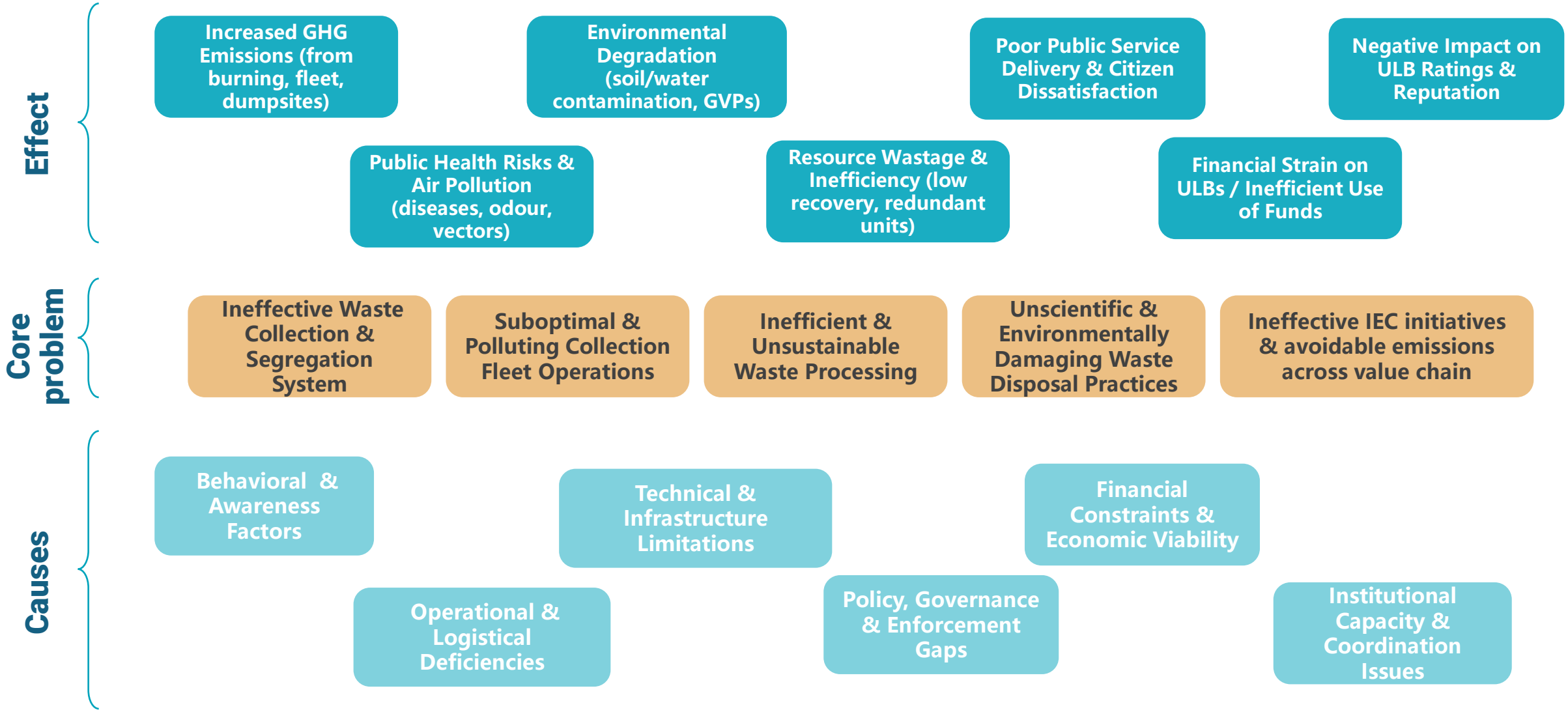
Solid waste management .....



Issues Identified

Source | Collection | Recovery and Processing | Disposal

Inefficient Collection Service

The inefficiencies in D2D service provided is causing massive GVP problems in Viramgam where D2D service is provided on alternate days. Odd timings of D2D in Mansa is leading to the issue of GVPs around Community bins.

Presence of Community Garbage Bins

Use of Community bins in Mansa are the major cause of GVPs forming in Mansa. In viramgam these bins are removed but those areas are still working with the same purpose.

Lack of monitoring hence no accountability

There is a significant lack in monitoring of people as well as the contractors. E.g. Tipper vans are paid just by the properties covered. There is no way to determine and quantify the quality of service delivered.

Inefficient Street Sweeping Service

Viramgam's street-sweeping system employs both 8-hour and 4-hour contract shifts, but the shorter shifts face chronic understaffing and poorly defined responsibilities. This undermines efficiency and accountability in maintaining cleanliness.

Waste Collection Point

These GVPs in Mansa and Viramgam are generally formed by street sweepers and Wheelbarrow operators as these are collection points for bigger vehicles like tipper vans to further take it forward.

Ineffective IEC initiatives

short-term outlook on IEC limits their effectiveness. Sustained impact requires follow-up and monitoring mechanisms across the waste value chain, which is currently missing.

Source: Primary Survey | Google Street View

the open burning of waste, a common practice in areas lacking efficient formal waste management systems, contributes to air pollution. The emitted pollutants, including fine particulate matter and toxic compounds, are associated with respiratory and cardiovascular diseases.

2,70,000

premature deaths each year worldwide

SOURCE: WasteAid. (2021). Waste, Climate and Health. Retrieved from https://wasteaid.org/waste-climate-and-health/

Recommendations from India for preparing policy guiding document

Community participation in garbage classification will help in attaining Circular economy has a positive impact on the SWM value

Awareness among citizens through behavior change activities in their local language.

Promoting WASTE as WEALTH . IEC cell which is constantly thriving to achieve a positive behavior shift among the citizens.

Financial incentive to promote recycle and reuse at property level, helps in reducing waste that needs to be treated at centralized level

Engagement of women led self-help group, evoking an inclusive environment in the paradigm of the SWM value chain

Empathy towards health and safety of sanitation workers by enrolling them under various national level health insurance schemes.

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To incentivize cities for performing well, star rating protocol came into action under the aegis of Swachh Bharat Mission

How Garbage Free cities are assessed?

ODF certification require

1 star

- **16** important components
- **2400 marks required out of 5200**

ODF + certification require

3 star

- **16** important components
- **3600 marks required out of 5200**

ODF++ certification require

5 star

- **24** components – **16** important and **8** aspirational
- **6300 marks required out of 7,500**

Water+ certification require

7 star

- **24** components – **16** important and **8** aspirational
- **7,500 marks required out of 7,500**

Parameters consider for calculating the city's score

Door to Door Collection of waste	Sweeping of public, commercial and residential areas, waste storage bins and litter bins	Dumpsite remediation	Citizen Grievance redressal	**City Beautification, IEC and capacity building**	**User fees, Plastic ban, sale of waste by-products**
Source Segregation of Waste	**Scientific Waste processing, Scientific landfilling and C&D waste management**	**Bulk waste generators compliance**	Geo – spatial mapping and digital monitoring of SWM operations	**Waste reduction through on-site processing of the wet waste**	Cleaning of storm water drains and water bodies and screening of Nallahs

Out of 12 parameters, 7 parameters of GFC protocol are linking along with the concept of closing the loop, 3R and improving the resource management

Swachh Survekshan as a measuring and monitoring tool for assessing status of the cities towards garbage free goal

- World's largest annual urban cleanliness survey
- A score-based framework

Three step process

- **Self-Declaration**
- **Star rating**
- **Third Party Verification**

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Source: SBM (Urban website), NATIONAL BEHAVIOUR CHANGE COMMUNICATION FRAMEWORK FOR GARBAGE FREE CITIES

Solid waste management poses distinct challenges in small and medium towns compared to larger municipal corporations

	Larger cities	Small and Medium Towns
Scale and Complexity of Waste Generation	Very high volumes, diverse waste streams	Lower volumes, mostly organic
Segregation	Inconsistent due to density & floating population	Easier socially, but weak enforcement
Infrastructure: Collection, Processing and Treatment	Centralised processing facilities: Composting plants, biomethanation units, and waste-to-energy plants.	Limited facilities and lack of infrastructure for collection and treatment, open dumping
Financial Sustainability	High O&M costs, partial cost recovery	Grant-dependent, weak user charges
Capacity Building	Dedicated staff, coordination challenges	Severe staff & technical shortages
Private Sector Engagement	High interest, complex & risky contracts	Low interest from private players, needs clustering
Environmental Risk	Severe landfill pollution & land scarcity	Localised health & water risks

Source: https://sbmurban.org/storage/app/media/Meri_LiFE_Mera_Swachh_Shehar_documentation.pdf

Initiatives taken to improve collection and Segregation

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

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.

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

activity at school

My Theli campaign

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

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

Steps taken by ULB to enhance D2D collection:

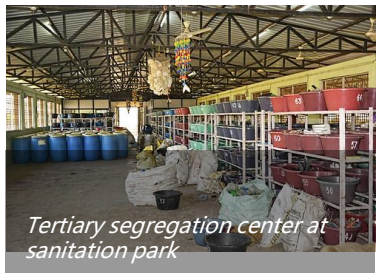
- Private operator strictly follows the collection routes given by ULB, as the vehicles were not adhering to any defined route earlier
- Along with GPS tracking, added a feature of alert on detour of vehicle to the monitoring authority
- Organized a virtual training session by monitoring app developer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

Initiatives by various local bodies for decentralized collection and transportation

Decentralised collection and transportation model of Ambikapur


Segregation at Source by SHGs


Tricycle for collection driven by women


Tertiary segregation center at sanitation park


Segregation at SLRM center

- The city adopted a decentralized, community-driven C&T system
- 17 wards managed by women self-help groups (SHGs)

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


WASTE TRASPORTATION


WASTE SEGREGATION


COMPOSTING


DRY WASTE STORAGE

- 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.
- **Small biogas units & shredders** (procurement under SFC grants)

Vermi Compost Plant for wet waste processing

- GMC has converted a former dumpsite into a local vermicomposting facility that processes organic waste near its source,
- ensures high-quality compost through well-designed infrastructure and O&M practices, and creates a closed local loop by using and selling the compost within the city

Initiatives of processing waste and converting waste to resource

Saswad processing its wet waste and utilizing as a compost generating monthly 4 lakh revenue

- Material is settled up for windrow composting
- Bioculture sprayed on windrows for effectively reducing waste volume
- Re-shredding after 30 days to produce fine compost ready for sale

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

- 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.

Khedbrama's Solid Waste Processing Plant

- MoU with various industries for

Good Practices in Plastic Waste Management

Eco Bricks from Plastic Waste Bhavnagar Municipal Corporation

- Citizens were asked to fill one-liter PET bottles with around 350 grams or more of non-recyclable plastic waste
- Paid Rs. 10 for every three such filled bottles,
- Implemented in collaboration with schools.
- 14 tons of plastic waste was used in developing a garden.

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.

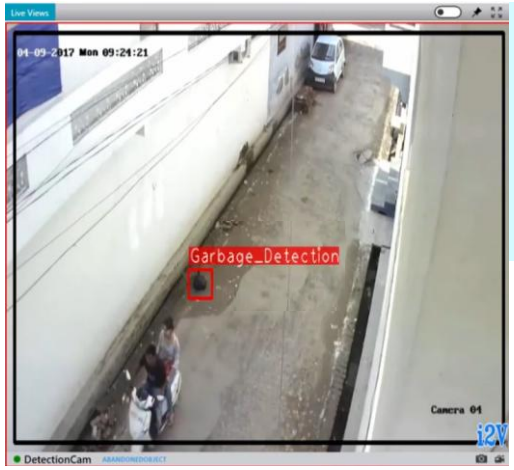
Plastic Waste Recycling in Itarsi, Madhya Pradesh

Recycled Plastic Bench, Weight: 40 Kg

- Pioneering initiative to manage plastic waste while generating economic and environmental benefits.
- Converts plastic waste into usable items
- 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.

Need for exploring innovations - IoT and digital analytics for improving SWM

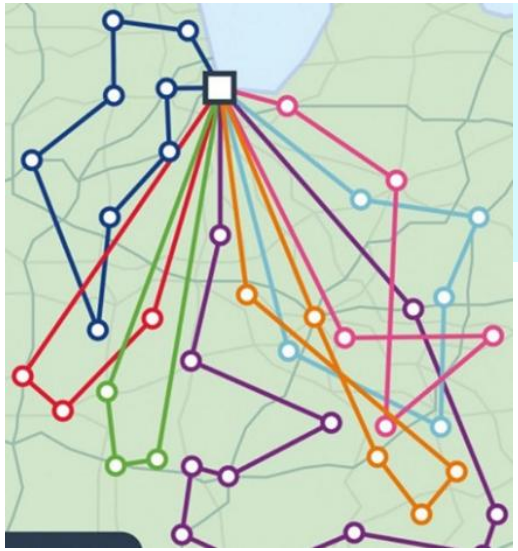
Machine based automated segregation of mixed waste



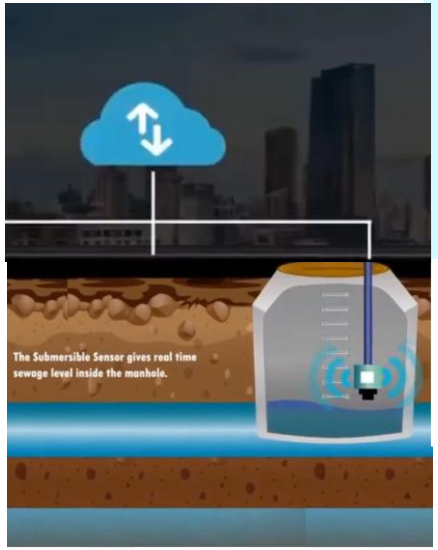
Monitoring of Garbage Vulnerable points through computer vision analytics

SMART bins – bin overflow monitoring through computer vision analytics

Drone based analytics for monitoring garbage hotspots



Route optimization for door-to-door collection through



Sensor based sewer monitoring for blockages and overflow