

# Circular Economy in Urban Solid Waste Management : A Case of Ahmedabad

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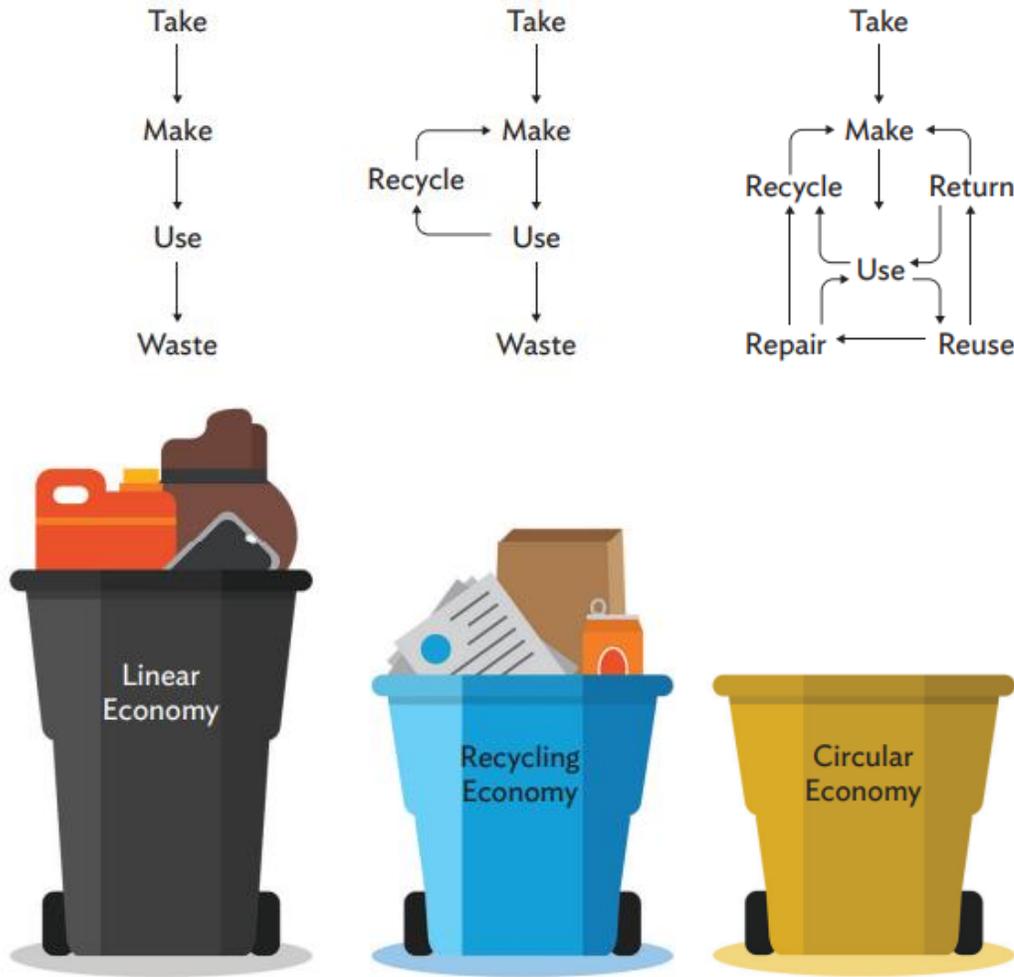
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# What is circular Economy



## Reducing waste

Decreases the amount of waste sent to landfills.



## Recycling Materials

Promotes resource efficiency and environmental preservation



## Recovering Resources

Creates cleaner cities, reduces pollution, and generates jobs in the recycling and waste management sectors

Source : WRI India, RMI, CEEW, & G20 Secretariat, India. (2024, December). *Unlocking India's circular waste economy potential for sustainability: Insights across seven key sectors.*

# Achieving circular Economy?

## Laws of Ecology

Outlines four principles: everything is connected, everything must go somewhere (no waste), nature knows best, and there's no free lunch (all actions have consequences)

(Commoner,1995)

## Biomimicry

Encourages innovation by imitating nature's time-tested designs and processes to create sustainable, efficient, and waste-free solutions.

(Benyus, 2002)

## C2C

**products are created with the intention of being reused or safely biodegraded, ensuring waste becomes a resource for new cycles.**

(McDonough and Braugngart, 2002)

## The Blue Economy

Suggests a systemic shift where business models are inspired by nature, promoting zero waste, local resource utilization, and generating multiple benefits from minimal inputs.

(Pauli, 2010)

## Industrial Ecology

Views industrial systems as analogous to natural ecosystems, promoting resource cycling, waste reduction, and symbiotic relationships among industries to create sustainable production networks

(Graedel and Allenby, 1995)

## Looped & Performance Economy

Emphasizes extending product lifecycles through reuse, repair, and remanufacturing, while shifting from ownership to service-based models to maximize resource efficiency.

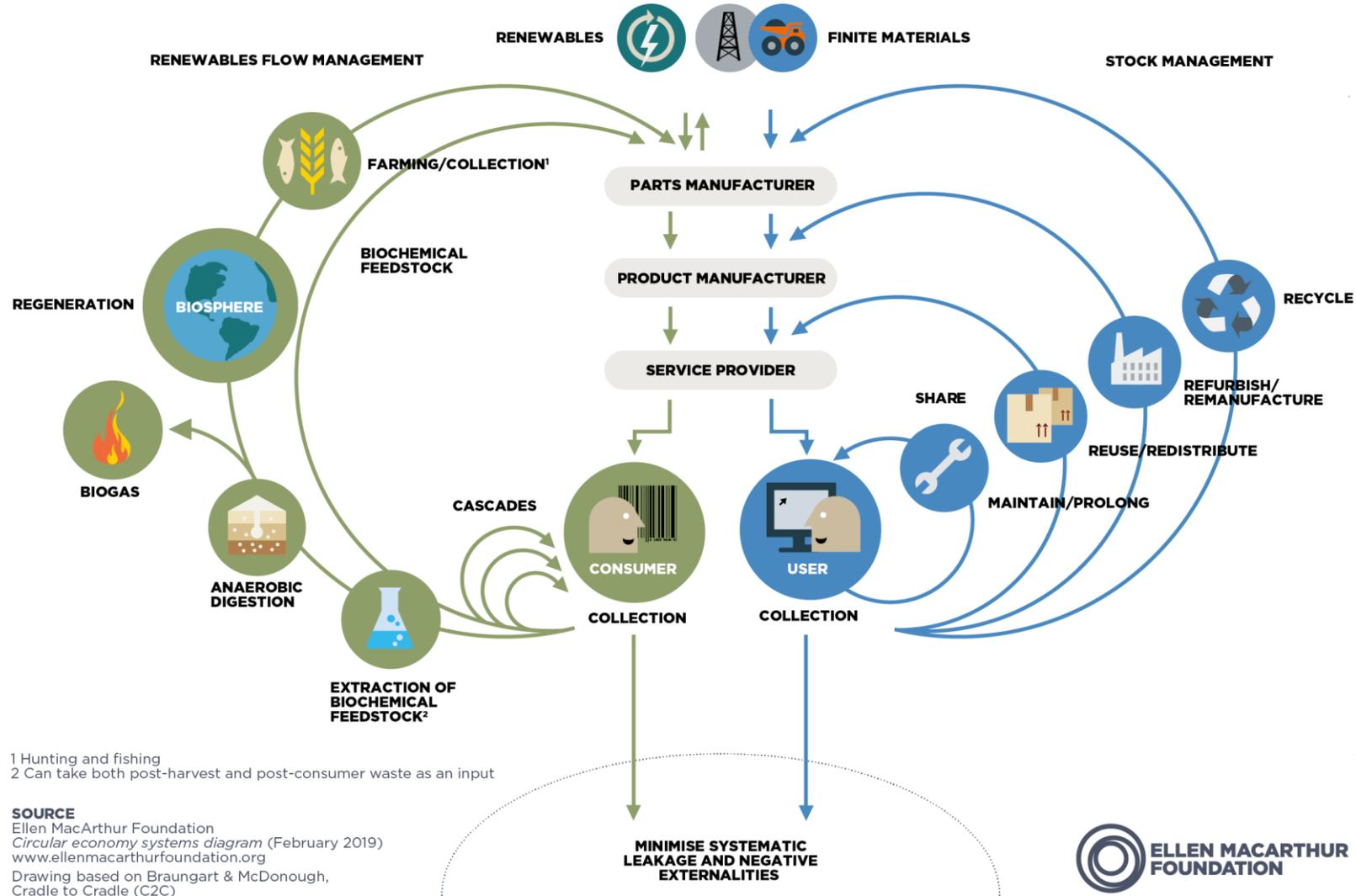
(Stahel, 2010)

Source : Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The circular economy - A new sustainability paradigm?

# Butterfly diagram for circular Economy?

## Biological Wet Waste

- Cascading
- Anaerobic Digestion
- Compost



## Technical

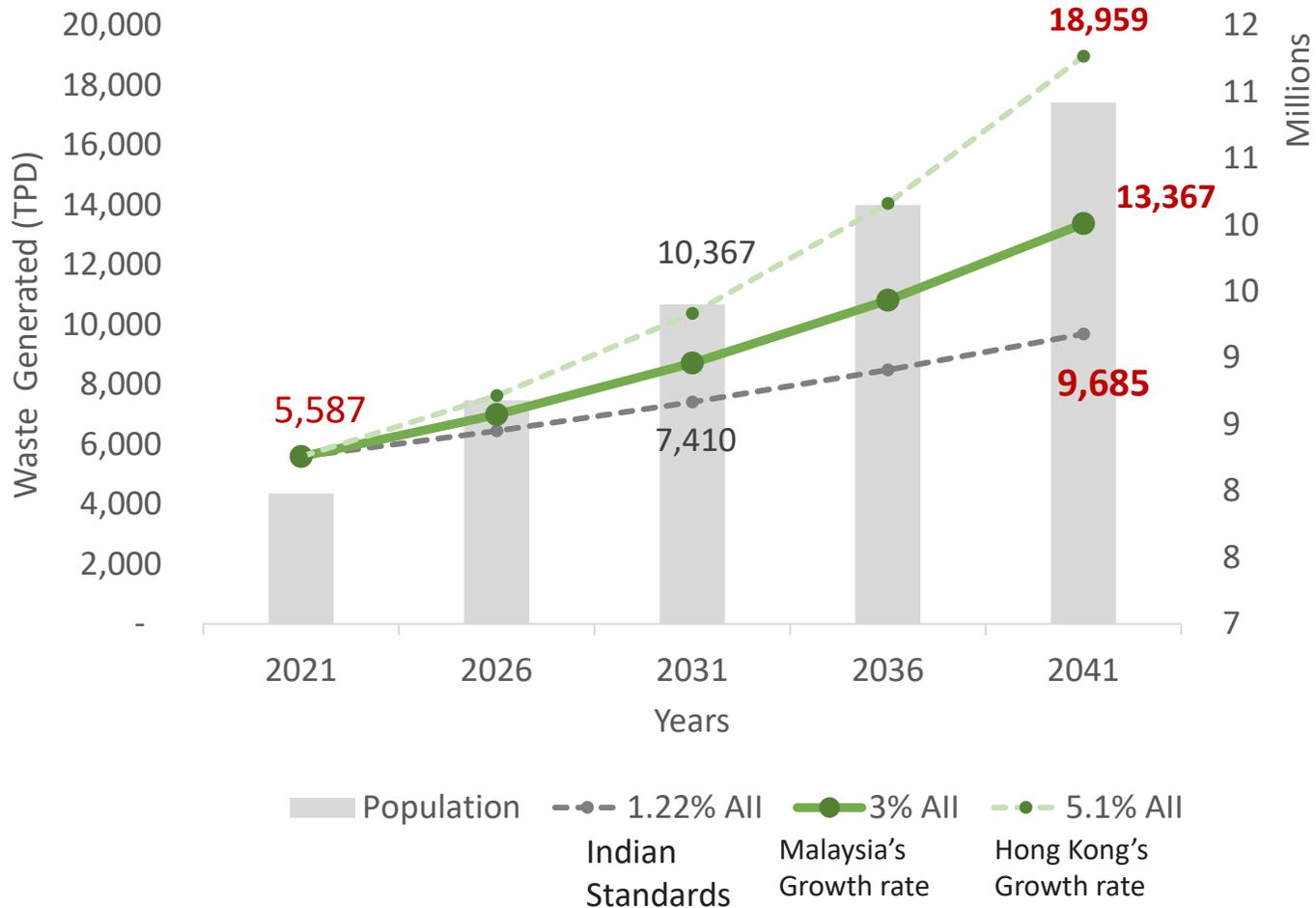
## Dry Waste

- Maintain
- Reuse
- Refurbish
- Recycle

Source : WRI India, RMI, CEEW, & G20 Secretariat, India. (2024, December). *Unlocking India's circular waste economy potential for sustainability: Insights across seven key sectors.*

# Indian Scenario

Annual Increase in Waste Generation



India is experiencing significant economic growth, with its GDP reaching **\$4.13 trillion** in 2025 and a projected growth rate of **7.4%** through 2026.

Industrial production and urbanisation are transforming the nation, driving an ever-increasing demand for resources.

**At this critical juncture, India faces two potential paths:**

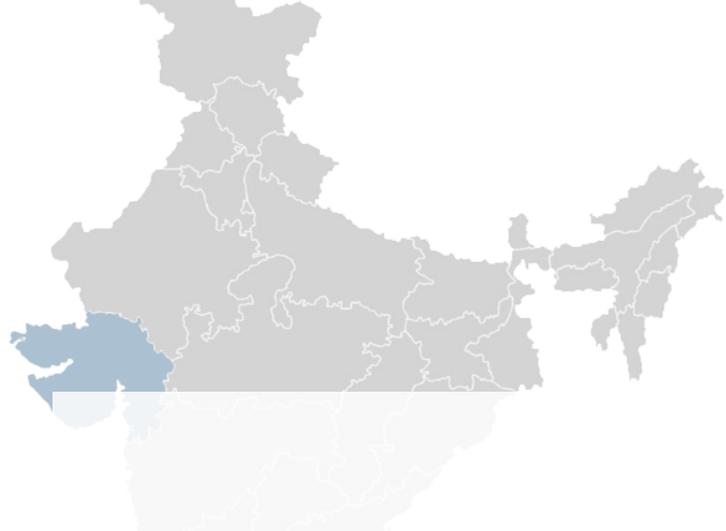
1. Traditional **business-as-usual** approach to industrial development
2. Embracing a more **sustainable and regenerative model** based on circularity.

Source : WRI India, RMI, CEEW, & G20 Secretariat, India. (2024, December). *Unlocking India's circular waste economy potential for sustainability: Insights across seven key sectors.*



In India, the concept of circularity is not merely an emerging trend but is deeply rooted in cultural traditions that prioritise conservation, sustainability, and respect for resources.

# Indian Scenario



Waste Generated **62** million tonnes

Annual growth rate **4%**

Urban areas contribute **58** million tonnes per year

Waste Generated in Gujarat **3.7-4** million tonnes

Types of Waste Recycled

Plastic Waste  
(3.6 million tonnes)

**CSIRO 8%**

**OECD 13.3%**

**CPCB 50%**

6.5 -8.5 million tonnes is  
recovered annually

Paper



2.4-4.3 million tonnes is  
recovered annually

Metal



Steel, aluminum, copper and  
iron are recycled and 100%  
recovered.

Glass



1.3 million tonnes with  
100% Recovery

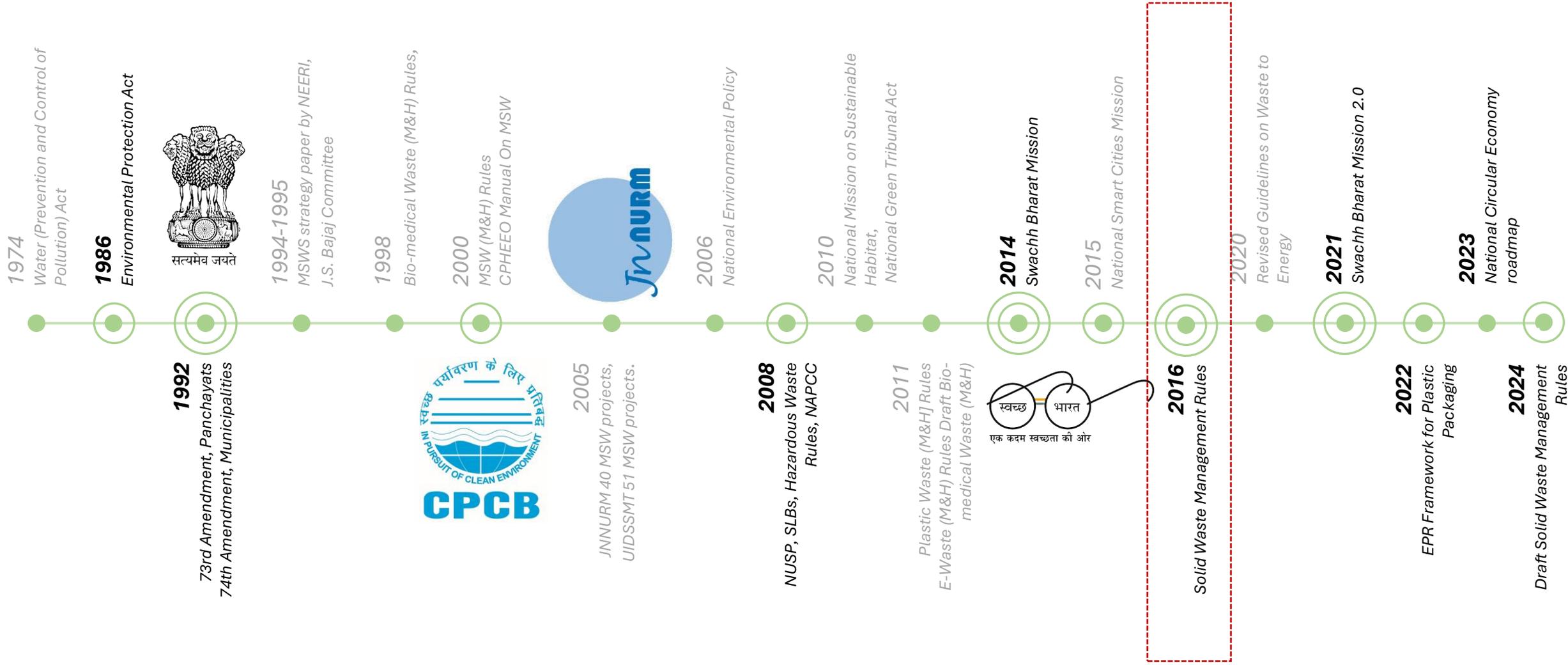
E-Waste



Formal 33%  
Informal 95%

Source : Ministry of Statistics and Programme Implementation. (n.d.). *Research studies comparative*. Government of India; The Energy and Resources Institute. (n.d.). *Factsheet.*; Central Pollution Control Board. (2020). *Annual report 2019-20 on plastic waste management*. World Bank. (n.d.). *Trends in solid waste management.*;

# Evolution of Policies in India



# Aim & Objectives

“The Aim of this study is to explore **Ahmedabad’s potential** for embracing a **circular economy**, with a particular focus on solid waste management through the **5R strategy.**”

## OBJECTIVES



To assess the solid waste management system in the city w.r.t. generation, collections, transportation, Segregation, Treatment and disposal.



To understand the 3R principles being applied in the city for SWM.



To examine the potential of a circular economy in the city as far as SWM is concerned.



To suggest improvements in SWM, keeping the circularity in mind.

# Methodology

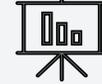
## 1. Background Study



Desk research



Literature review



Case study review

## 2. Network Mapping



Primary surveys



FGD's



Key informant interviews

## 3. Establish the network for 5R

**Refuse**

Identifying opportunities to reduce waste generation.

**Reduce**

reduction of harmful, wasteful, and non-recyclable materials

**Reuse**

diligent reuse of any materials

**Repurpose**

refuse, reduce, or reuse certain items and materials

**Recycle**

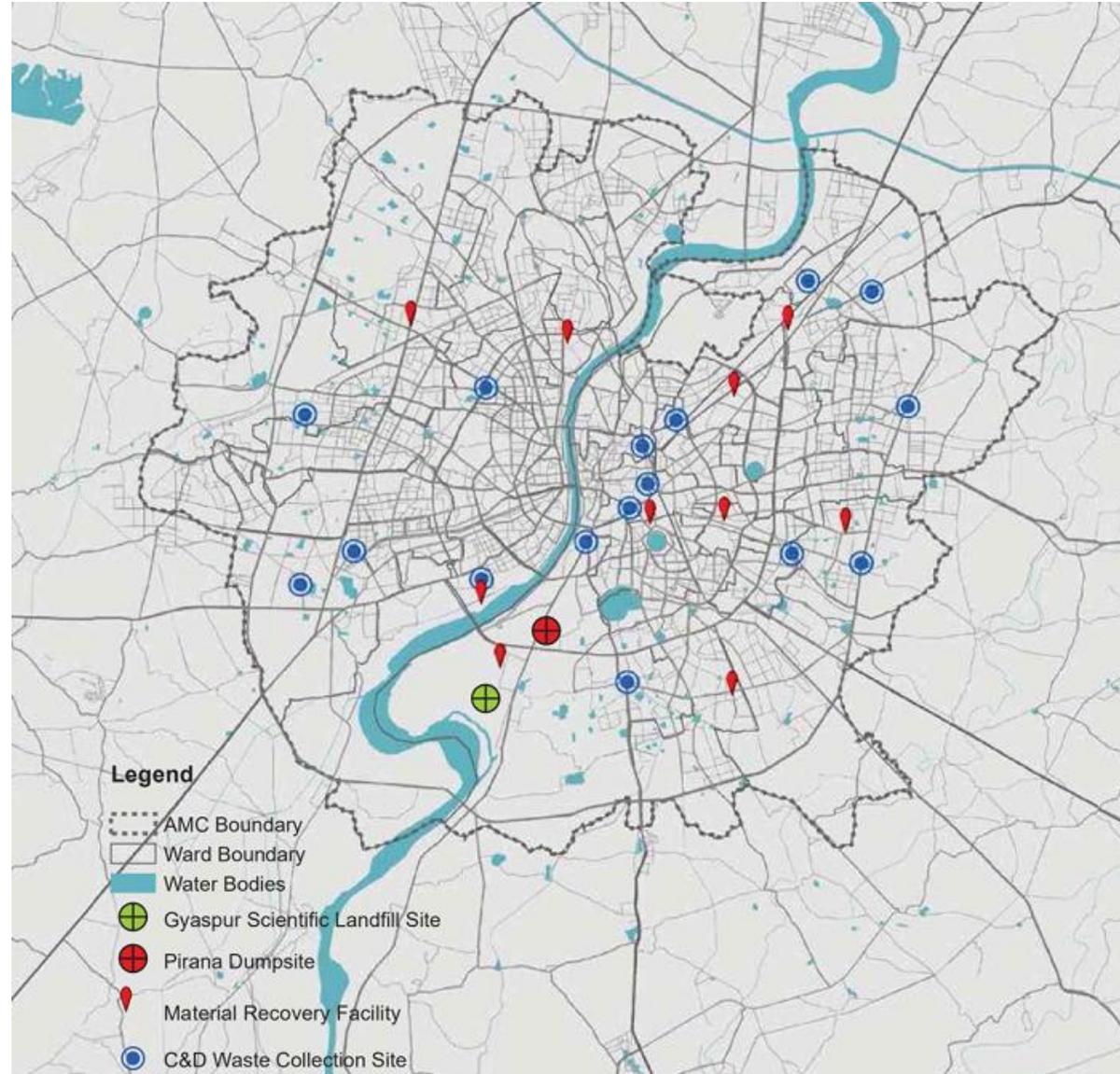
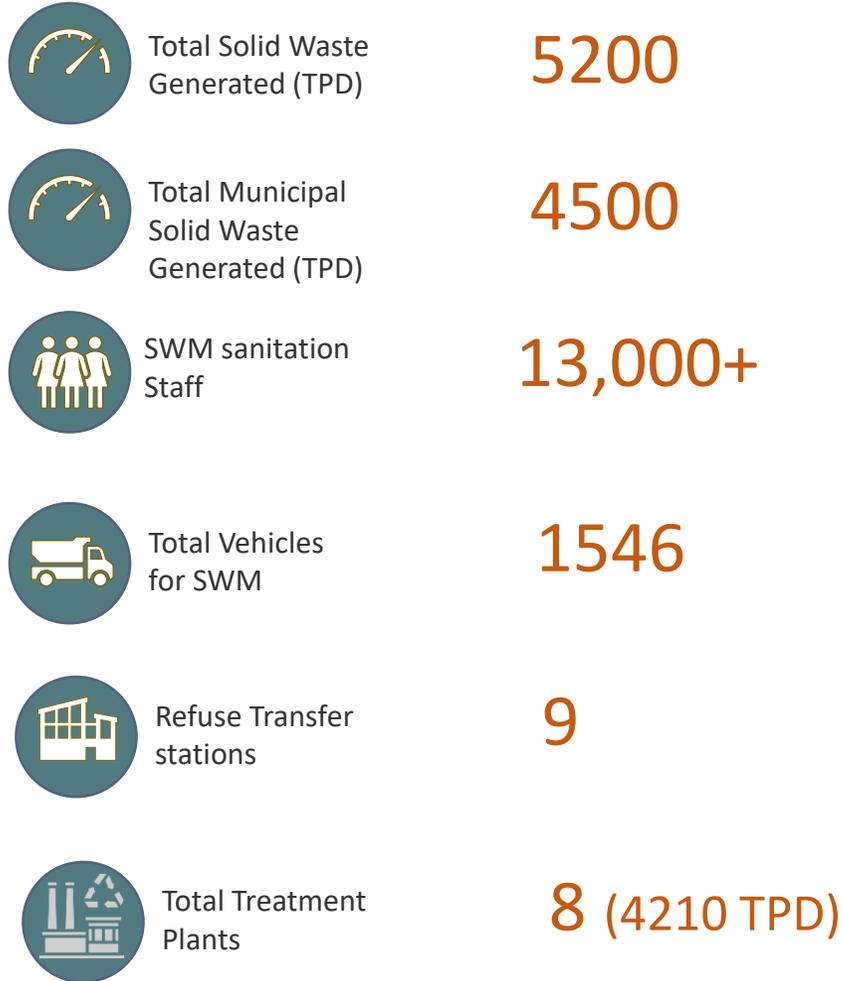


## 4. . Strategies for Circular Economy



Recommendations

# IMPRESSION OF THE CITY – AHMEDABAD (AMC)



**700g**  
Per capita waste/ day  
standard (0.60Kg)



**₹1,793**  
Per capita Spent on Waste



**₹1.98 cr**  
Spent per Sq.Km

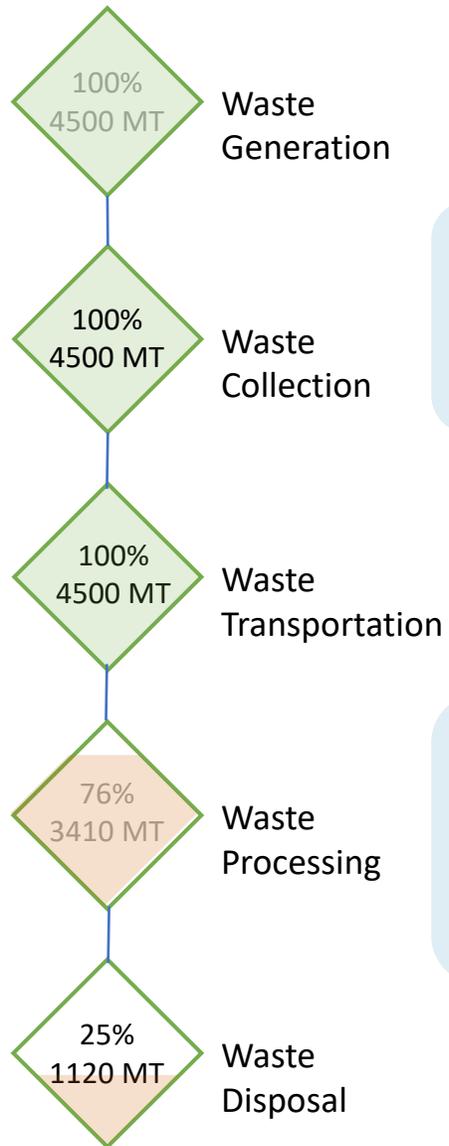
AMC- Ahmedabad Municipal Corporation



# Objective 1

To assess the solid waste management system in the city w.r.t. generation, collections, transportation, Segregation, Treatment and disposal.

## Data Acquired from AMC,2025



- 3100 HH
- 800 Road Sweeping
- 90 Hotel & Kitchen Waste
- 500 Waste from JCB
- 8 Dead Animal Waste

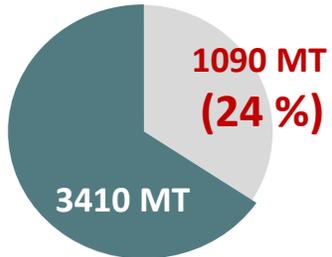
- CAPACITY**
- 350 TPD RDF& Compost-BEIL
  - 430TPD Compost-creative Ecosport
  - **500TPD RDF-GGEPIL**
  - 100 TPD Plastic Processing NEPRA
  - 1000 TPD WTE Plant
  - APMC BIOGAS PLANT 30 TPD

## Generation



18% Segregation \*

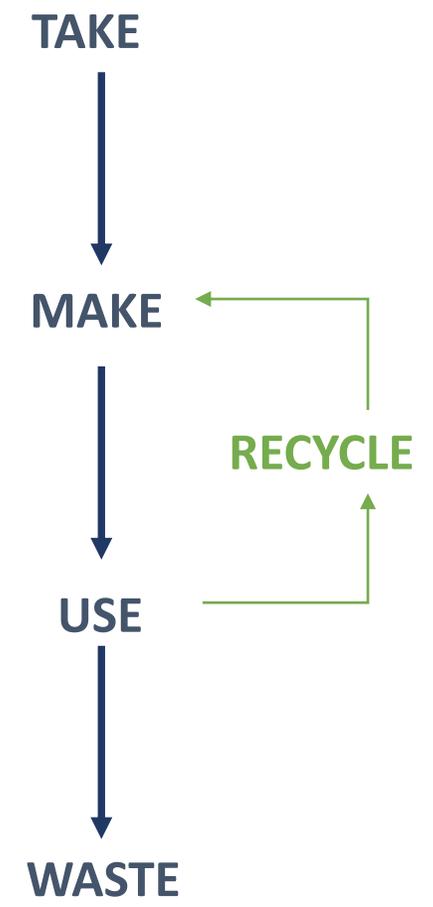
## Processing



## Disposal

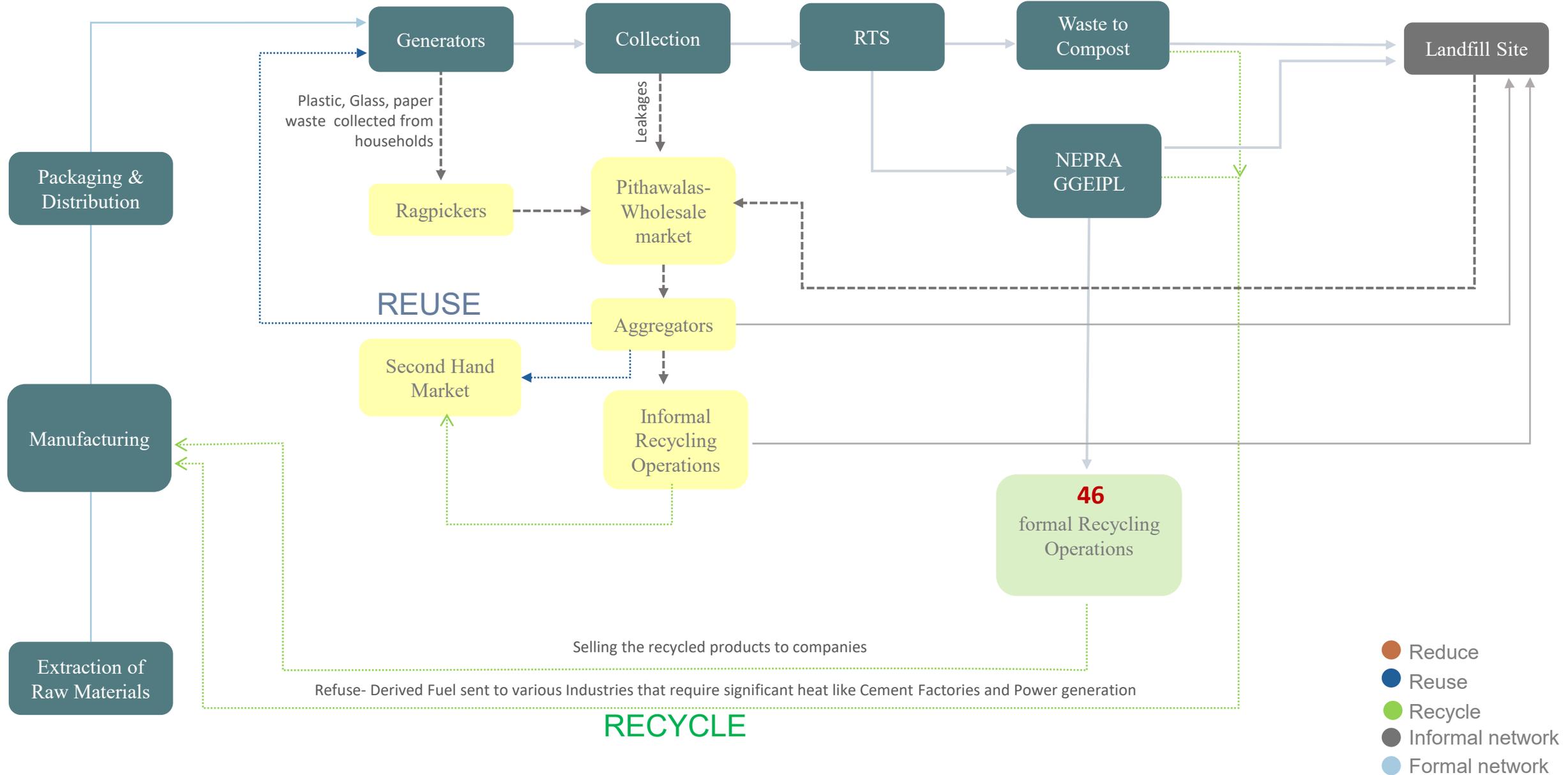


## Recycling Economy

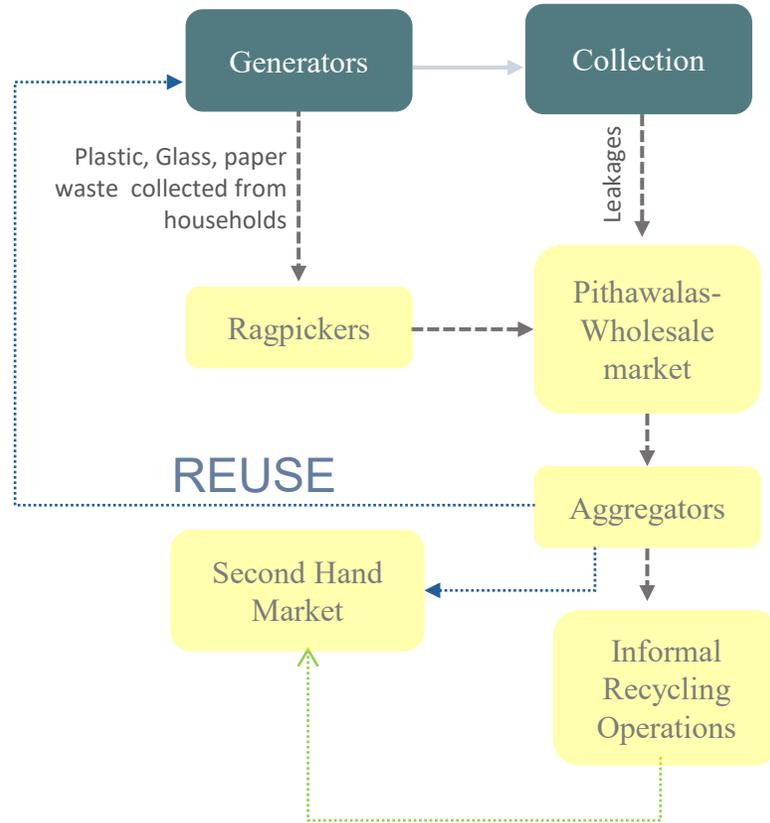


Source : \*ICLIE, 2023, Ahmedabad Climate Resilient City Action Plan; AMC;

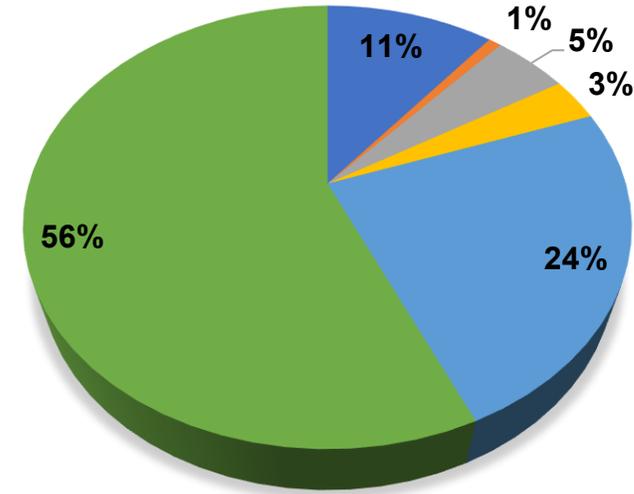
# 3R MAPPING NETWORK OF MSW



# 3R MAPPING NETWORK OF MSW- Informal Sector



Materials Recovered by the Informal Sector



■ cardboard ■ Pet bottles ■ Alumium ■ glass ■ wooden doors ■ newspaper



Cardboard & Newspaper



Plastic



E-Waste



Metal



Glass

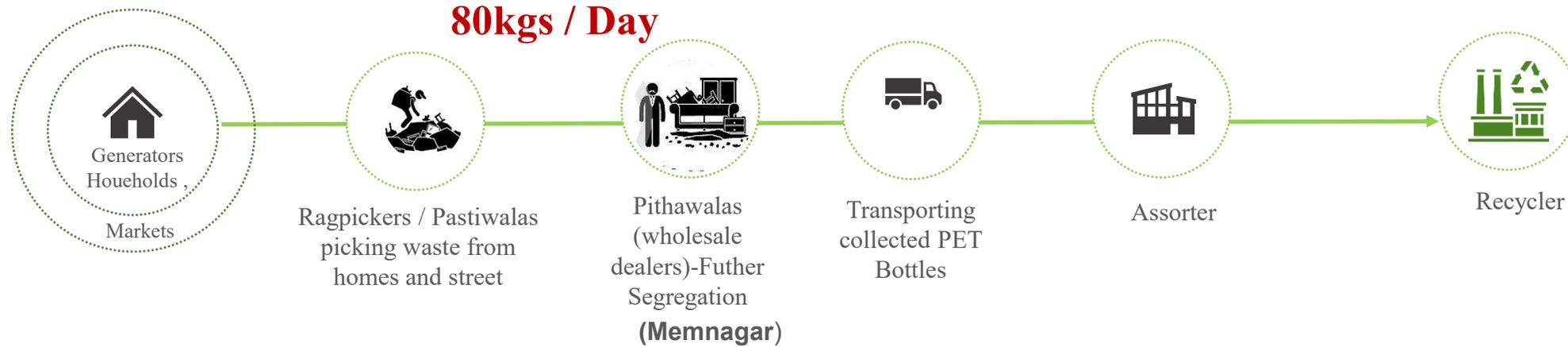
# Plastic Waste

Total No. of shops : 36

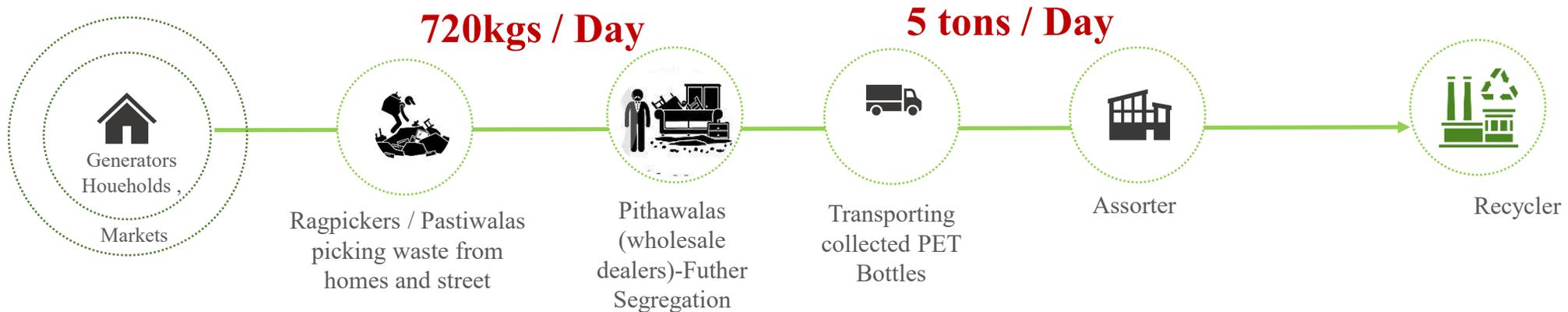


# MAPPING NETWORK OF MSW-Plastic Value chain

## Plastic bags



## PET Bottles



**Challenge:** lack of formal recognition, poor working conditions, and long transportation distances that increase emissions and reduce economic efficiency. Moreover, the growing presence of multi-layer plastics and weak enforcement of Extended Producer Responsibility (EPR) policies further limit recyclability



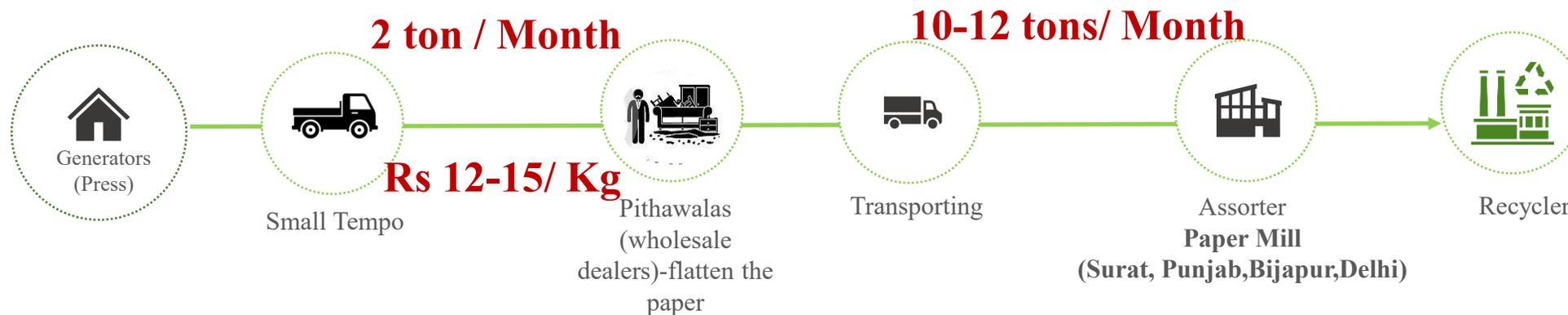
# Newspaper & Cardboard Waste

Total No. of Cardboard shops : 38

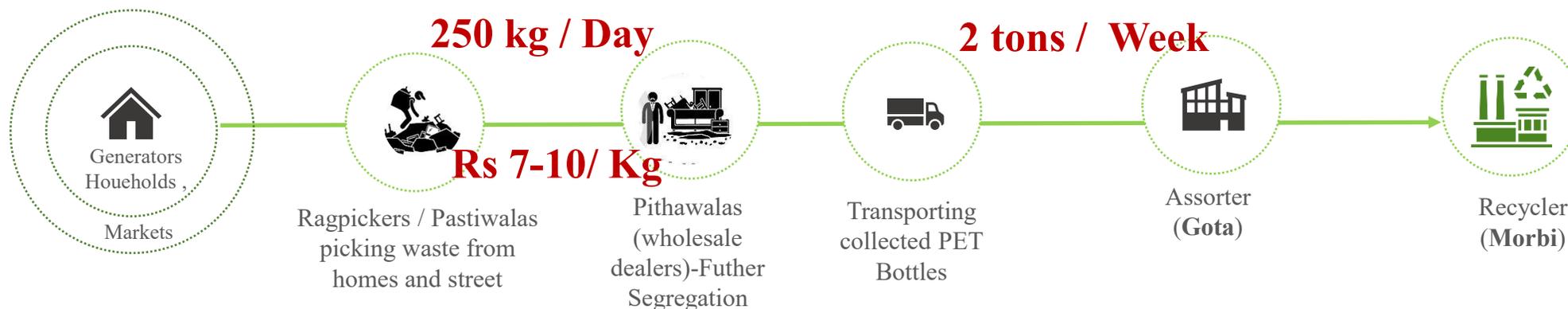
Total No. of Newspaper Shops: 25

# MAPPING NETWORK OF MSW- Newspaper and Cardboard boxes

## Newspaper



## Cardboard Boxes



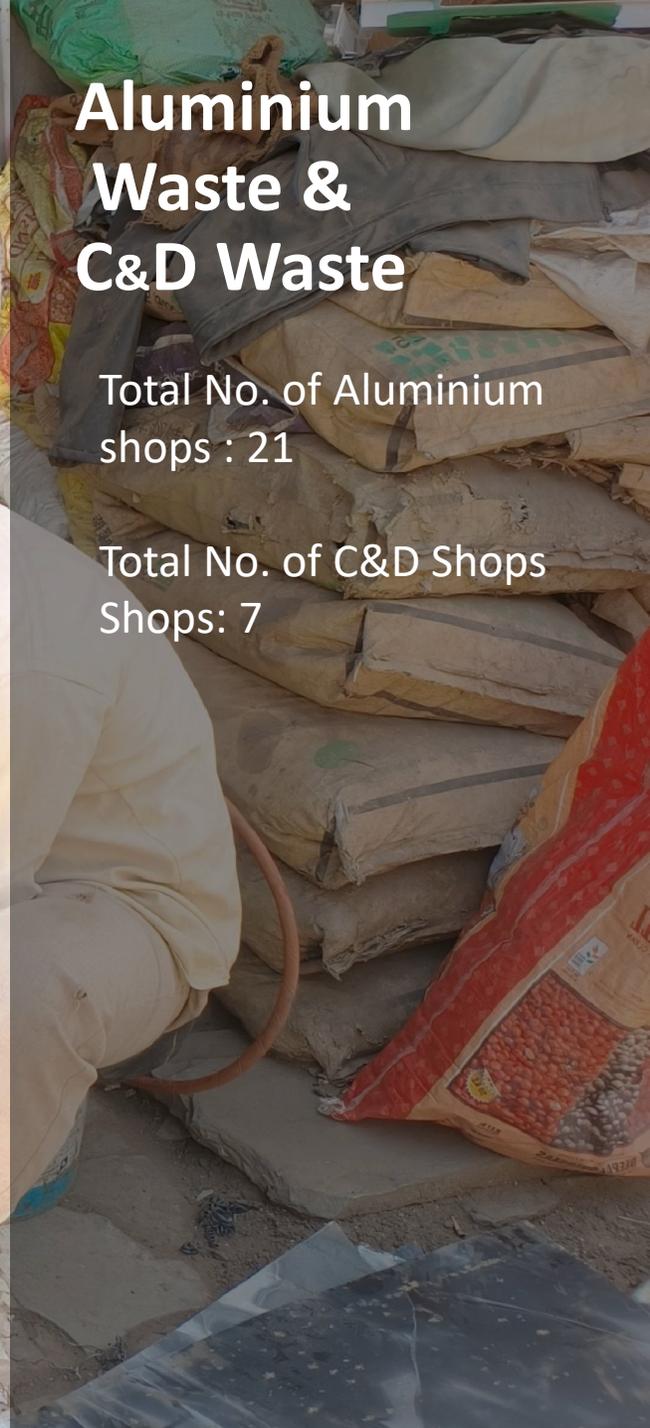
**Challenge:** unstable prices, dependency on middlemen, and long lead times for transportation..



# Aluminium Waste & C&D Waste

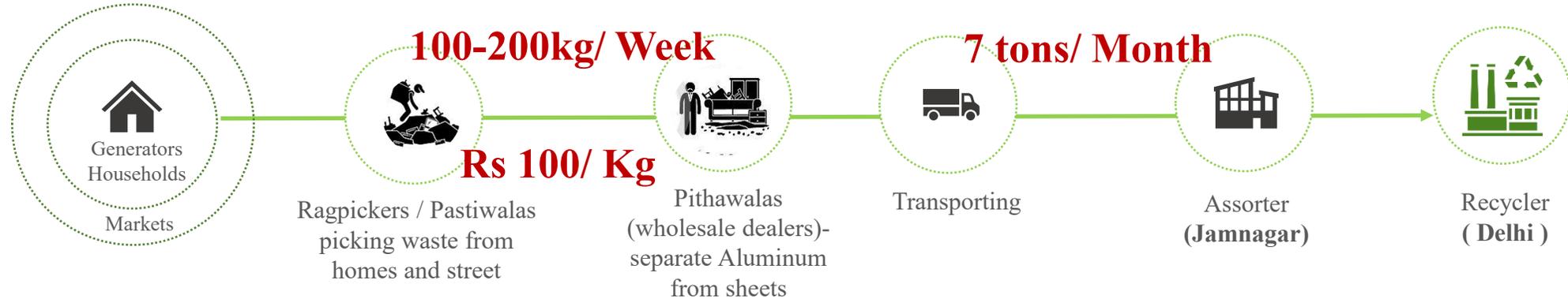
Total No. of Aluminium  
shops : 21

Total No. of C&D Shops  
Shops: 7

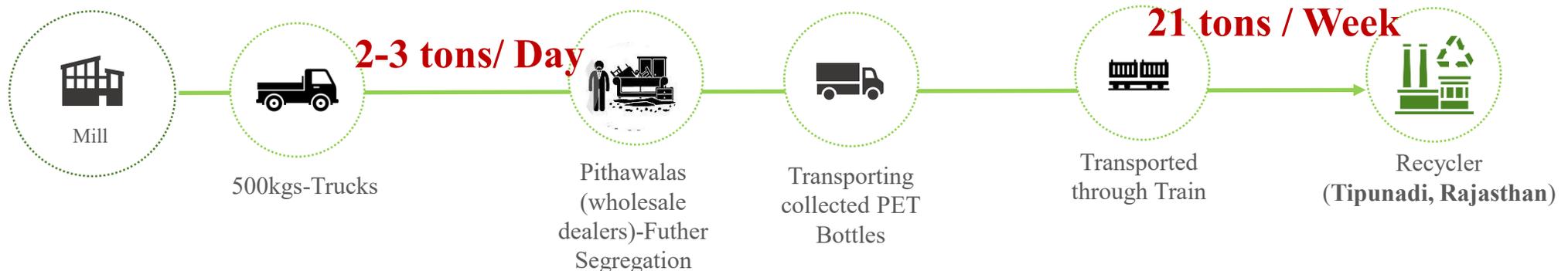


# MAPPING NETWORK OF MSW- Aluminium and Wooden doors

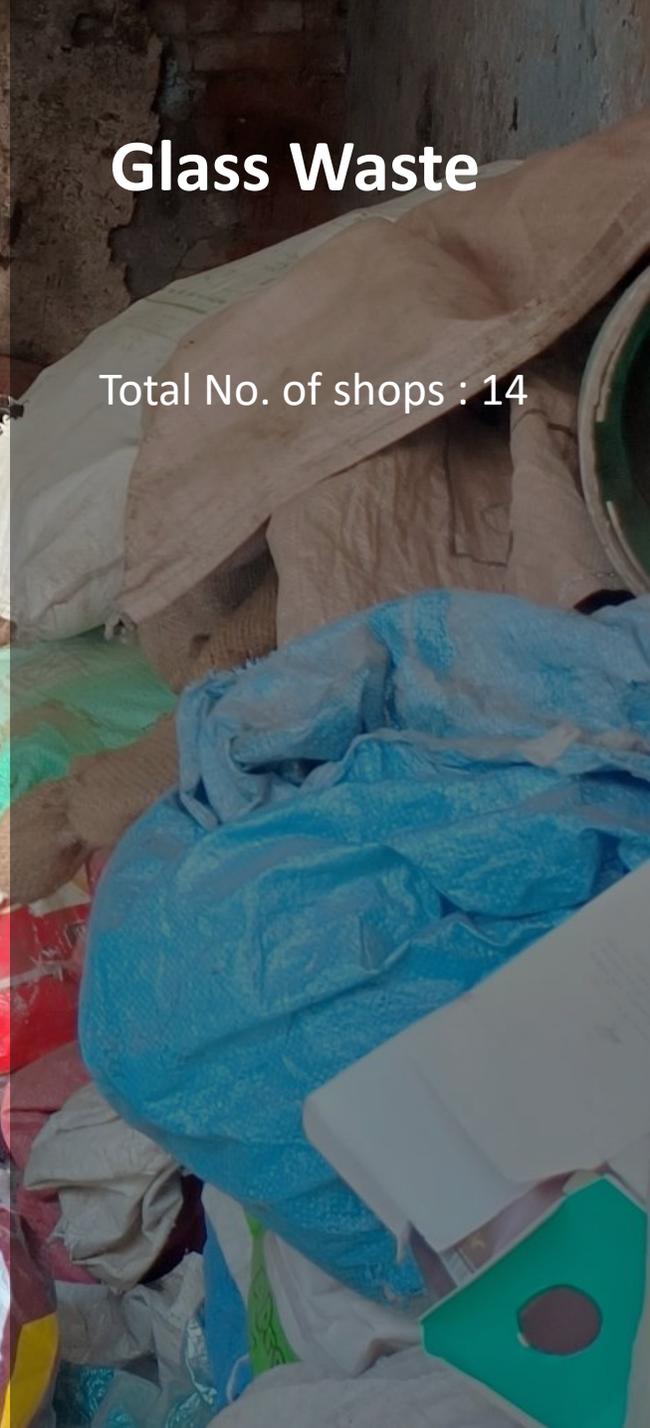
## Aluminium



## Wooden Doors



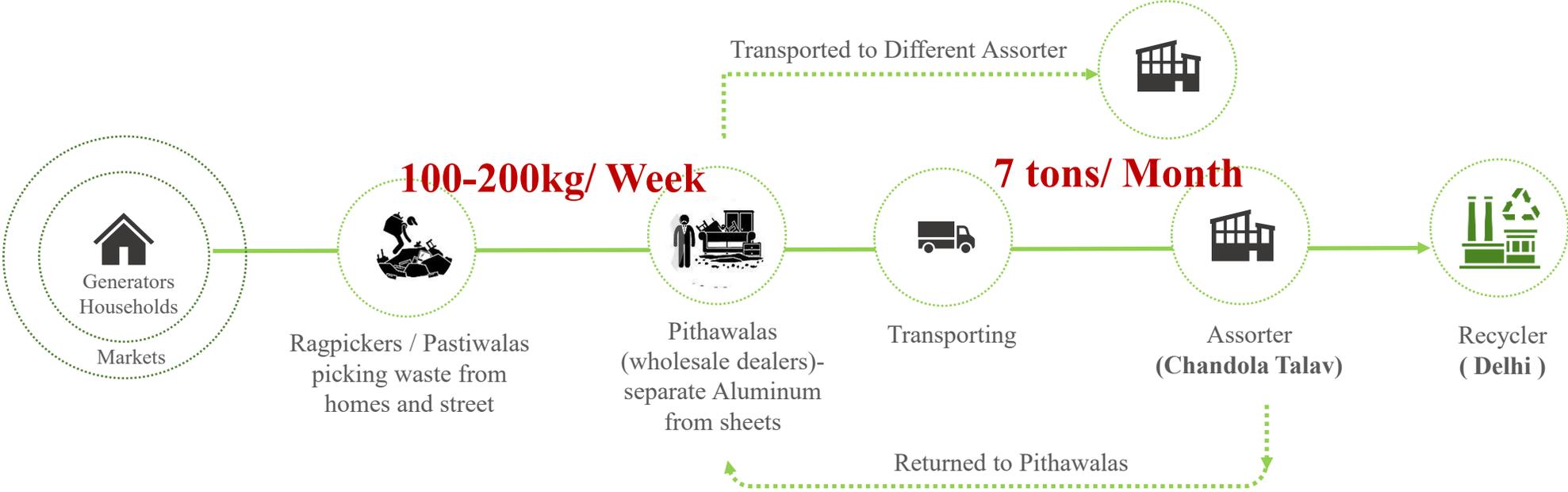
**Challenge:** exposure to sharp or contaminated materials, long-distance transport, and low recovery from mixed waste.



## Glass Waste

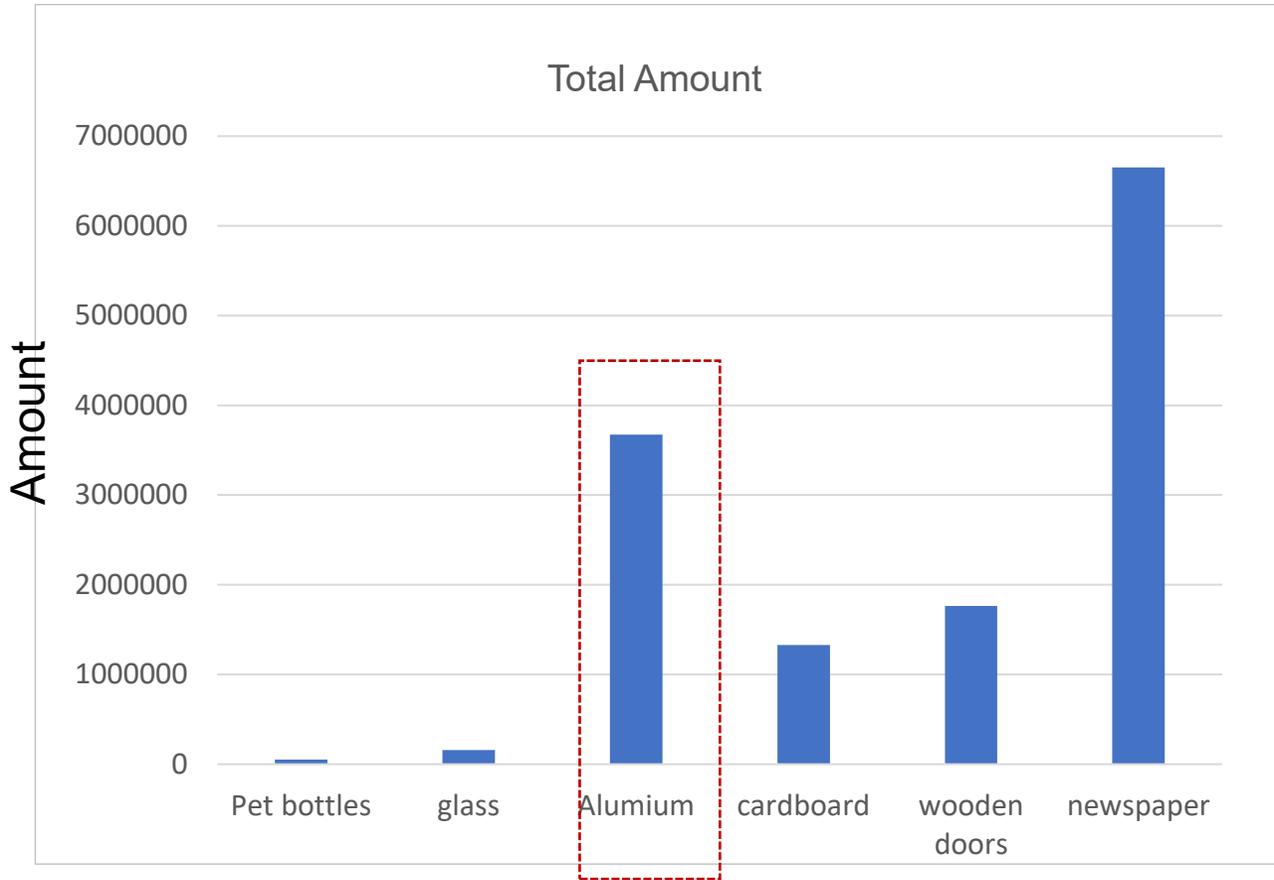
Total No. of shops : 14

# MAPPING NETWORK OF MSW- Glass

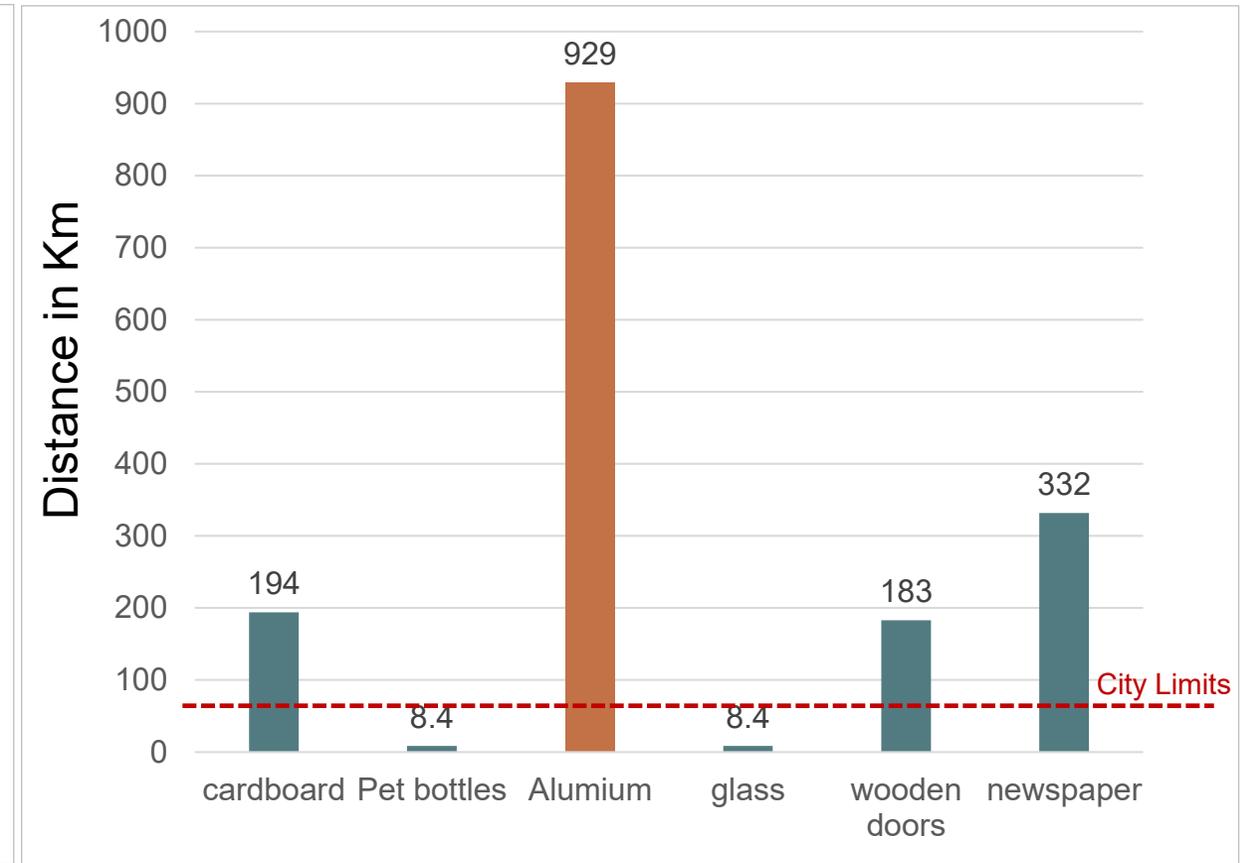


**Challenge:** include high transport costs, breakage during handling, and low demand for recycled glass

Total Quantities With Revenue Generated



Total distance travelled to reach the recyclers



The total weekly quantity of materials sent to aggregators from these 7 markets = **617.54 tonnes**

Estimated total revenue generated from this = **₹9.54 crore.**

The total distance travelled to recycle Aluminium is more.

**Challenge:** These workers operate without financial security, contracts, or recognition despite creating real economic output. The lack of local processing units reduces material recovery efficiency and makes the system carbon-intensive.

# MSWM GAP ANALYSIS

## UPSTREAM

(Production, Distribution & Consumption)

## MIDSTREAM

(Collection, Sorting & Aggregation)

## DOWNSTREAM

(Recycling & Disposal)

-  Weak community awareness and lack of incentives for plastic waste segregation.
-  Weak regulation and enforcement related to Extended Producer Responsibility (EPR).
-  Limited adoption of eco-design or sustainable packaging practices.
-  Poor reverse logistics systems for unsold or returned plastic products.
-  Absence of take-back schemes in most retail operations.
-  Often fills the gap in segregated collection but lacks formal recognition and tools to do so effectively.

-  Leakages to the Informal Sector
-  Often operates without permits or oversight, leading to environmental and health risks.
-  Weak consumer awareness and lack of incentives for plastic waste segregation.
-  Social stigma and poor working conditions.
-  Lack of access to infrastructure (e.g., carts, protective equipment).
-  Fluctuating material prices.

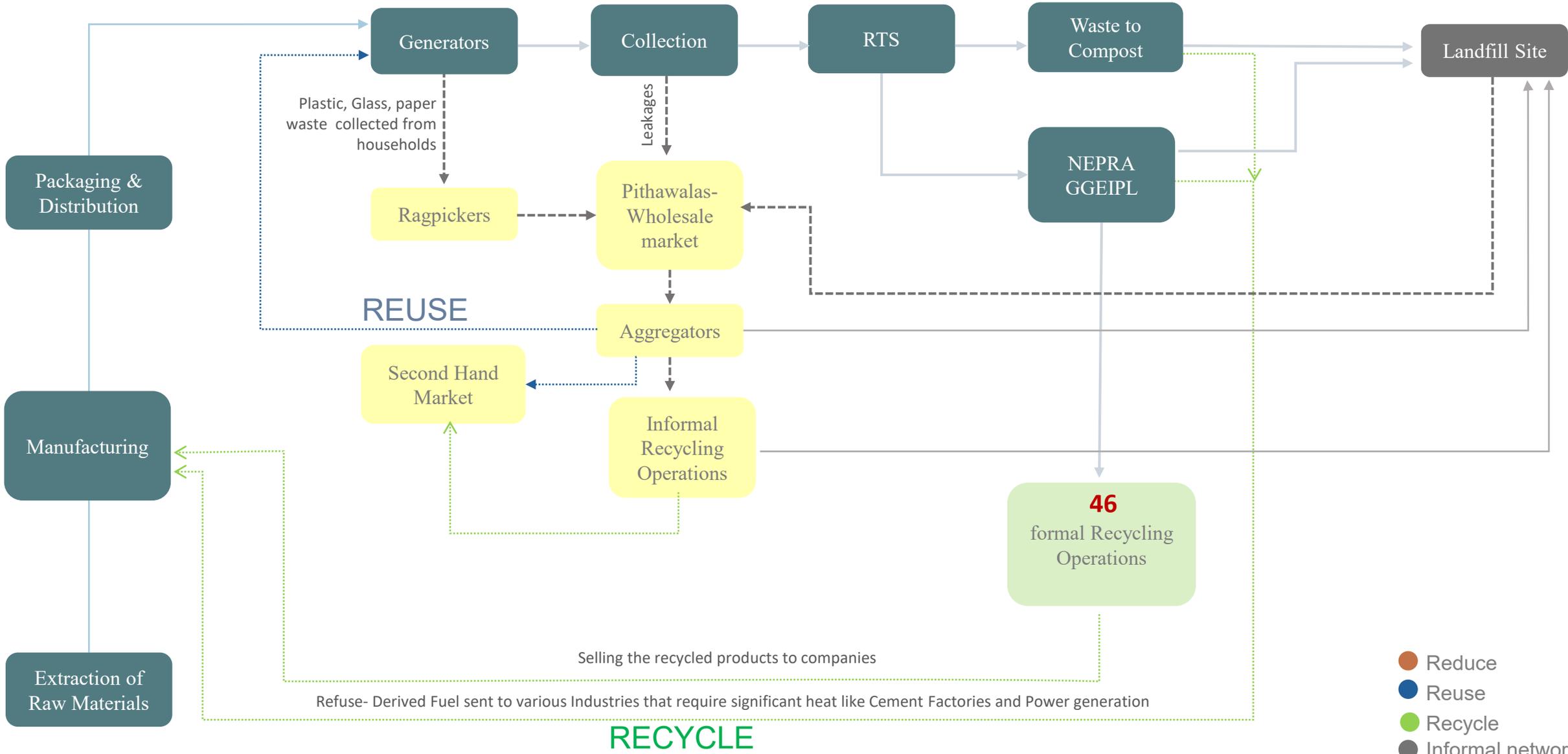
-  Limited processing capacity
-  Low revenue generation from Waste Processing
-  Reliance on landfills due to insufficient alternatives (e.g., incineration or advanced recycling).
-  Fragmented infrastructure for Material Recovery Facilities (MRFs).
-  Minimal role, except occasional burning or dumping of non-recyclables, leading to pollution.
-  Struggles with quality control and market access.
-  Inadequate capacity and limited types of materials recycled.

- Formal Sector
- Informal Sector



Recommendations

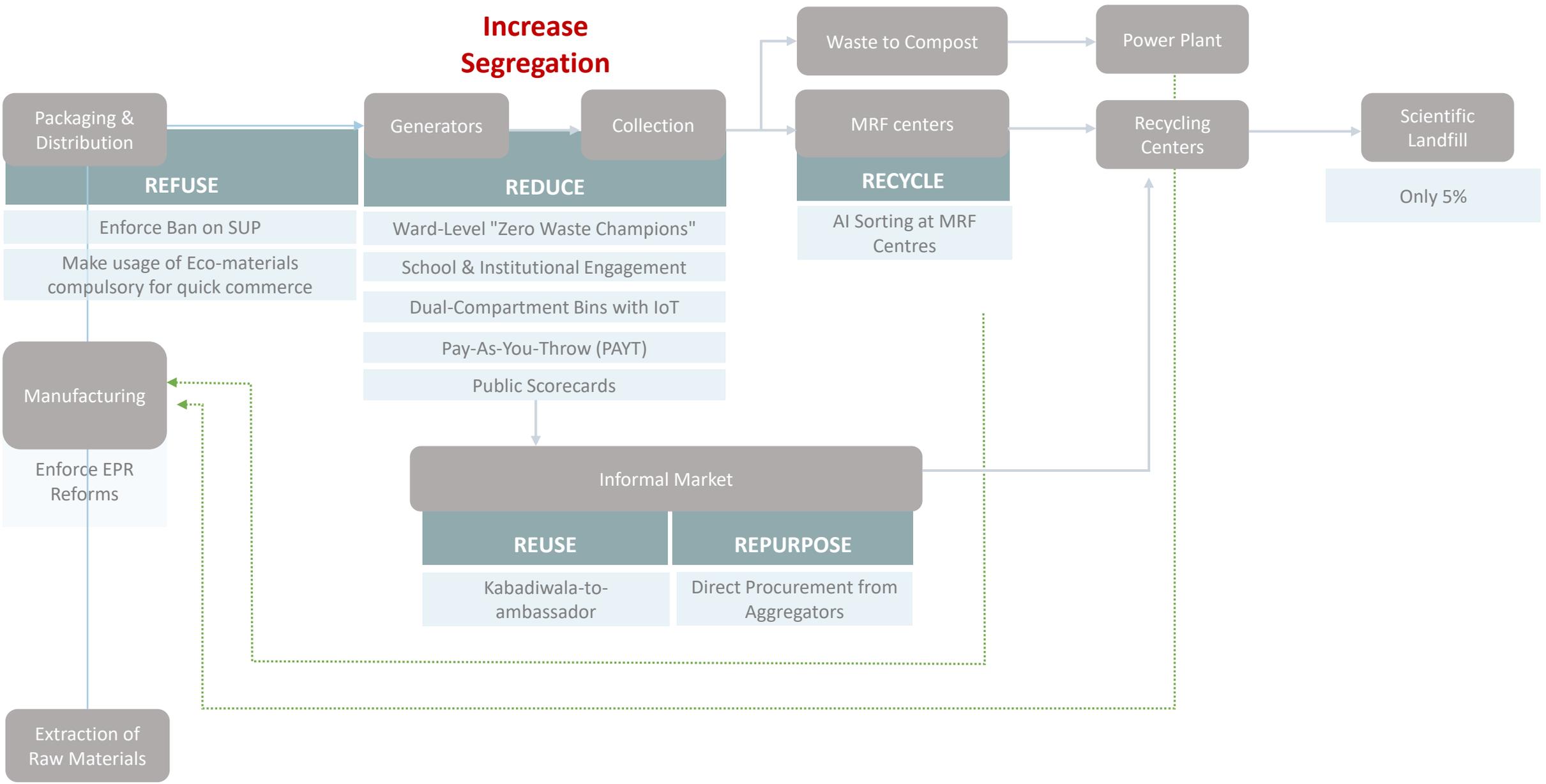
# Existing 3R MAPPING NETWORK OF MSW



- Reduce
- Reuse
- Recycle
- Informal network
- Formal network

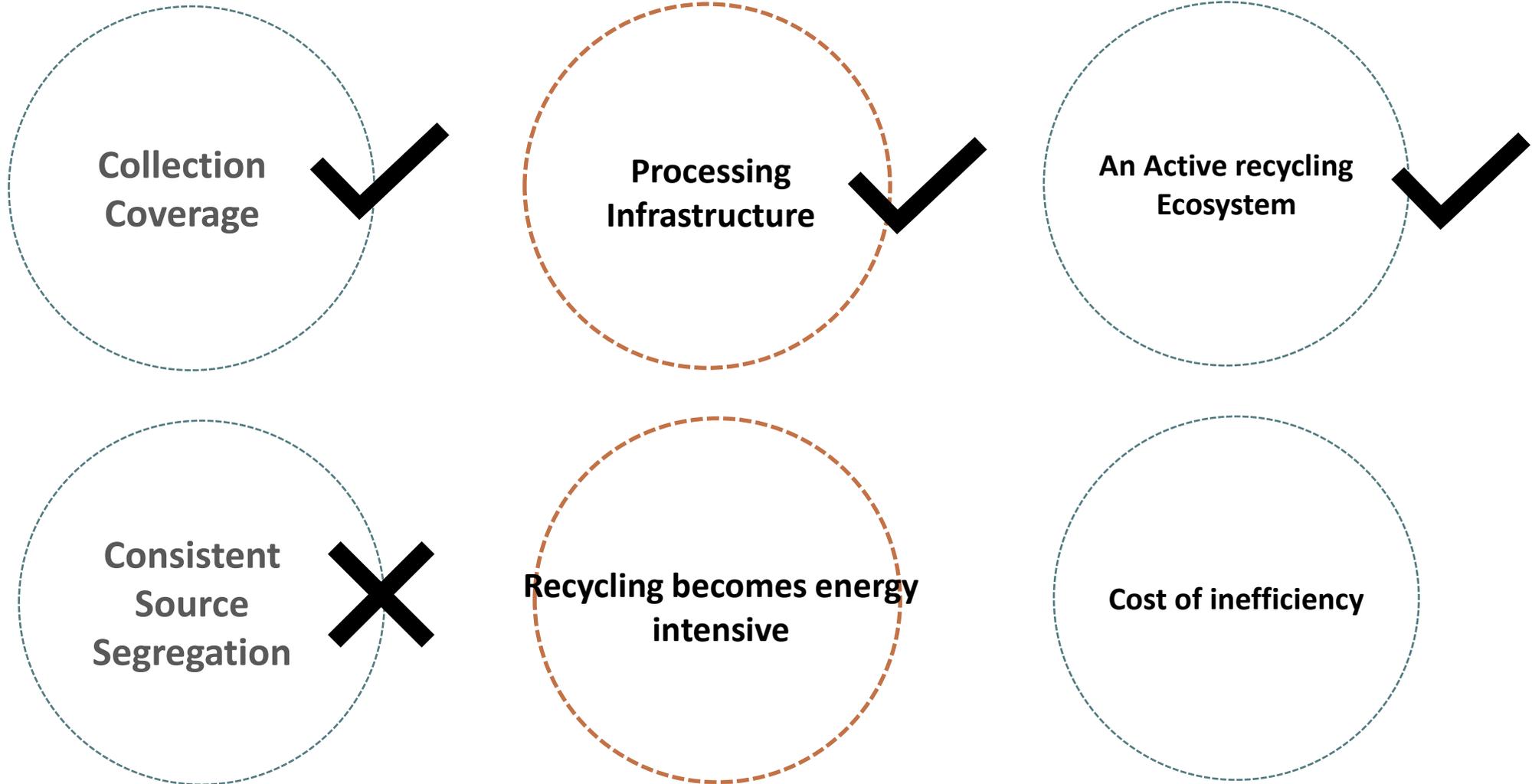
Source :KII (Primary Survey), AMC

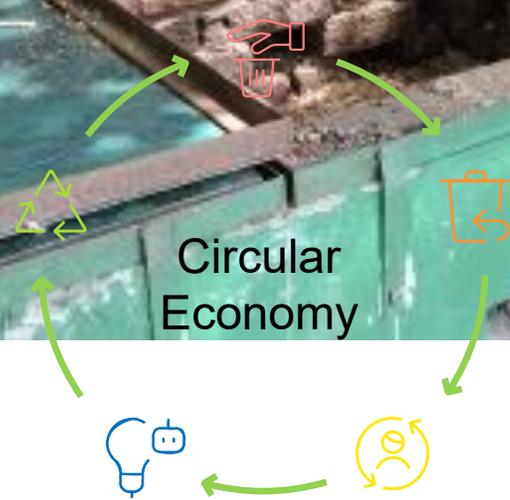
# Proposed 5R MAPPING NETWORK OF MSW



Strategy	Key Actions	Expected Outcome
<b>Ward-Level "Zero Waste Champions"</b>	<ul style="list-style-type: none"> <li>- Train RWA volunteers</li> <li>- Door-to-door education using local languages and visual aids</li> </ul>	<b>50% segregation in pilot wards (1 year)</b>
<b>School &amp; Institutional Engagement</b>	<ul style="list-style-type: none"> <li>- School curriculum integration</li> <li>- Mandatory bins in institutions</li> </ul>	<b>30% higher institutional compliance</b>
<b>Dual-Compartment Bins with IoT</b>	<ul style="list-style-type: none"> <li>- Deploy color-coded smart bins-</li> <li>- Dashboard-linked monitoring</li> </ul>	<b>40% reduction in mixed waste</b>
<b>Decentralized MRFs</b>	<ul style="list-style-type: none"> <li>- Ward-level MRFs within 5 km</li> <li>- Employ kabadiwalas as operators</li> </ul>	<b>25% drop in transport costs, better purity</b>
<b>Pay-As-You-Throw (PAYT)</b>	<ul style="list-style-type: none"> <li>- ₹50/month for mixed vs. ₹20 for sorted</li> <li>- RFID-linked rebates</li> </ul>	<b>20–30% waste reduction</b>
<b>Enforce Extended Producer Responsibility (EPR)</b>	<ul style="list-style-type: none"> <li>- Penalize non-recyclable packaging</li> <li>- Redirect EPR funds to infra</li> </ul>	<b>15% drop in non-recyclables annually</b>
<b>Kabadiwala-to-Ambassador</b>	<ul style="list-style-type: none"> <li>- Train informal collectors for awareness</li> <li>- Issue ID cards, uniforms</li> </ul>	<b>35% segregation rise in informal zones</b>
<b>Direct Procurement from Aggregators</b>	<ul style="list-style-type: none"> <li>- AMC to buy sorted waste at fair prices</li> <li>- Blockchain for transparency</li> </ul>	<b>20% income rise, less dumping</b>
<b>Digital Reporting &amp; Penalties</b>	<ul style="list-style-type: none"> <li>- Tablets for waste inspectors</li> <li>- Fines ₹500–₹5,000 for violations</li> </ul>	<b>80% compliance in commercial areas</b>
<b>Public Scorecards</b>	<ul style="list-style-type: none"> <li>• Publicize ward-level performance</li> <li>• Infrastructure rewards for top wards</li> </ul>	<b>10–15% annual improvement</b>

# Conclusion





# Thank You

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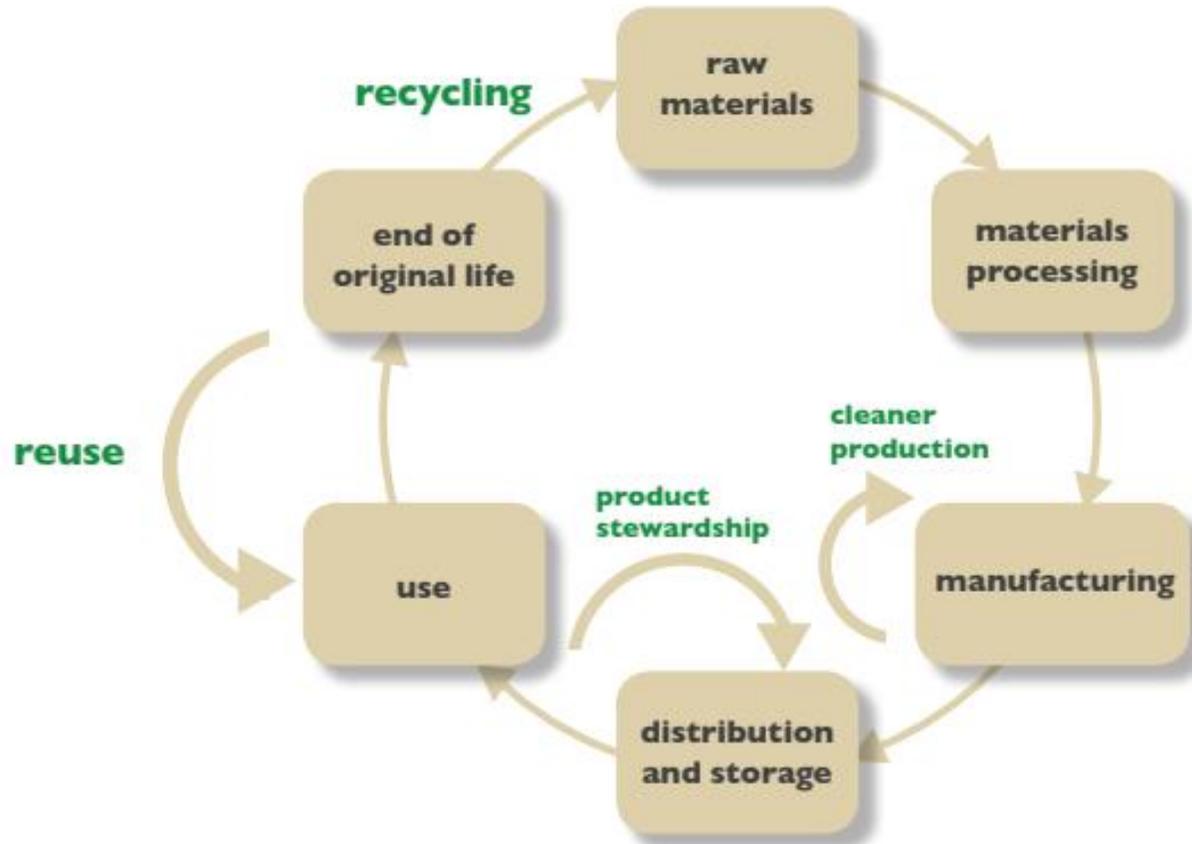
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Intervention Area	Strategy	Model/Case Study	Key Stakeholders
<b>Behavioral Change &amp; Awareness</b>	Ward-Level "Zero Waste Champions"	Indore: My Home, My Ward	AMC, RWAs, CEPT
	School & Institutional Engagement	Kerala: Green Protocol	Education Boards, School Admins
<b>Infrastructure &amp; Tools</b>	Dual-Compartment Bins with IoT	Bengaluru: Smart Bins	IoT firms (Enevo), AMC, CEPT
	Decentralized MRFs	Ambikapur: Garbage Cafés	AMC, Kabadiwala Co-ops, NGOs
<b>Economic &amp; Policy Incentives</b>	Pay-As-You-Throw (PAYT)	Surat: Volume-based fees	AMC, Smart Bin Vendors, RWAs
	Enforce Extended Producer Responsibility (EPR)	Pune: Plastic Credit System	MoEFCC, GPCB, FMCG companies
<b>Informal Sector Integration</b>	Kabadiwala-to-Ambassador	Delhi: Safai Sena	NGOs (Chintan), AMC, Co-operatives
	Direct Procurement from Aggregators	Chennai: Waste-to-Wealth	AMC, Aggregators, Recyclers
<b>Monitoring &amp; Enforcement</b>	Digital Reporting & Penalties	Hyderabad: Swachh Auto App	AMC, GPCB
	Public Scorecards	Mysuru: Clean Street Rankings	AMC, RWAs, Media

# 3R strategy for ZERO WASTE



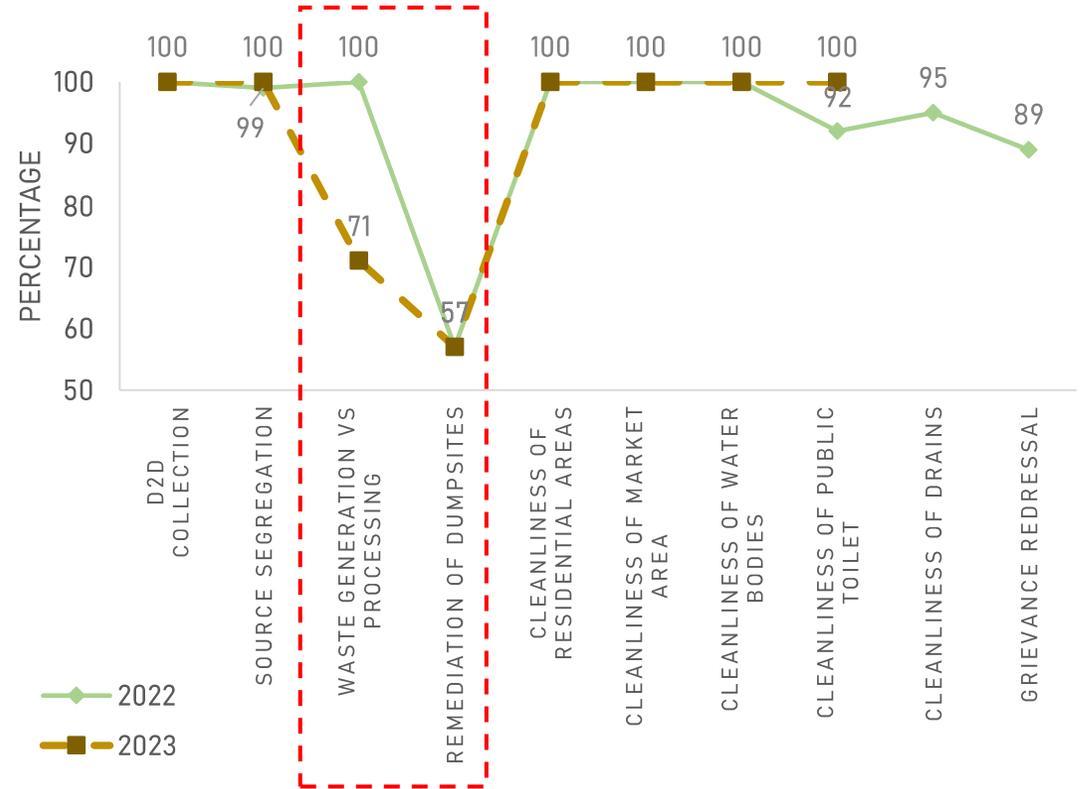
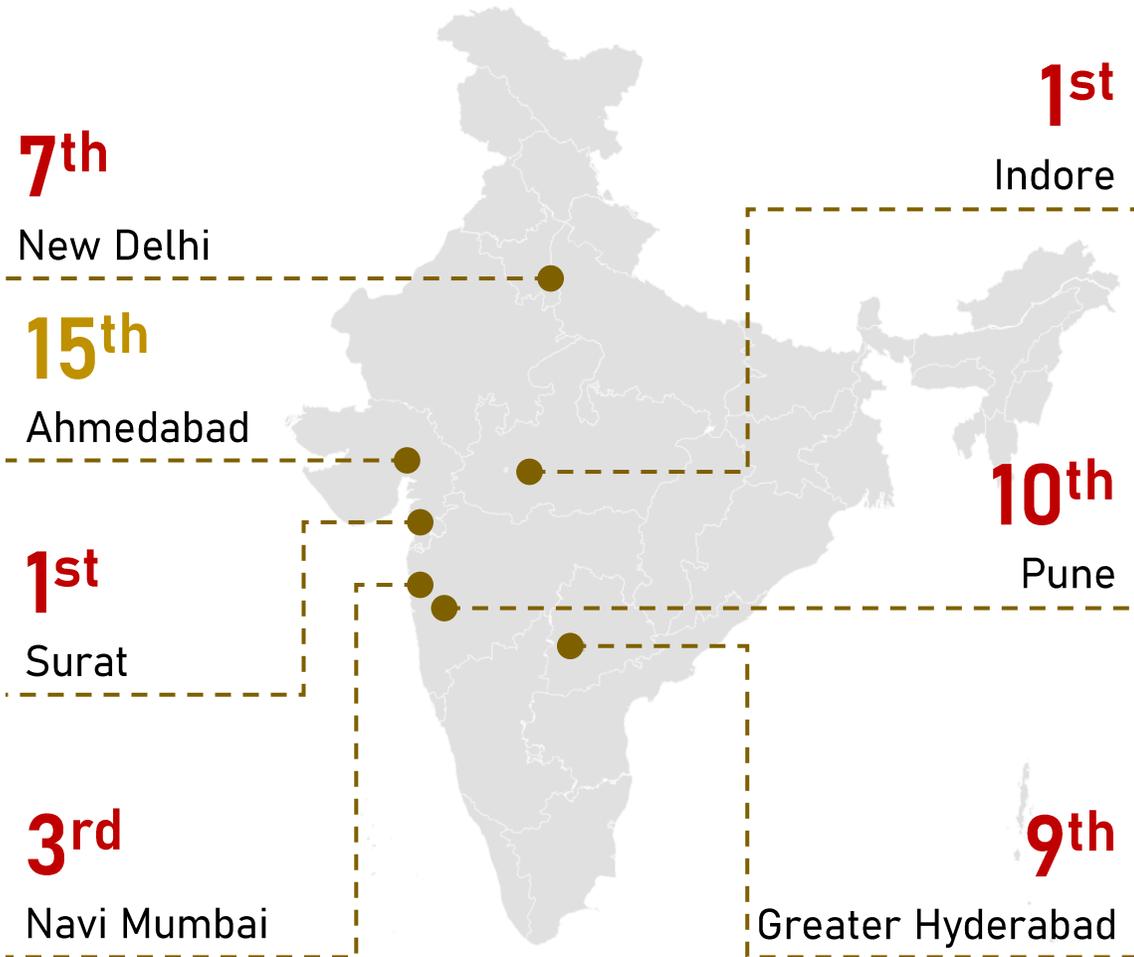
The focus of this road map is **cradle to cradle** processes, to view products in all its stages to minimize waste and maximize usefulness

The 3 Rs are:

- **Reduce** - reduce generation of waste at the source
- **Reuse** - maximise recovery of materials for reuse
- **Recycle** - maximise recycling of discarded material

Zero Waste seeks to design and manage products and processes to reduce the quantity and toxicity of waste with an ultimate goal of eliminating waste that needs to be burned or buried or that can harm the environment and people.

## 2023 Ranking



Indore and Surat cities achieved 100% door-to-door waste collection, 98% source segregation, and **100% remediation** of dumpsites.