

# Plastic Waste Management Strategies and Action Plan- Gap Analysis and Plan Development

## Module IV



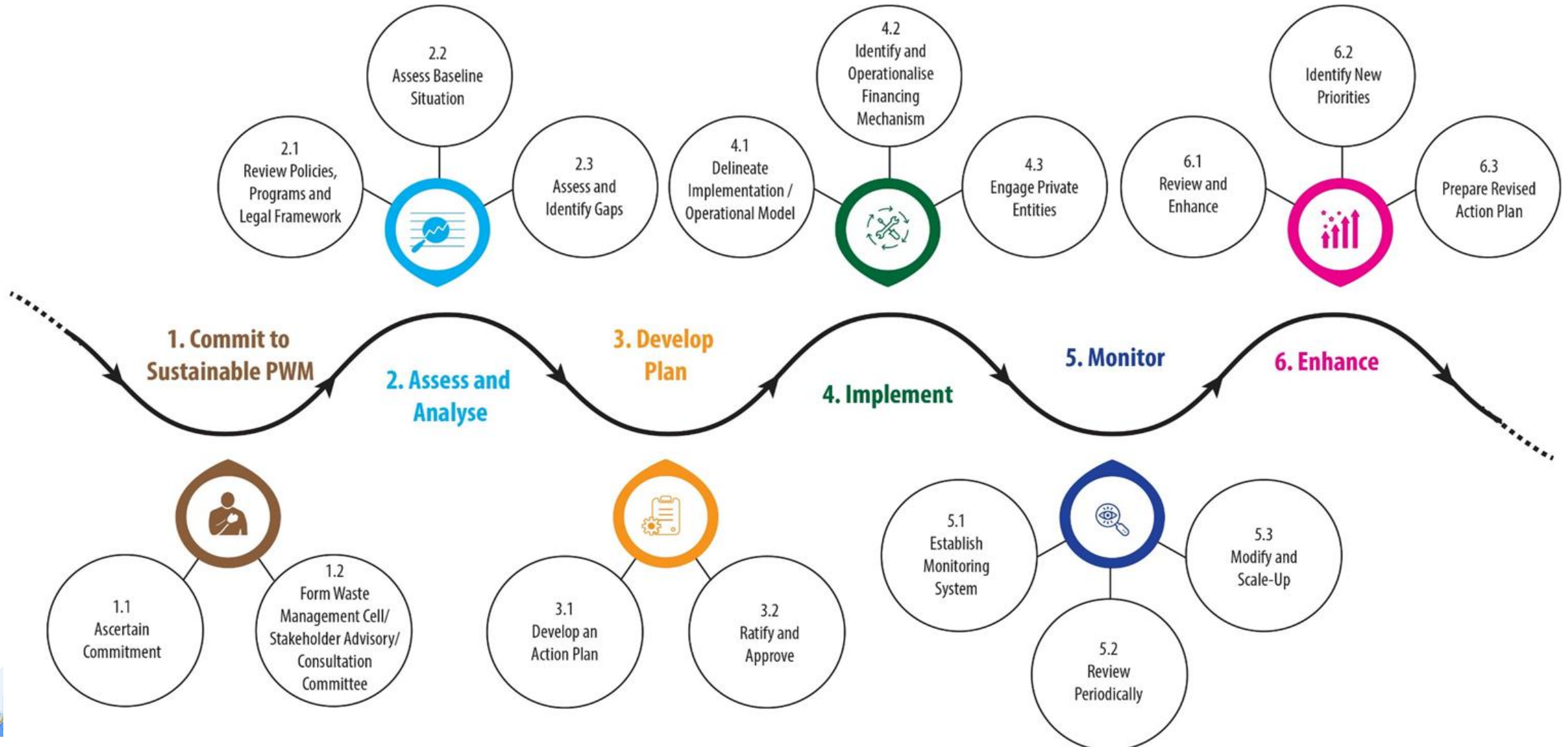
# Session Overview

**Tools and techniques for assessment and identification of gaps**

**Step-wise guidance to develop Plastic Waste Management Action Plan**



# Overall process to develop plastic waste management action plan





## 2. Assess and Analyse



## 2.3 Assess and identify gaps



### Description

- Identify gaps in the existing system
- First Stakeholder Consultation (Identify short term and long-term objectives, considering the identified gaps, baseline, inputs from stakeholders, financial situation, and technical capabilities of the local body)

### Key Actions

- Comparison with standards/benchmarks and future demands
- Identify technical, financial, administrative, operation, and maintenance gaps in the existing PWM system.
- Identify gaps in the implementation of existing programs and policies.
- SWOT Analysis
- Stakeholder meetings



## 2.3.1 Identification of gaps in existing PWM System

Gap analysis – Comparison of baseline waste management information vis-a-vis existing regulations and Service Level Benchmarks (SLBs) to identify the gaps in the existing waste management system. This can be used to prepare the plan to improve the waste system (including Plastic Waste).

*Source: CPHEEO Manual on Municipal Solid Waste Management, 2016*

Some of the assessment tools to be utilized for conducting gap analysis:

1. Comparison with standards/benchmarks
2. Material flow analysis
3. SWOT Analysis

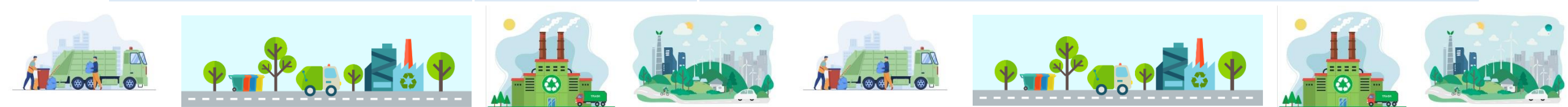




## 2.3.2 Comparison of existing situation with standards/benchmarks

**Table 1: Service Level Benchmarks for Solid Waste Management as per erstwhile Ministry of Urban Development (MoUD), 2008**

Indicators	Benchmark	Descriptions
Door to Door collection	100%	% of HH and establishments covered by a daily doorstep collection system
Collection efficiency	100%	Ratio of total waste collected to the total waste generated (excluding recycling or processing at the generation point)
Extent of segregation	100%	Percentage of waste segregated to total waste generated.
Extent of municipal solid waste recovered (Including plastic Waste)	80%	Quantum of waste collected, which is either recycled or processed.



## 2.3.2 Comparison of existing situation with standards/benchmarks (Contd.)

**Table 1: Service Level Benchmarks for Solid Waste Management as per erstwhile Ministry of Urban Development (MoUD), 2008**

Indicators	Benchmark	Descriptions
Extent of scientific disposal of municipal solid waste	100%	The amount of un-recovered waste that is disposed in sanitary landfills
Extent of cost recovery in SWM services	100%	The extent of recovering all operating expenses relating to SWM services from operating revenues of sources related exclusively to SWM.
Efficiency in collection of SWM charges	100%	Current year revenues collected, expressed as a percentage of the total operating revenues (Mandate and acceptable user charges )





## 2.3.3 Material flow analysis

### Capture the following information across the value chain

- Quantum of waste moving and diverting from each stage - Leakages into environment
- Economic value of waste at each stage
- Stakeholders with their roles and responsibilities
- Technical, environmental and social issues and gaps across the value chain

Allows critical view

Helps to choose sustainable technologies

Helps to evaluate the environmental soundness

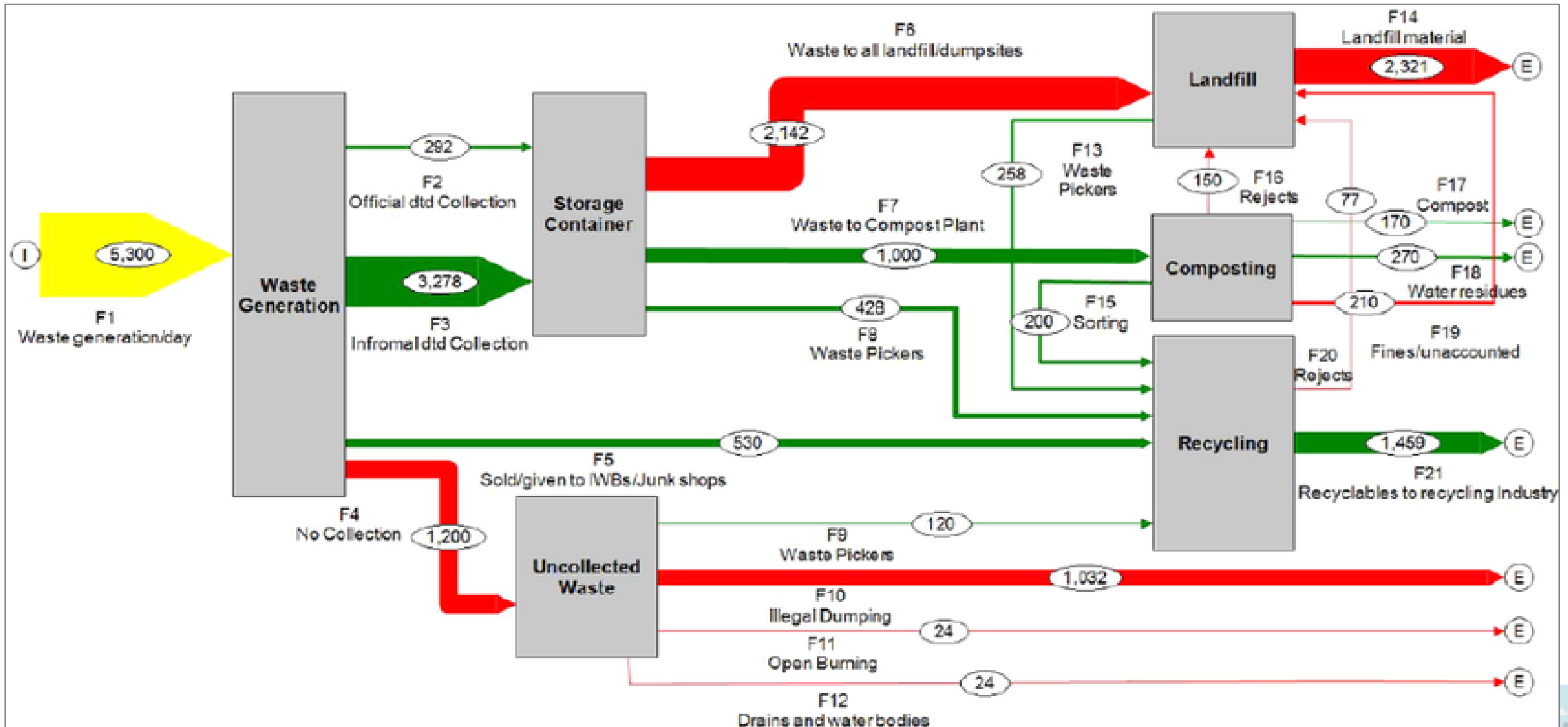
Identifies various stakeholders

Ideal technical basis for planning and decision making

For reliable assessment, collect data and conduct investigative research

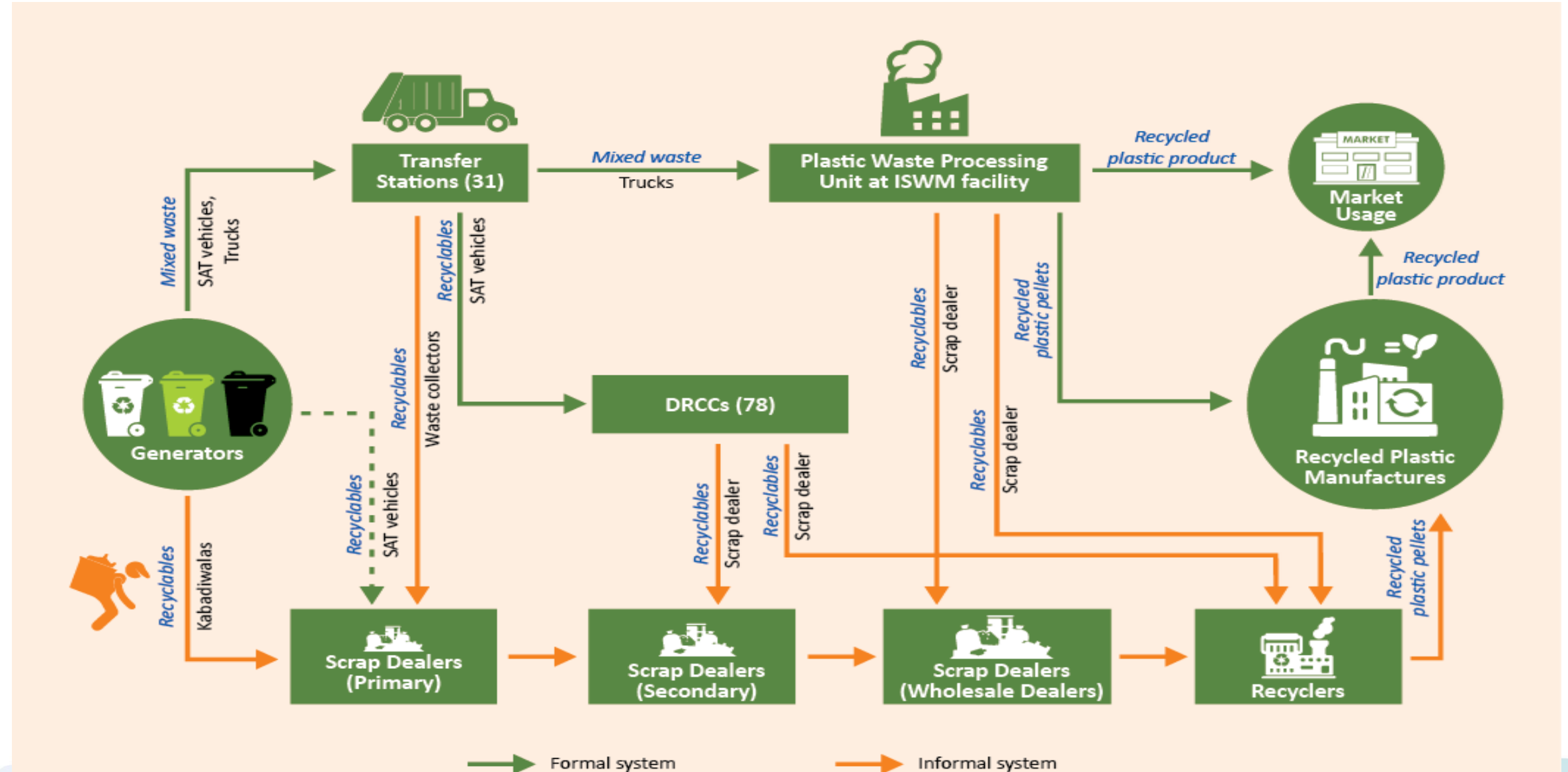


## 2.3.3 Material flow analysis



(Source: <https://www.researchgate.net/publication/264629066> An assessment of the current municipal solid waste management system in Lahore Pakistan)

# Material Flow of MSWM in GHMC



(Source: Developed by ICLEI South Asia, 2019)

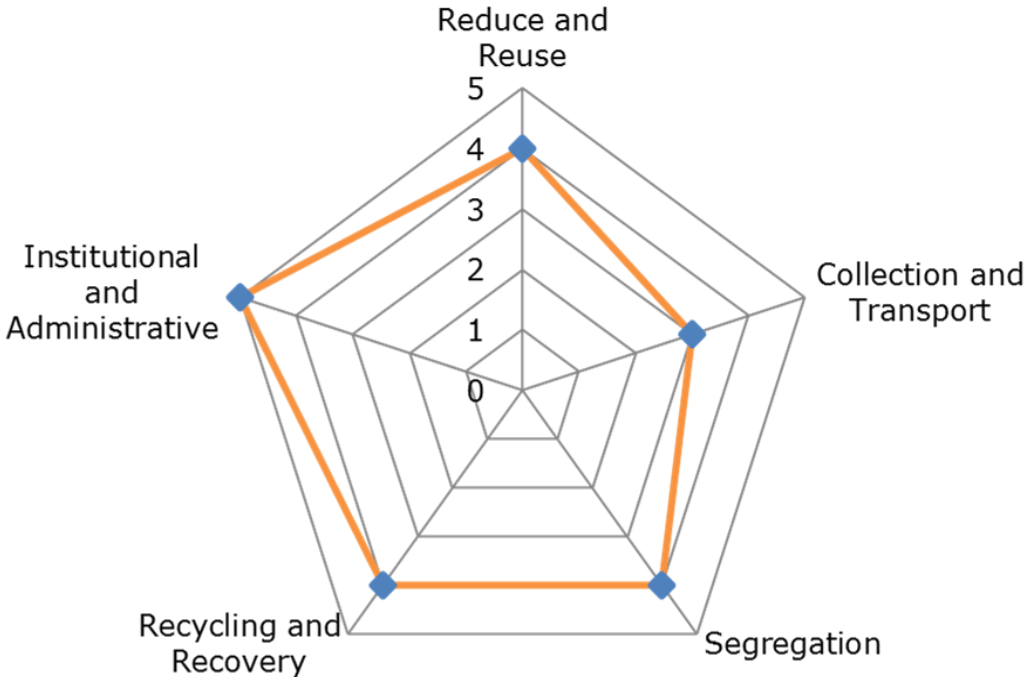
# 2.3.4 SWOT Analysis

	Reduce and Reuse	Collection and Transportation	Segregation	Recycling and Recovery	Institutional and Administrative
Strengths					
Weakness					
Opportunities					
Threats					

List the strengths ,weakness, opportunities and threats across the value chain of plastic waste including administrative and management systems.



# SWOT Analysis – Identifying strength of PWM value chain in Hyderabad



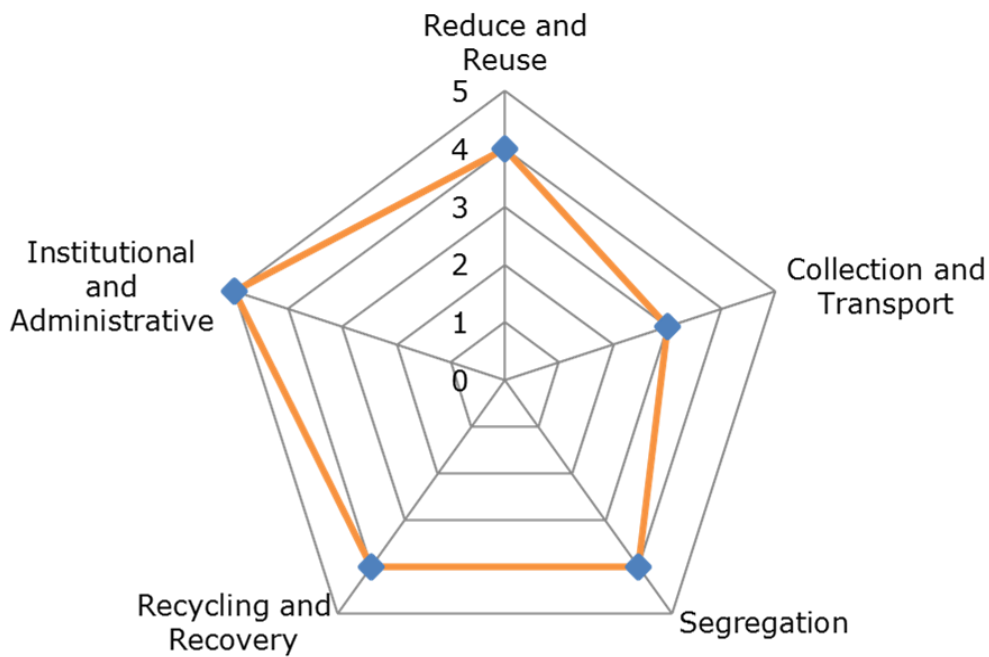
## Strengths

Reduce and Reuse			
1. Availability of alternatives of SUPs	2. Strong enforcement tackling the usage of SUPs carry bags in large scale retail shops	3. Focused IEC on reduction in usage of SUPs	4. City level vigilance team to monitor and regulate the production of plastic products below 50 microns.

Collection and Transport		
1. 98% coverage of D2D collection by Swachh Auto Trippers (SAT) vehicles	2. Privatization of SAT vehicles – transfer of O&M to private party	3. Availability of zone wise infrastructure



# SWOT Analysis – Identifying strength of PWM value chain in Hyderabad (Contd.)



**Strengths**

## Segregation across Value Chain

1. Strong determination at city level to achieve source segregation

2. Continues IEC activities on source segregation

3. Compartmentalised SAT vehicles for segregated transport

4. 78 Dry Resource Collection Centers (DRCCs) in the city

## Institutional and Administrative

1. PWM Rules, and State level Orders

2. City level resolution to "Ban" below 50 micron plastic

3. Strong political will at city and state level

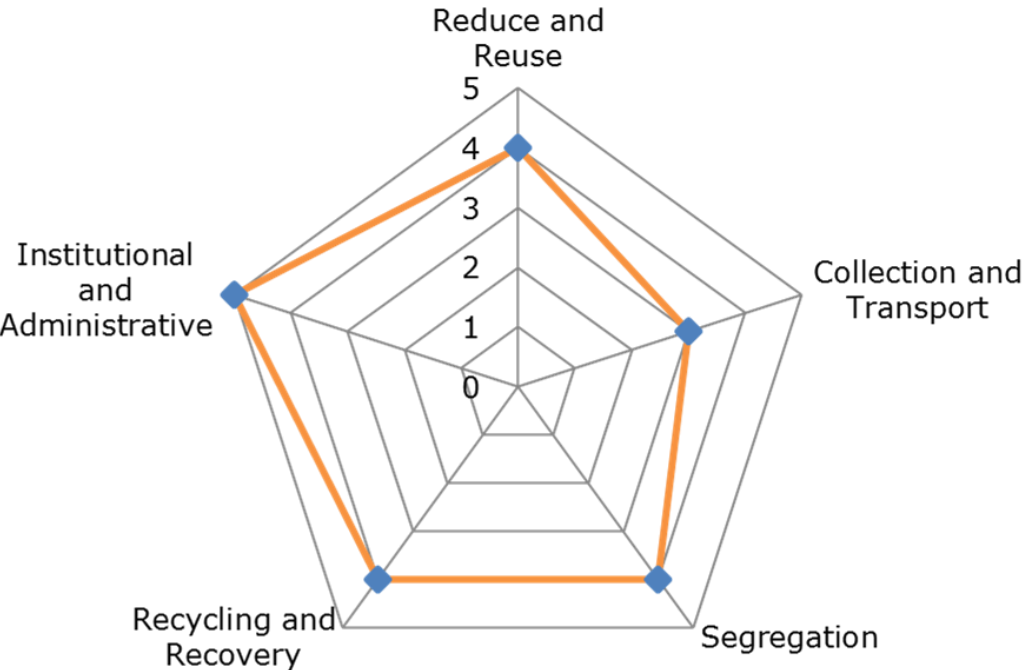
4. Strong organisational hierarchy to cater to all administrative units dedicatedly

5. Power of GHMC to make bye-laws/ issue orders, resolution or notifications





# SWOT Analysis – Identifying strength of PWM value chain in Hyderabad (Contd.)

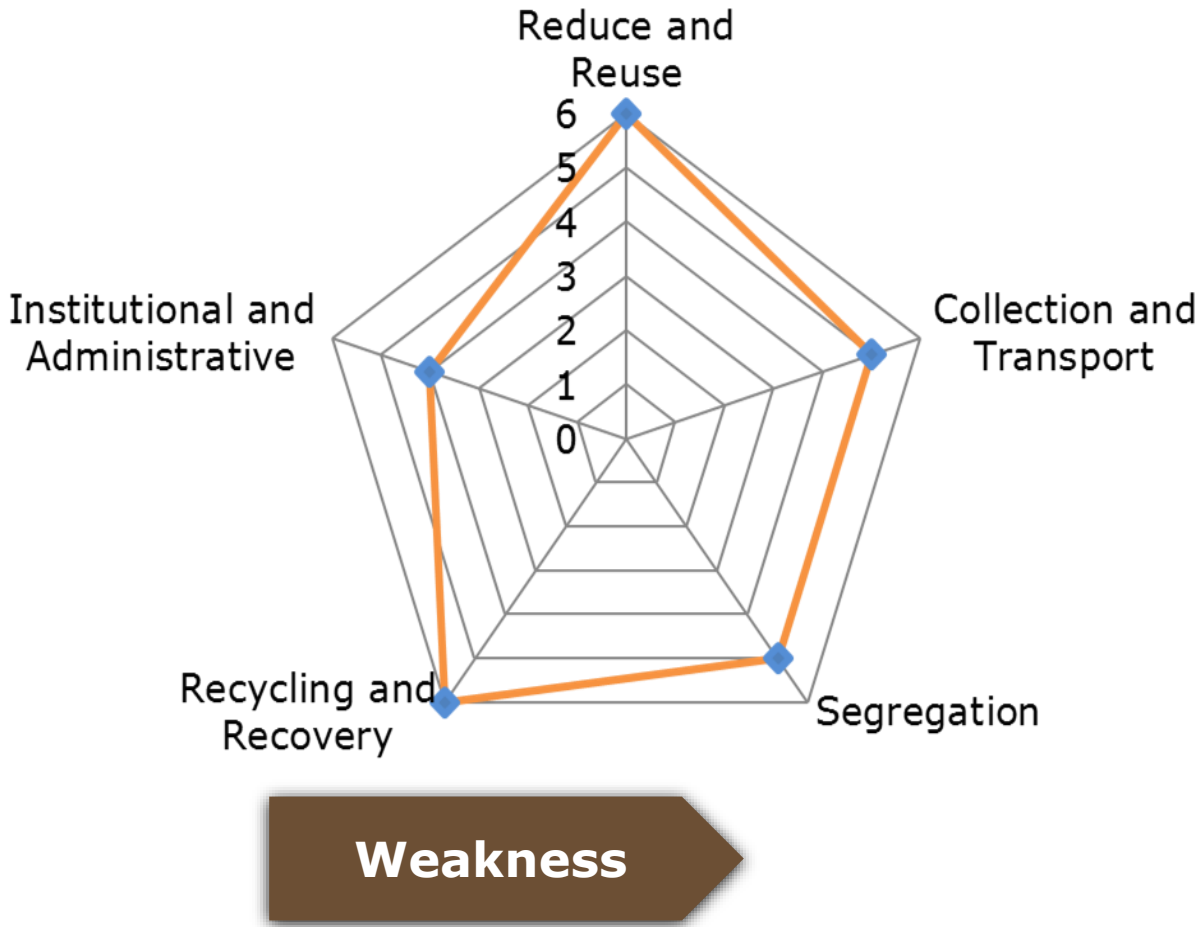


Recycling and Recovery			
1. Existing integrated waste management facility	2. Large number of plastic recycling industries (formal and informal) in and around the city	3. GHMC has favorable attitude towards exploring plastic recycling options	4. GHMC has access to technical and R&D expertise (CIPET, CII, TAAPMA) on plastic recycling

## Strengths



# SWOT Analysis – Identifying weaknesses of PWM value chain in Hyderabad

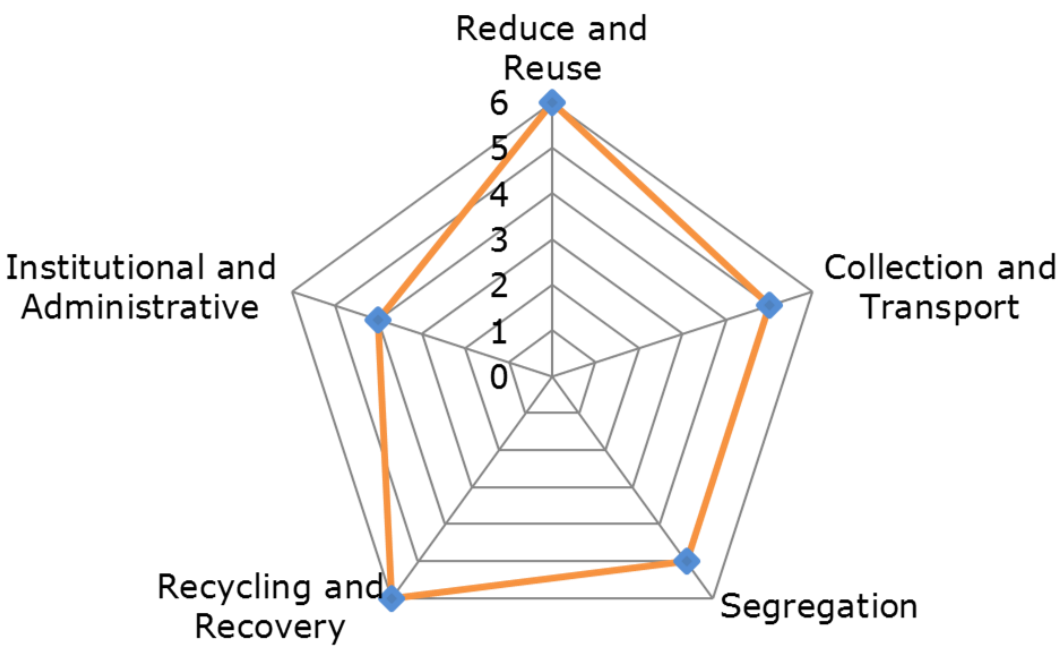


Reduce and Reuse		
1. Low accessibility of alternative products	2. Lack of affordable alternative products	3. Piecemeal implementation of awareness programmes

Reduce and Reuse		
4. No legal enforcement for citywide ban on SUPs	5. Lack of co-ordination between Sanitation and Vigilance team	6. Citizens' apathy towards alternative products



# SWOT Analysis – Identifying weaknesses of PWM value chain in Hyderabad (Contd.)



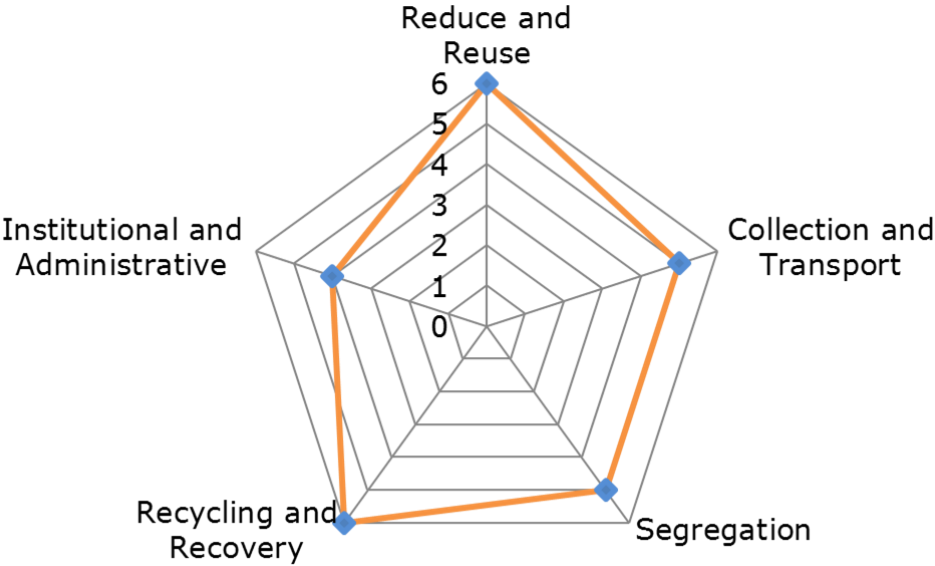
**Weakness**

Segregation across Value Chain				
1. Lack of priority on secondary and tertiary segregation	2. Fragmented segregation and recovery of only high value (PET, HDPE, PP) plastic waste	3. Diversion of collected waste to informal scrap dealers	4. No monitoring and regulatory system for existing DRCCs.	5. Lack of capacity building of sanitation workers

Collection and Transport				
1. Weak regulation and monitoring of D2D collection system	2. Alternate day waste collection in most part of the city	3. Lack of availability and usage of safety gears	4. Age old transfer stations	5. No dedicated regulatory/ financial measures for bulk waste generators



# SWOT Analysis – Identifying weaknesses of PWM value chain in Hyderabad (Contd.)

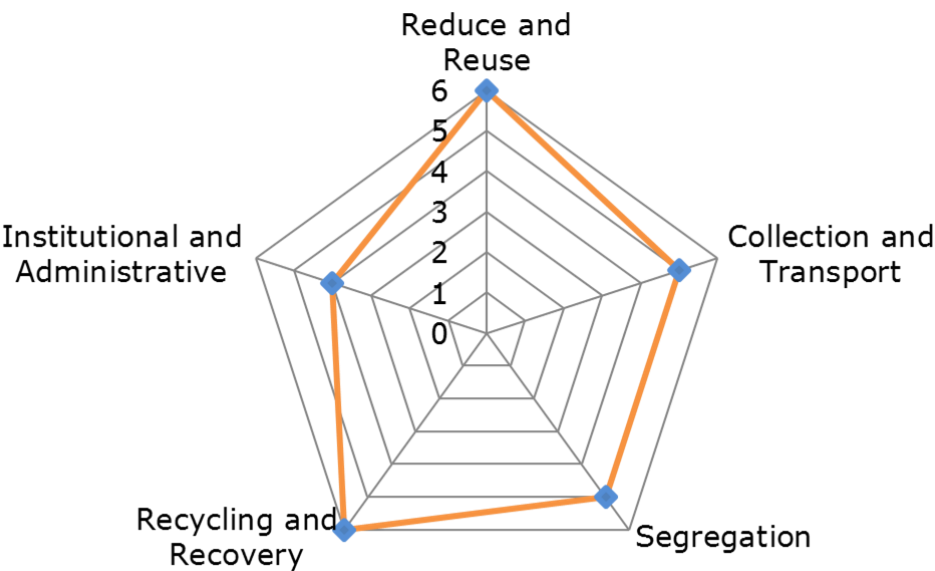


Institutional and Administrative			
1. Limited technical capacity of local authorities in understanding plastic waste	2. Rigid top-down planning	3. Lack of co-ordination, transparency and data sharing among key stakeholders	4. Lack of clarity on mobilization of EPR. Authority primarily lies with the Central Govt.

Weakness



# SWOT Analysis – Identifying weaknesses of PWM value chain in Hyderabad (Contd.)

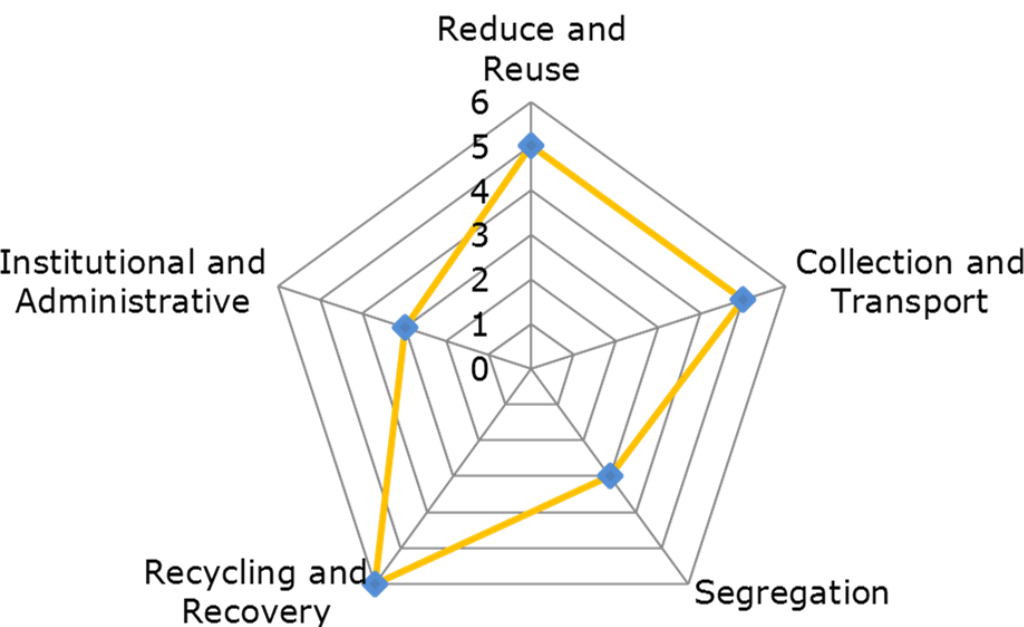


Recycling and Recovery				
1. Majority of PW reaching ISWM facility is landfilled /converted in to RDF	2. LDPE, highest PW fraction in city, not recycled due to expensive segregation and pre-processing	3. GST, lack of financial subsidy and expensive environmental control measures deter setting up recycling/processing industries	4. Orange category industry to undergo cumbersome approval procedure	5. Lack of monitoring on usage of recycled products/ plastic processed fuel

Weakness



# SWOT Analysis – Identifying opportunities for PWM value chain in Hyderabad



Opportunities

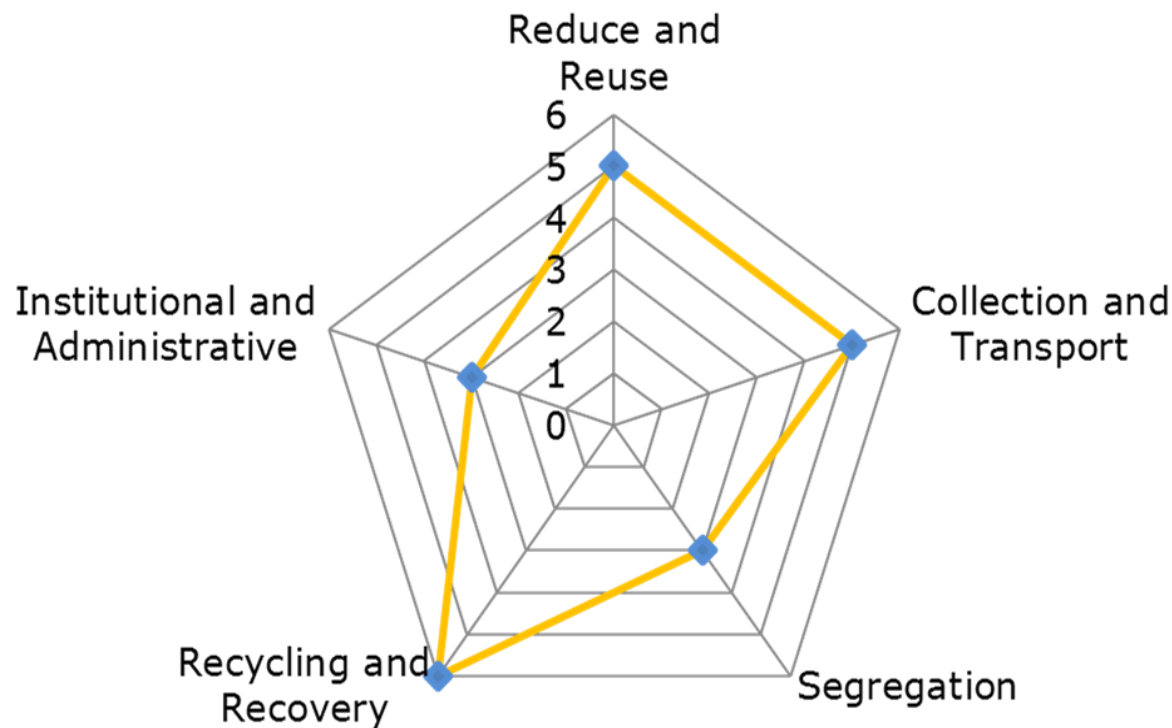
Reduce and Reuse		
1. Mission based IEC opportunity towards behavior change	2. Availability of cotton as local raw material for manufacturing alternative products	3. Presence of active CBOs, SHGs, RWAs to be developed as a small-scale production units for alternative

Reduce and Reuse	
4. Leveraging government schemes to encourage production of alternative products	5. Involving R&D institutes and incentivizing and cross subsidizing the alternative materials through available CSR funds, Trusts etc.





# SWOT Analysis – Identifying opportunities for PWM value chain in Hyderabad



Opportunities

Collection and Transport		
1. Existing informal sectors as a potential resource for integrated and efficient waste recovery network.	2. Dedicated land for transfer station has potential for decentralised development in future	3. Strong top to bottom hierarchy of officials within local government working towards 100% collection of waste.

Collection and Transport	
4. Presence and interest of LSPs to set up digitalised waste collection and transport system	5. Availability of Command Control Centre



The illustration sequence shows the waste management process from left to right: 1. Waste collection by a green truck. 2. Transport of waste to a recycling facility. 3. Recycling process with a green truck and a recycling symbol. 4. Final disposal or recycling stage with a green truck and a recycling symbol. 5. A large yellow box labeled 'up approach'.

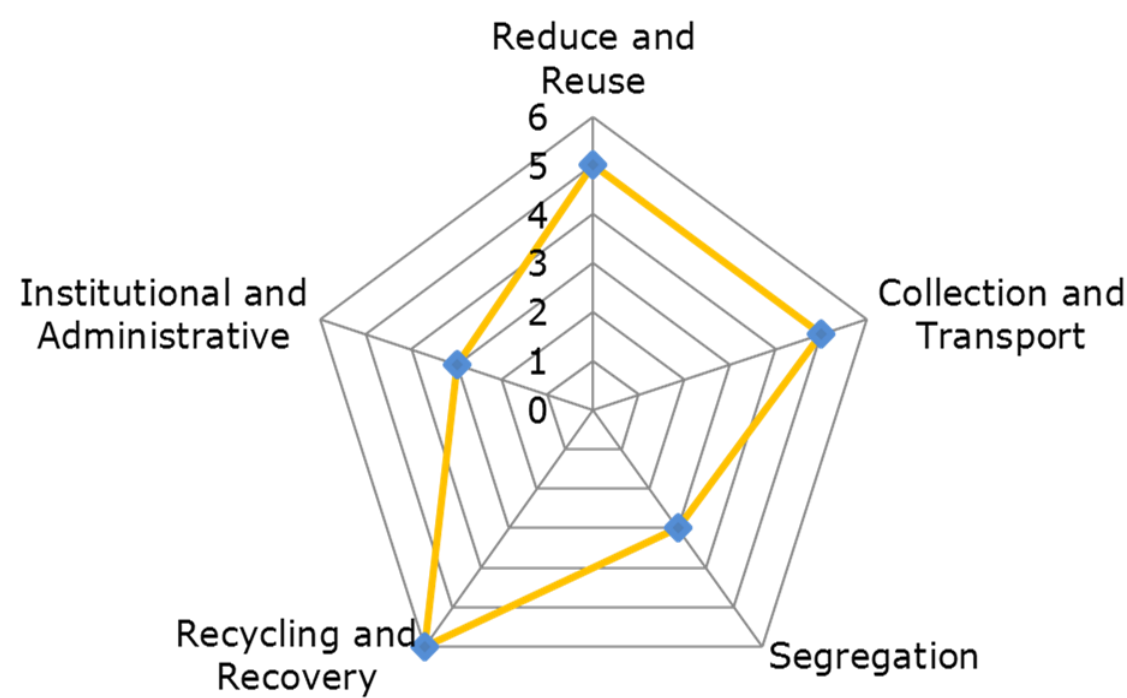


Segregation across Value Chain		
1. Existing informal sectors with comprehensive manual segregation systems.	2. Interest among private parties in investing in DRCC	3. Presence of NGOs with source segregation as key agenda

Institutional and Administrative		
1. Opportunity to develop state/city level policies and guidelines as part of implementation of plastic waste management rules.	2. Exploring PPP in plastic waste management	3. Involvement of Community Based Organizations (CBOs) and Non-Government Organizations (NGOs) for promoting bottom-up approach

# SWOT Analysis – Identifying opportunities for PWM value chain in Hyderabad (Contd.)



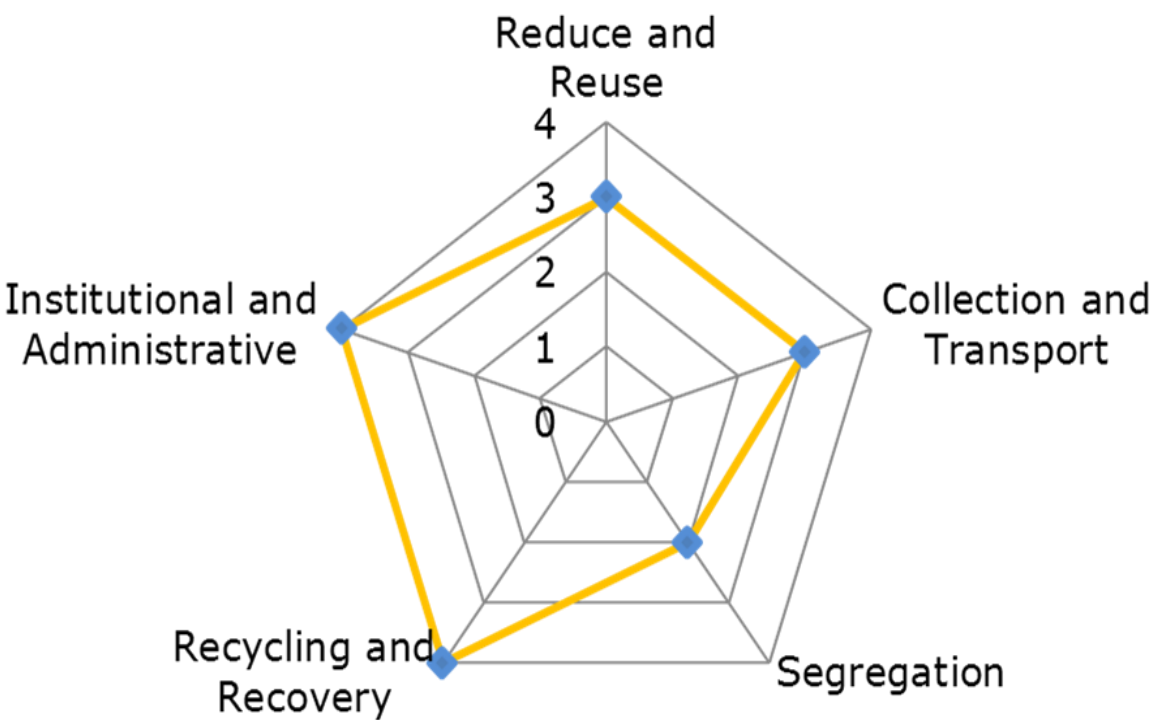
Opportunities

Recycling and Recovery		
1. EPR as an opportunity to cross subsidizes the recycling economy	2. Demand for recycled plastic granules	3. Well established plastic recycling and use of plastic waste in road technology and associated environmental control measures

Recycling and Recovery		
4. Availability of labor for plastic recycling/ processing units	5. Availability of multiple organi- sations for regulating and monitoring	6. Incentivising and rehabilitating informal workers for a streamlined value chain



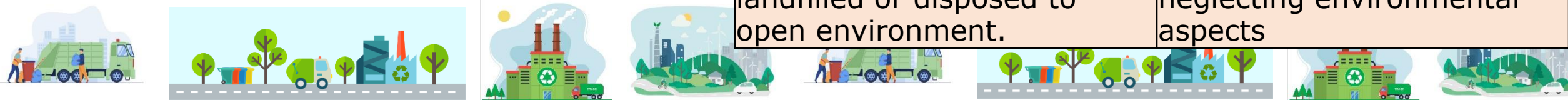
# SWOT Analysis – Identifying threats for PWM value chain in Hyderabad



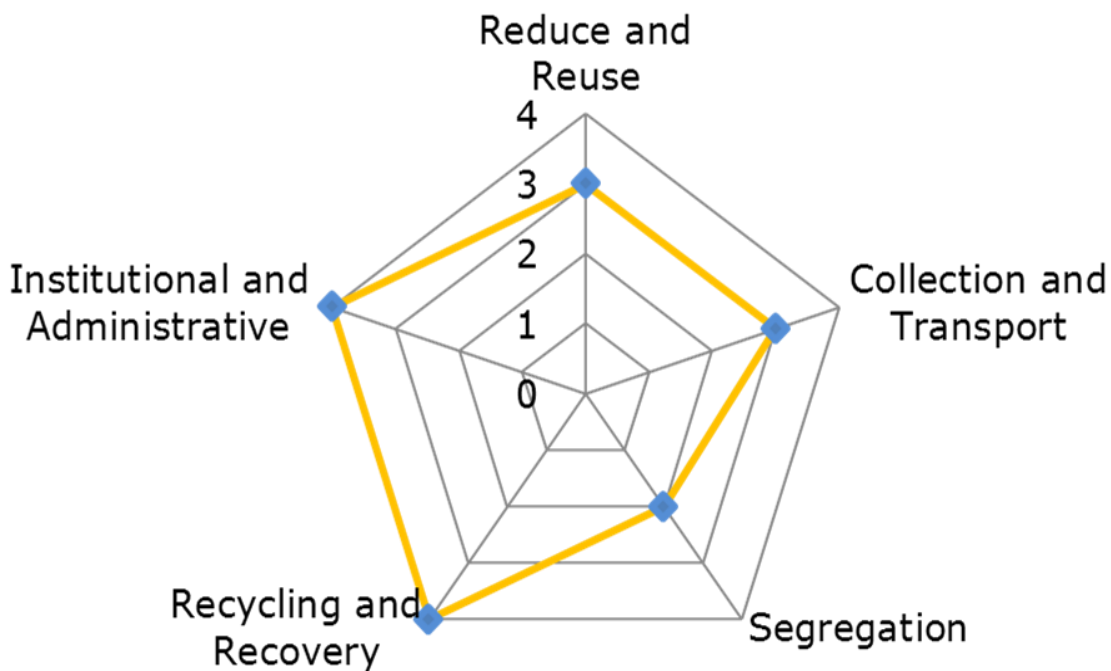
Threats

Reduce and Reuse		
1. Un-appropriate alternatives products entering market eg. non-woven plastic bags, non-verified bio- degradable bags etc.	2. No existing state/city level regulatory and monitoring guidelines on all kinds of alternative products and up cycling of plastic waste	3. No availability of alternatives for plastic cutlery used by street food vendors at the same/lesser price point

Segregation across Value Chain	
1. Low value plastic is not of an interest for existing scrap market. Thus, left to be landfilled or disposed to open environment.	2. Existence of strong informal sector driven by socio-economic factors neglecting environmental aspects



# SWOT Analysis – Identifying threats for PWM value chain in Hyderabad (Contd.)

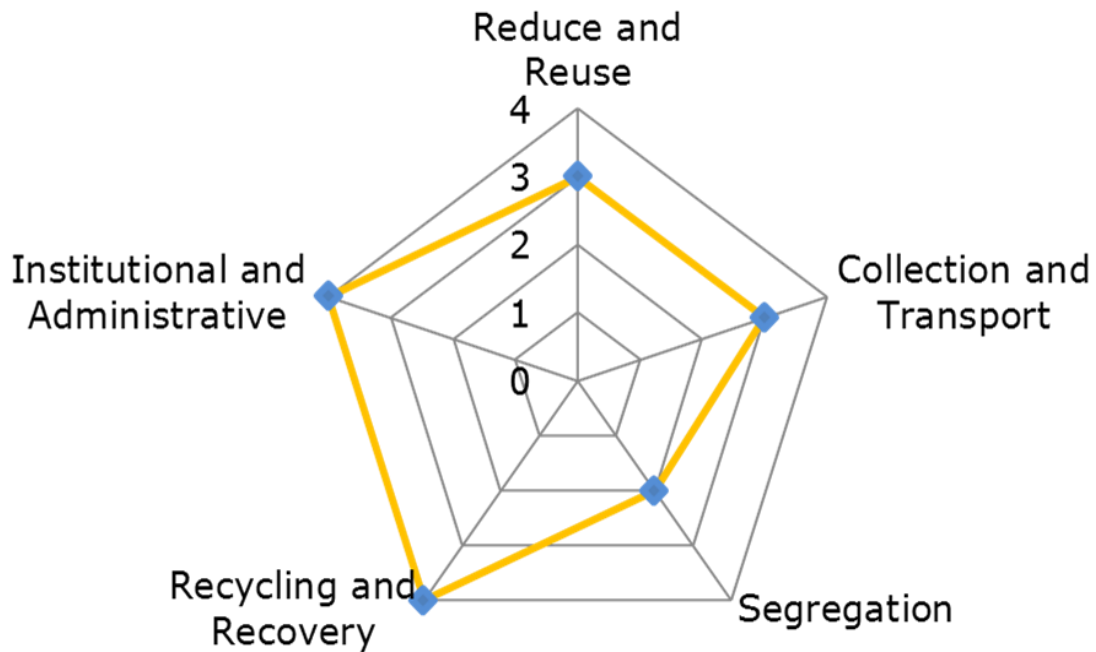


Collection and Transport		
1. Lack of control on SAT operators that could lead to unprecedented situation e.g. Strike etc.	2. Open dumping and burning is quite common in several parts of city	3. Community's non-willingness to cooperate, participate and pay collection charges, Not In My Backyard(NIMBY) syndrome and Who cares syndrome

Threats



# SWOT Analysis – Identifying threats for PWM value chain in Hyderabad (Contd.)



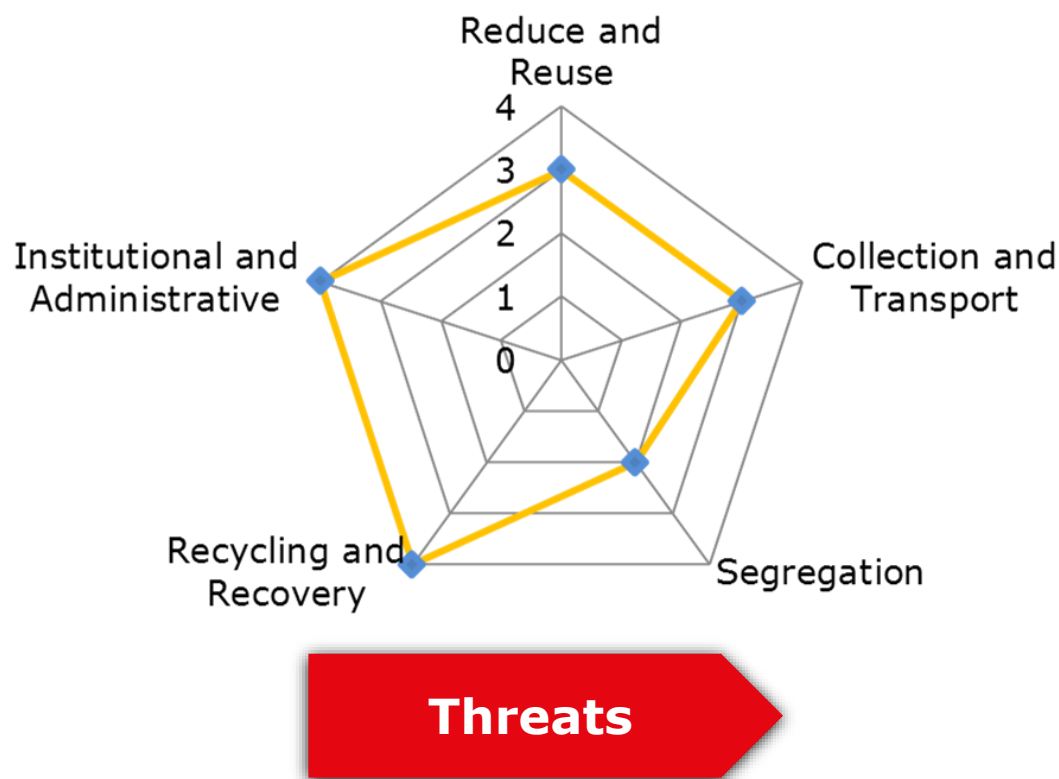
Threats

Institutional and Administrative			
1. Different ideas and ideologies amongst group of stakeholders	2. Lesser priority to plastic waste management by government officials to develop best and mutually agreed upon solutions among all stakeholders	3. No enough scope and power to local communities	4. Political interventions in the operation of city and pollution control board





# SWOT Analysis – Identifying threats for PWM value chain in Hyderabad (Contd.)



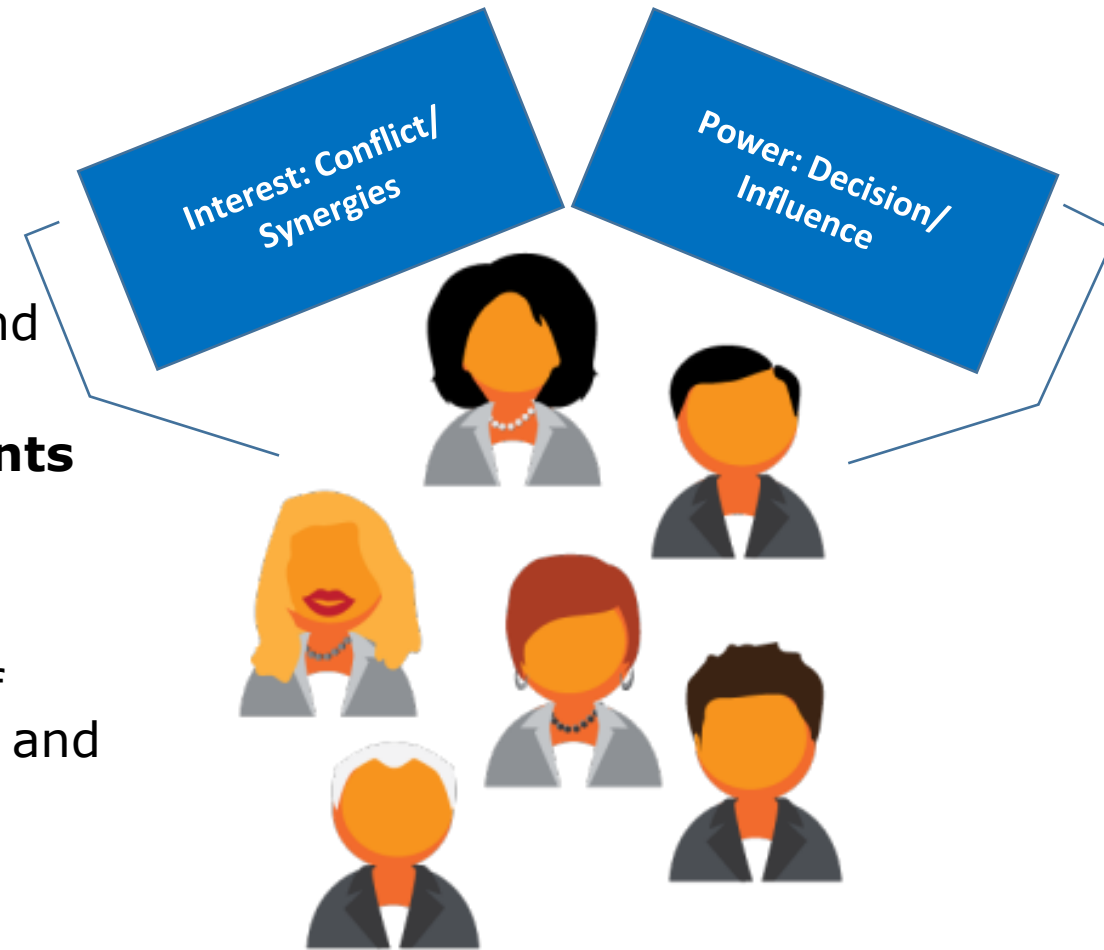
Recycling and Recovery			
1. Environmental degradation due to open disposal of rejects from recycling industries	2. No monitoring and record on the grade of recycled granules/ plastic processed fuel	3. Extrusion of multi - layer plastic is observed on ground, which is further used in agriculture pipelines. This could pose serious threat to human health	4. Plastic to fuel is an emerging technology with no well-defined environmental control regulation



## 2.3.5 Stakeholder consultation is important

Helps to know:

- **Ability and willingness to cooperate**
- **Demand** for type and requirement of service and frequency
- **Attitude towards participating in experiments or pilot projects** such as those on source segregation, reuse, recycling, treatment and disposal
- **Willingness to work with** different sections of society, such as rag pickers, municipal workers, and entrepreneurs
- **Willingness to pay for services**, the mode of payment, and the **frequency of payment**



# List of key stakeholders identified during GHMC's PWM planning process

## Government Agencies

- Greater Hyderabad Municipal Corporation
- Telangana State Pollution Control Board
- Commissioner and Director of Municipal Administration



Confederation of Indian Industry

## Research Organisations

- Confederation of Indian Industry (CII)
- Central Institute of Petrochemicals Engineering & Technology (CIPET)
- Environment Protection Training and Research Institute (EPTRI)
- Regional Center for Urban and Environmental Studies (RCUES)



# List of key stakeholders identified during GHMC's PWM planning process (Contd.)

## Private agencies

- Ramky Enviro Engineers Limited- Recycling/ Processing/Disposal Service Provider/ Operator of ISWM Facility
- ITC's Well-being Out of Waste (Wow) - DRCC operator
- PYROGREEN Energy Pvt Ltd - Technology provider (Plastic to Fuel- Pyrolysis)
- Waste Ventures India - Logistics Service Provider (LSP)

## Other Stakeholder

- Manufacturers & Recyclers Association
- Cherlapally notified municipal industrial area service society
- Banyan Nation- IOT enabled recycling company, aggregator of informal sector

## Non-Governmental Organisation (NGOs)

- WaterAid
- AccelerateSD





# 1<sup>st</sup> Stakeholder consultation

- First meeting - after quick assessment of existing plastic waste management and gap analysis.
- Stakeholders to identify short- and long-term objectives, considering the identified gaps, baseline, financial situation and technical capacity of local authority.



**First Stakeholder meeting of GHMC**



### 3. Develop Plan





# 3.1 Develop an action plan



## Description

- Identify viable strategies and interventions
- Prioritize and finalize actions with clearly defined timelines

## Key Actions

- Future projections
- Identify short term and long-term actions in consultation with waste management cell
- Identify city-specific contextual strategies in consultation with waste management cell
- Identification of established and potential linkages with other on-going programs/policies at the national/state level and city level



## 3.1.1 Future projections

- Estimate future plastic waste generation
- It depends on the following parameters
  - Future Population projection
  - Anticipated lifestyle change
  - Change in socio-economic profile of city



### **Future Projection of the Waste Quantity**

Future Waste Generation = Per capita waste generation \* Projected population

*(Source: CPHEEO Manual on Municipal Solid Waste Management, 2016)*



# Future population projection

- **Arithmetic Increase Method:** If there has been a constant increase in population (in absolute numbers) over the past few decades, then for the purpose of future projection, arithmetic increase method could be used

Available data: Population in base year ( $t_1$ )-  $P_1$ , Current population ( $t_2$ )-  $P_2$

Step 1: Hence, arithmetic growth rate ( $K_a$ )=  $P_2 - P_1 / t_2 - t_1$  (constant)

Step 2: Projected population after  $t$  decade =  $P_1 + k(t-t_1)$

- **Geometrical Increase Method:** In this method the geometric mean of decadal averages is considered to be the rate of growth

Available data: Population in base year ( $a$ )-  $P_a$ ,  $t$  = the number of years between 'a' and 'b'

Step 1: Decadal growth rate ( $r$ )=  $\{(P_{1981} / P_{1971})^{1/t} - 1\} \times 100$  (here  $t = 10$ )

Step 2: Projected population for year  $b$ =  $P_a (1+r)^t$



# Future population projection (Contd.)

- **Incremental Increase Method:** In this method the increment in arithmetical increase is determined based on the past decades, and the average of that increment is added to the average increase.

Available data: Population in base year -  $P_0$ ,  $n$  = Period of projection in decades

Step 1:  $X$  = Average increase of population of known decades

Step 2:  $Y$  = Average of incremental increases of the known decades

Step 3: Projected population after  $n$  decades from present =  $P_0 + nx + n(n+1)/2 * Y$

- In case of a big and growing city like Hyderabad, it is recommended to use average of geometric and incremental growth rate
- Floating population also to be accounted for in the population projection and calculation of future waste generation



# Population projection for GHMC

Year	Geometric Increase	Incremental Increase	Average Population	Floating Population (4.4% of Urban Population)	Design Population (Average + Floating Population)	Per capita waste generation (in g/c/d)	Waste generation (TPD)	Waste Generation (Annual in Tonnes)
2012	7020858	6828984	6924921	304697	7229618			
2013	7322339	6928628	7125484	313521	7439005			
2014	7636765	7030723	7333744	322685	7656429			
2015	7964693	7135267	7549980	332199	7882179			0
2016	8306703	7242261	7774482	342077	8116559			0
2017	8306703	7351706	7829204	344485	8173689		0	0
2018	9035412	7463600	8249506	362978	8612484	329	2833	1034010
2019	9422300	7577044	8500672	374030	8874701	333	2957	1079343

(\* Average Population: Average of Geometric and Incremental Increase)



# Population projection for GHMC (Contd.)

Year	Geometric Increase	Incremental Increase	Average Population*	Floating Population (4.4% of Urban Population)	Design Population (Average + Floating Population)	Per capita waste generation (in g/c/d)	Waste generation (TPD)	Waste Generation (Annual in Tonnes)
2020	9828046	7694739	8761393	385501	9146894	338	3087	1126909
2021	10250070	7813983	9032027	397409	9429436	342	3224	1176821
2022	10690215	7935678	9312947	409770	9722716	346	3368	1229198
2023	11149261	8059822	9604542	422600	10027141	351	3518	1284165
2024	11628018	8186417	9907218	435918	10343135	355	3676	1341854
2025	12127334	8315461	10221398	449741	10671139	360	3842	1402404

(\* Average Population: Average of Geometric and Incremental Increase)



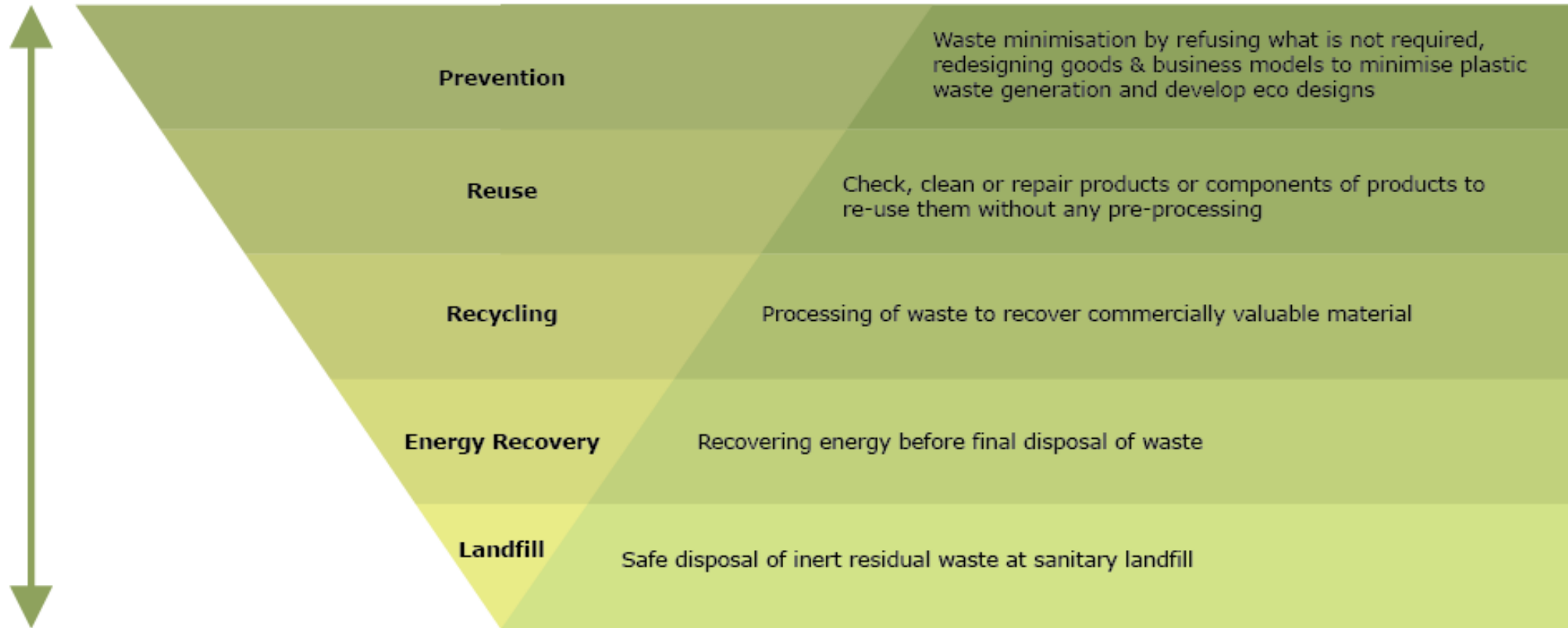
## 3.1.2 Identify viable plastic waste management strategies and action plan

- The strategies for plastic waste management should consider existing rules and regulations.
- The action plan should consider achieving the targets of government's ongoing programmes such as Swachh Bharat Mission
- The strategies should also consider:
  - Accountability regarding legal measures
  - Technology-based interventions
  - Viable and cost-efficient alternatives
  - Socially inclusive actions that do not negatively impact the weakest sections in society
  - Collaborative actions
  - Ambitious deadlines and targets



# Principles for identifying viable plastic waste management strategies and action plan

Most Preferred

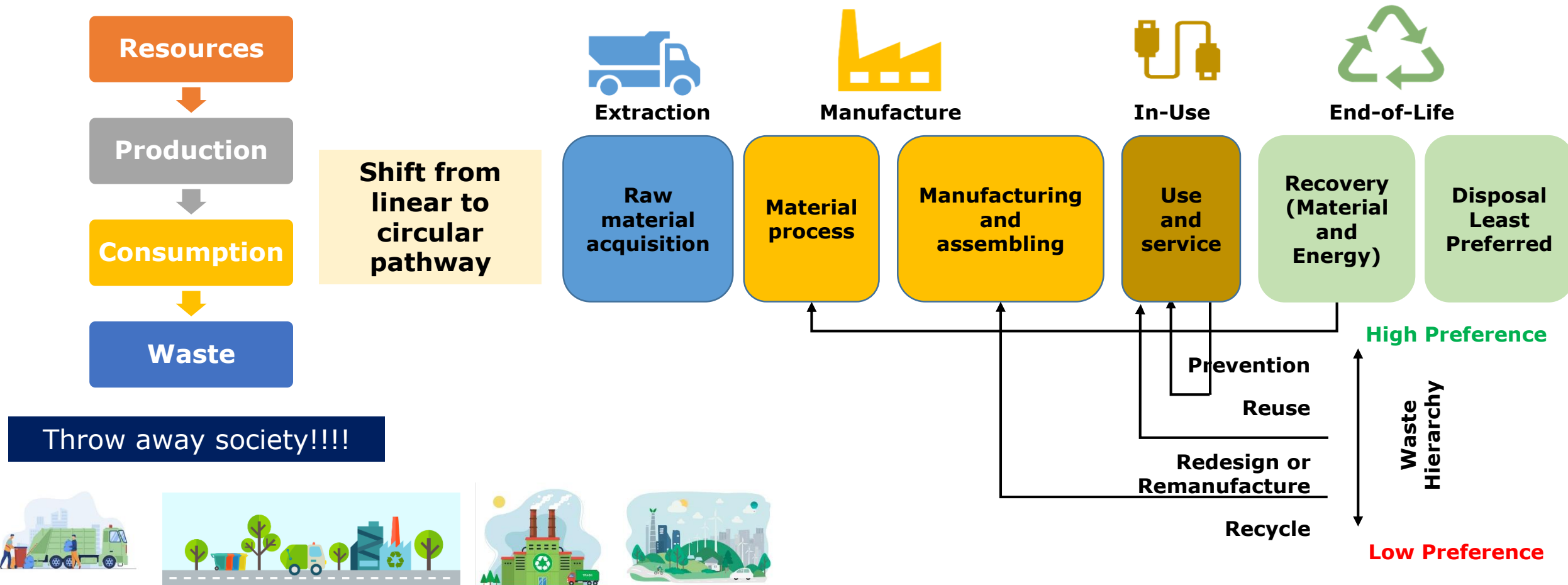


Least Preferred



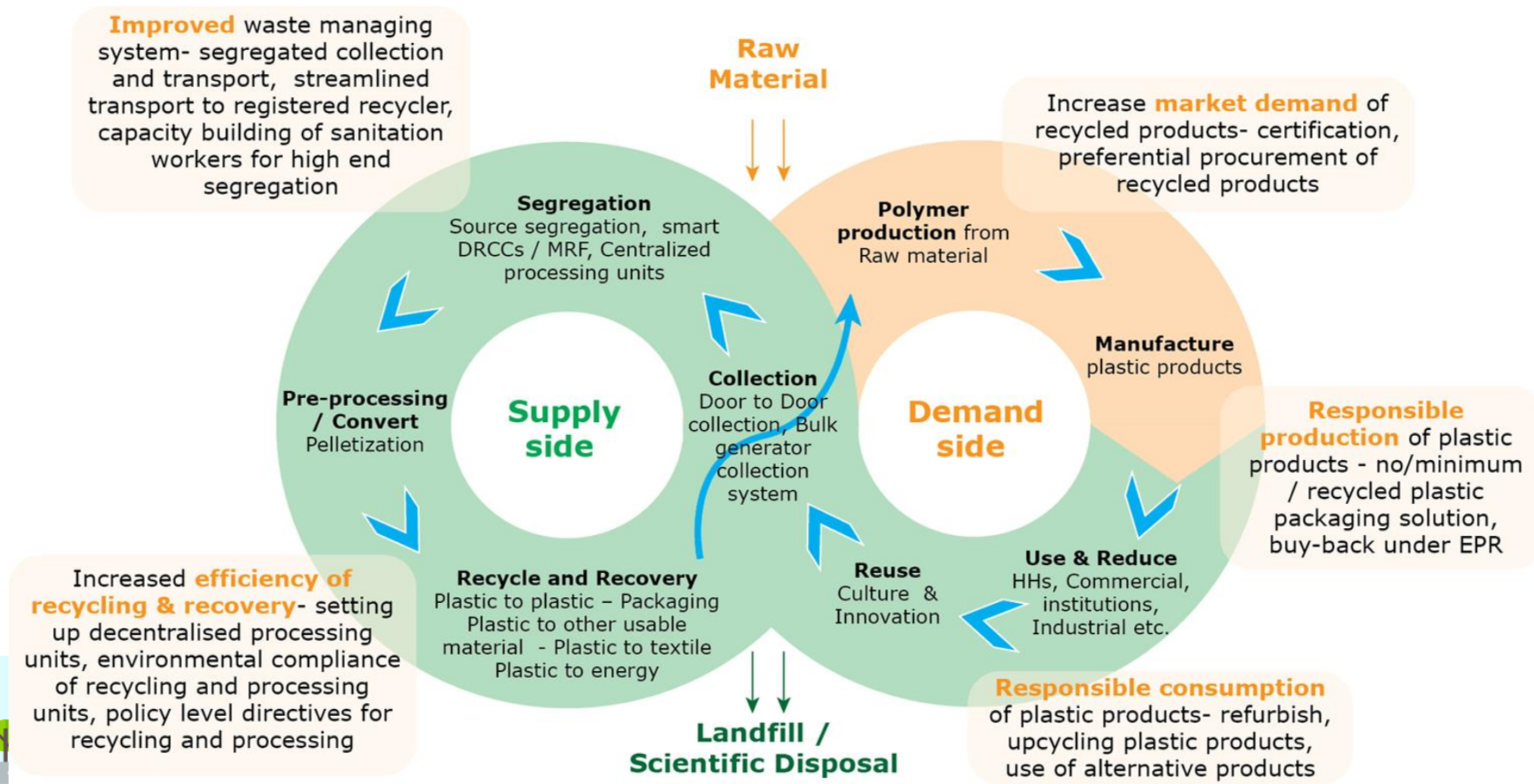
# Principles of identifying viable plastic waste management strategies and action plan

- The strategies should consider shifting from linear to circular pathway integrating the concept of waste management hierarchy



# Principles of identifying viable plastic waste management strategies and action plan

- Strategies should focus on increasing the life span of the plastic products and deviating waste reaching land fill, in the lens of circular economy and waste management hierarchy



## 3.1.3 Time frame

- While preparing a municipal plastic waste management plan, the following design periods (time-frame) have to be decided depending upon the necessity of the plastic waste management plan:
  - Short-term plan: 5 years
  - Long-term plan: 20-25 years
  - Mid-term review between 2nd and 3rd year

*(Source: CPHEEO Manual on Municipal Solid Waste Management, 2016)*



## 3.1.4 Prioritise actions

- Identify the city specific contextual strategies in consultation of with stakeholder, core team and waste management cell.
- Strategies should be prioritized based on the waste management hierarchy and circular economy principles.
- Strategies should be prioritized based on its potential to curb the leakage of plastic in environment.
- Short- and long-term strategies can be prioritized based on the financial and technological feasibility for the city.
- Strategies to be linked with ongoing programs and government schemes.





# Prioritise actions

Stage of Waste Hierarchy	Strategies	Prioritised Target	Prioritised Minimum Actions
Prevention and Reuse	<p>Strategy 1: Reduction in generation of plastic waste</p> <p><b>MOST PREFERRED OPTION IN WASTE HIERARCHY</b></p>	<p><b>High Priority, Immediate Action:</b></p> <p>Zero Single Use Plastics (SUP) waste generation by 2025</p>	<ul style="list-style-type: none"> <li>Implement and enforce ban on SUPs</li> <li>Enhance availability and accessibility to alternatives of SUPs</li> </ul>
Recycling and Recovery	<p>Strategy 2: Segregated collection and transport of plastic waste to registered waste processing facilities</p>	<p><b>Medium Priority, Long Term Action:</b> 100% segregated waste collection and transport by 2030</p>	<ul style="list-style-type: none"> <li>Ensure 100% source segregation and D2D collection of waste on daily basis</li> <li>Streamline collection and transport of waste to registered recyclers by installation of RVMs, engagement of LSPs</li> <li>Set up Command Control Centre for integrated monitoring</li> </ul>

# Prioritise actions (Contd.)

Stage of Waste Hierarchy	Strategies	Prioritised Target	Prioritised Minimum Actions
Recycling and Recovery	<p>Strategy 3: Promote maximum recycling and explore opportunities for co-processing of plastic waste</p> <p><b>LESS PREFERRED OPTION IN WASTE HIERARCHY</b></p>	<p><b>Medium Priority, Long Term Action:</b> 100% plastic waste processing by 2030</p>	<ul style="list-style-type: none"> <li>• Ensure plastic is recycled in environmentally compliant manner in all recycling and processing units</li> <li>• Increase market demand of recycled plastic through green certification, preferential procurement policy etc.</li> </ul>



# Prioritise actions (Contd.)

Stage of Waste Hierarchy	Strategies	Prioritised Target	Prioritised Minimum Actions
Overall Requirement to Move Up Waste Hierarchy	Strategy 4: Create awareness among all stakeholder groups through Information, Education and Communication (IEC) activities	<b>Simultaneous Action across Interventions:</b> for All major stakeholders are aware of harmful impacts of plastic waste and have adopted necessary measures by 2027	<ul style="list-style-type: none"> <li>Capacity building and IEC campaign for all stakeholders across value chain to promote source segregation, importance of segregation on recycling and processing of plastic waste</li> </ul>
	Strategy 5: Strengthening of Institutional Structure and Monitoring and Evaluation Framework	<b>Immediate Action for High Impact:</b> Creating an efficient institutional structure for holistic management of plastic waste by 2025	<ul style="list-style-type: none"> <li>Recruit adequate number of human resource across tiers of administrative units</li> <li>Ensure interaction, data exchange and transparency across different key organisations in the PWM sector</li> </ul>



## 3.2 Ratification and approve



### Description

- Second Stakeholder consultation
- Ratify and approve the plan

### Key Actions

- The Draft Action Plan with implementation schedule to be presented and accepted by the stakeholder committee who provided inputs to the draft plan
- Based on the feedback of the stakeholder team, further revisions to the plan may be required to finalise it
- Official approval/adoption of the plan in the Municipal Council





## 2<sup>nd</sup> Stakeholder consultation

- Meeting to consult draft plan with strategies and actions with citizens and stakeholders before finalization.
- Draft plan should be revised based on the inputs and feedback of the stakeholder committee.



**Second Stakeholder meeting of GHMC**

## 3.2.1 Council approval for PWM Plan and implementation plan

- The final action plan to be presented to the elected body of the local authority to seek approval and officially formalize the plan
- Council should be made aware of the short term and long-term actions
- Council should also approve the financial plan and necessary institutional strengthening for implementation of the plan
- City council ratification of the plan, along with an agreed implementation schedule, is vital for future implementation



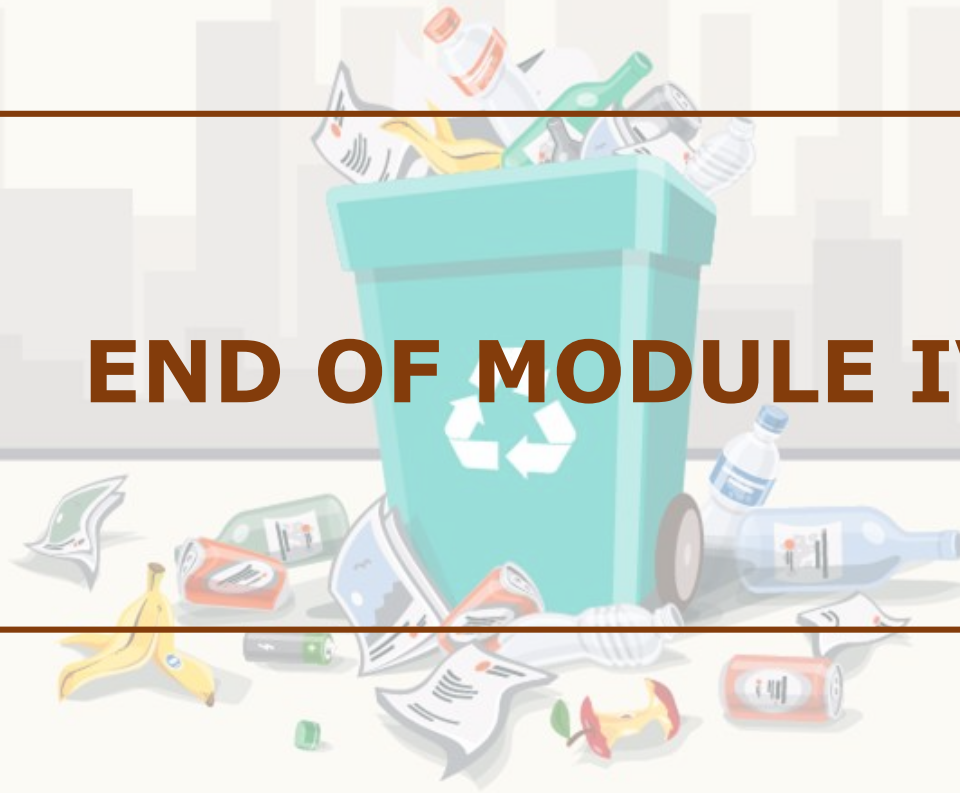


# Exercise – 30 min

- The participants will be divided in a group of 3-4. Each group will be asked to:
- identify major gaps in plastic waste management across the value chain for their city
- Identify one solution each for each stage of waste segregation, collection and transport and recycling



# END OF MODULE IV





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## Disclaimer

The Training Modules on developing 'Plastic Waste Management Strategy and Action Plan for Urban Local Bodies(ULBs)' is prepared by ICLEI-Local Governments for Sustainability, South Asia under the contract- Development of Knowledge, Training and Capacity Building Materials on Plastic Waste Management based on the activities of GHMC, supported by the IGES Centre Collaborating with UNEP on Environmental Technologies (CCET). The views expressed in this document do not necessarily represent the official decision or stated policy of the United Nations Environment Programme. The citing of trade names in this document does not constitute any endorsement.

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