



# WASTE MANAGEMENT OVERVIEW: COLLECTION AND TRANSPORTATION

# OVERVIEW OF WASTE MANAGEMENT

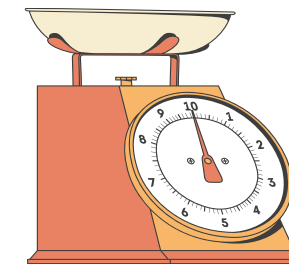
## CONTENT

- 1. Waste quantification and Characterization:**
- 2. Overview of SWM**
- 3. Segregated Waste Value chain**
- 4. Segregated Waste Value chain**
- 5. Elements for Efficient SWM**

# WASTE QUANTIFICATION AND CHARACTERIZATION:

Per capita/year increase in waste generation quantity	1.3 %/ year
Annual increase in waste quantities	5% per year.
Per capita waste generation rate	<1 lakh-300 gm/capita/day
Per capita waste generation rate for population	1 lakh-10 lakh-450gm/capita/day
Wet waste	40-60%
Recyclables in dry waste	20-30%
Non recyclables	20-10%
C & D waste (of total waste)	5-15%
Sanitary and Household Hazardous waste(of total waste)	0.66%
Inert-	<20% of total waste

## Waste quantification



## Waste composition



# WASTE QUANTIFICATION AND CHARACTERIZATION:



Density of waste for design consideration:Wet waste-	0.5t/cum <sup>1</sup>
Gross Density of digested Compost	0.7t/cum <sup>2</sup>
Gross Density of Finished Compost	1 t/cum <sup>3</sup>
Dry waste	0.45t/cum <sup>4</sup>
Inert waste (10-15% of total waste)	0.85t/cum <sup>5</sup>
C & D waste	1.6 t/cum <sup>6</sup>

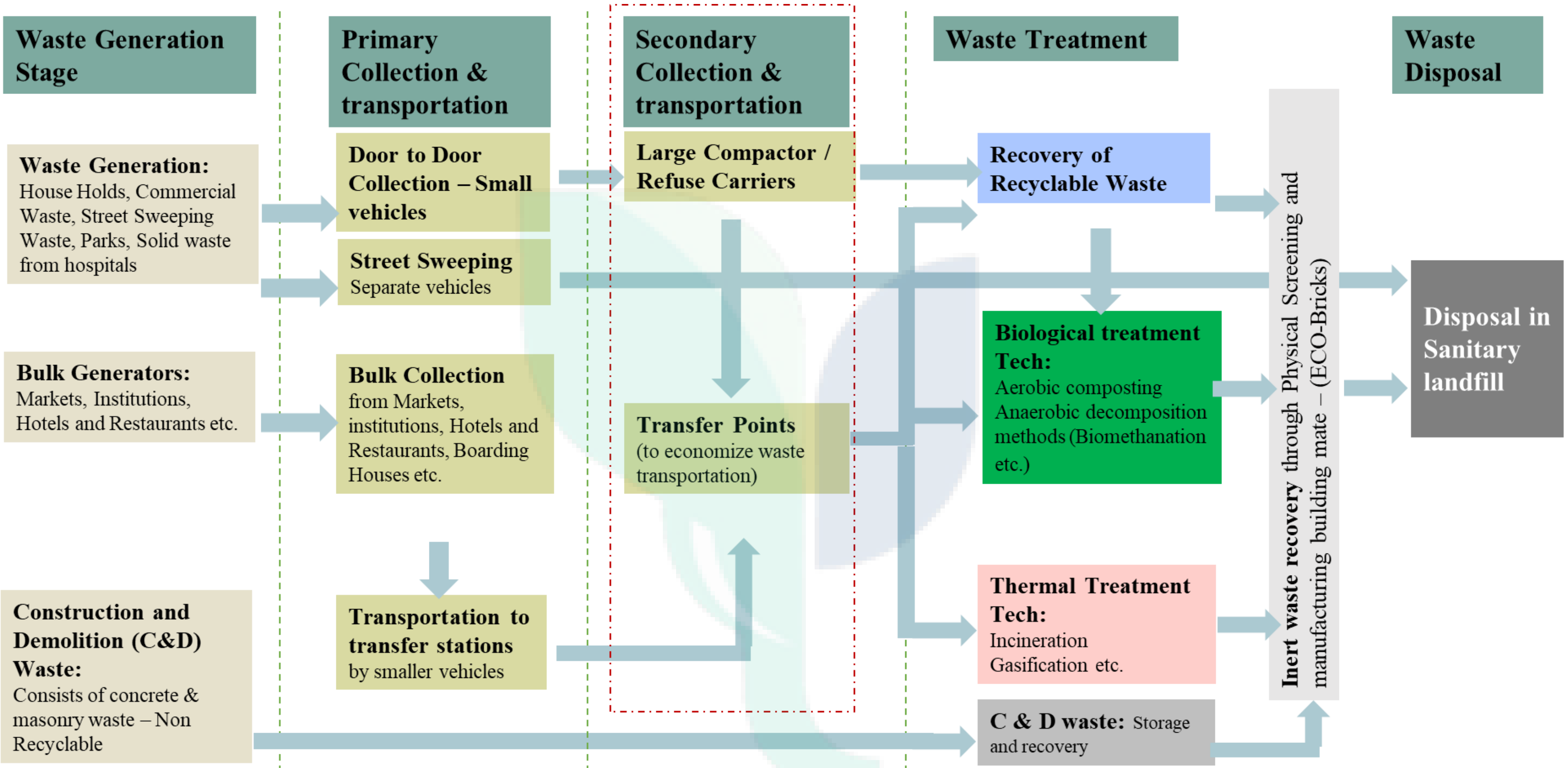
## Volumetric Analysis



**Other studies and observations indicate that waste generation rate:**

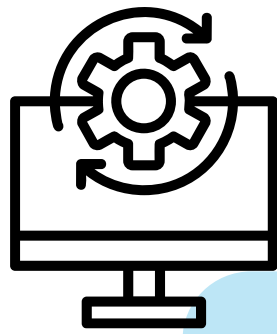
Population below 2,00,000	200-300 gm/capita/day
2,00,000 and 5,00,000	300-350 gm/capita/day
between 5,00,000 and 10,00,000	350-400 gm/capita/ day
above 10,00,000.	400-600 gm/capita/day

# OVERVIEW OF SWM



Reference: SWM Toolkit, Ministry of Urban Development

# ELEMENTS FOR EFFICIENT SWM



## Operation Systems

Service provision for collection, transportation and processing of segregated waste from 100% properties



## Citizen Participation

Engagement of citizens through awareness and BCC.



## Monitoring

Efficient and true monitoring of the operations on a day to day basis

# COLLECTION AND TRANSPORTATION SYSTEM

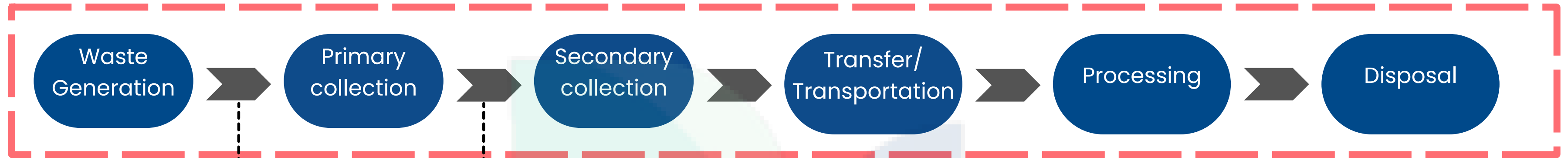
## CONTENT

- 1.Solid waste Management Value chain
- 3.Understanding the waste generators
- 4..Collection of segregated waste
- 5.Primary collection system
- 6.Transfer and secondary collection of waste
- 7.Approach for planning a system for 100% coverage
- 8.Monitoring Mechanism
- 9.Tender conditions

**Strategic management of resources will lead to effective and efficient implementation**

# SOLID WASTE MANAGEMENT VALUE CHAIN

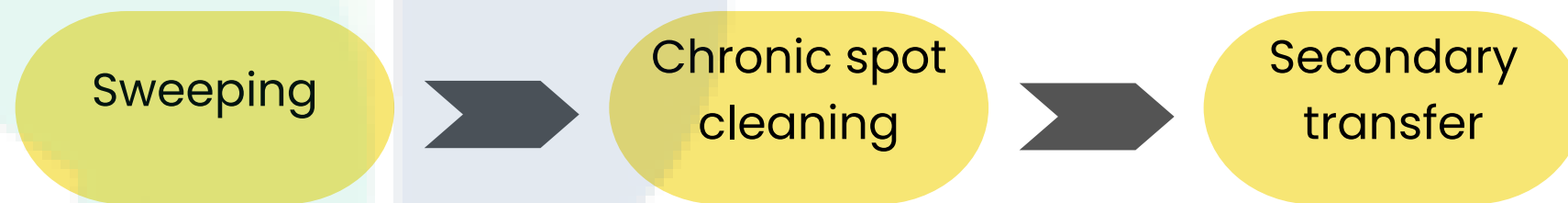
## MUNICIPAL SOLID WASTE



Removal of reusables and recyclables like news papers by waste generator

Removal of recyclables by waste collectors/waste pickers

## SWEEPING AND LITTERED WASTE



## OTHER TYPES OF WASTE

Garden waste

Slaughter House waste

Dead Animal

Construction and Demolition waste

# Waste Generation



## Type of vehicle required

for congested area	for other part of city	Separate vehicle for collection/ twice a day collection if required	Separate vehicle for collection/ twice a day collection if required	Separate vehicle for collection	Separate vehicle for collection	Separate vehicle for collection	Separate vehicle for collection
Pushcart/ tricycle	Auto Tipper	Auto Tipper/ tipper Truck	Tipper Truck/Mini Compactors	Offal vehicle , dead animal lifter	Auto Tipper/ tipper Truck	Suction machine/ Auto Tipper	4.5 cum open skips and 10 cu.m roll on and roll of open containers



Other collection and supply chain mechanism for collection of other types of waste like E waste , Thermocole, Old clothes and other recyclables

## COLLECTION OF SEGREGATED WASTE



**Clear Instructions on segregation of waste**

**ULB should also Identify sources of good segregated wet waste such as Agriculture Market/ Mandai, hotels waste, marriage halls etc This waste should be collected separately to promote implementation of circularity model reducing waste going to the landfill**

# PRIMARY COLLECTION SYSTEM



## DOOR TO DOOR COLLECTION

## GATE COLLECTION

## COMMON POINT COLLECTION

## DOOR TO DOOR COLLECTION

### Strength

- Collecting waste from every door step
- Suitable for high density areas and or high rise individual buildings
- Better monitor of coverage and segregation
- SHGs can be integrated

### Weakness

- Human resource heavy model
- High dependency on secondary waste transfer system

## GATE COLLECTION

### Strength

- Collecting from the gate of a society or building
- Suitable for lesser dense area
- Less human resource required
- Direct transfer for vehicles

### Weakness

- Lack of tracking for segregation of waste
- Dependency on 100 collection coverage from within society or building

## COMMON POINT COLLECTION

### Strength

- Good for areas with very high density and narrow roads

### Weakness

- In case deployed for single buildings may flag false 100% coverage and increase chronic spot in area
- May not match the demand and supply for service time
- Needs strict monitoring and enforcement for implementation

To Improve the efficiency of gate collection and common point collection it is better to send awareness team along with collection vehicles to increase participation of people and thus segregation levels

# PRIMARY COLLECTION SYSTEM



VEHICLE FOR PRIMARY COLLECTION	NUMBER OF HOUSEHOLDS TO BE COVERED IN DIFFERENT AREAS	POPULATION SERVED	STAFF REQUIRED
Push Carts	Congested area: 250 - 300 Medium Density area: 200 Scattered Area: 125 Hill area: 85-90	1,250-1,500 1,000 625 400-450	1 person per push cart
Tricycle	Congested area: 300 Medium Density area: 250 Scattered Area: 200 Hilly area: 125	1,500 1,250 1,000 Should be decided based on operational conditions	1 person per tricycle
Light Commercial Vehicles (LCV) having 500 to 700 kg capacity	1,000	5,000	1 driver and two labour per LCV
LCV with more than 700 kg capacity	1,500 to 2,000	7,500 to 10,000	1 driver & two labour per LCV

**Note : Vehicles used for collection of wet waste should not be compactors as it increase leachet formation and also hampers the possibility of further segregation**

## OTHER OPTIONS FOR VEHICLES - ELECTRIC AND CNG



### Positives

- E waste and CNG vehicles can be used for primary collection vehicles
- It can considered to have direct impact on emission control
- Ease of operations as models can be used on congested areas spread across scattered settlement pattern

### Planning points

- There should sufficient charging infrastructure available
- The maintenance contract with the contractor should be rightly done to benefit ULB
- Utilization of vehicles should be planned based on terrain of the geography

# TRANSFER AND SECONDARY COLLECTION OF WASTE

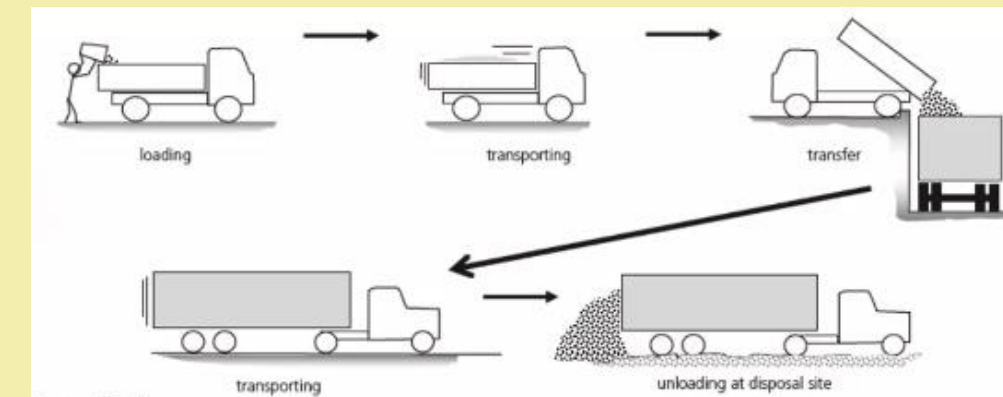
## Transfer of waste

- **Transfer points optimization:**
  - Designed for smaller vehicle fleet efficiency
  - Utilized for segregated waste flow management
- **Location considerations:**
  - Avoid direct vicinity to residential areas
  - Prevent hazards from waste spillage, dirt, and leachate
- **Infrastructure improvement:**
  - Enable vehicle-to-vehicle waste transfer
  - Minimize manual interference
- **Transfer point design to avoid:**
  - Littering during transfer
  - Increased human interaction with waste
- **Cleanliness protocols:**
  - Post-transfer space cleaning
  - Monthly deep cleaning with jet spray
- **Personal Protective Equipment (PPE) mandate:**
  - Required at transfer stations for waste handling
- **Provision of temporary storage:**
  - Based on waste quantities and secondary vehicle availability

## Secondary collection of waste

Secondary Collection vehicle specifications: Higher capacity covered vehicles required  
Waste compression provision:

## Transfer of waste



## Secondary collection vehicles



# APPROACH FOR PLANNING A SYSTEM FOR 100% COVERAGE

## Residential and commercial area:

- Separate fleet for primary and secondary collection
- Demand based twice a day collection in congested areas or gaothan areas



## Sweeping and Chronic spot waste

### Fleet for Sweeping and Chronic Spot Waste:

Dedicated fleet required for collecting sweeping waste and addressing chronic spots within the city

### Priority services:

Provision for priority services, including deep cleaning activities



## Hotels and Bulk Waste Generators

### Dedicated fleet for Hotel Waste:

- Specifically designated for collecting wet waste from hotels

### Scheduled Collection for Dry Waste:

- Vehicles can be scheduled to collect dry waste from bulk waste generators
- Collection frequency may not be daily, but set according to a predetermined schedule

### Notes

1. Fixed route and time for collection services increases the participation of the waste generators
2. The time of operations for waste generators should match the time of service
3. Segregated collection of waste is motivating factor for at source segregation

# MONITORING MECHANISM

## DATA



- Compulsory biometric attendance system
- Reporting of allocated work responsibilities
- Compulsory GPS monitoring and reporting systems
- App-based integration for waste traceability tracking

## MECHANISM

**Daily dashboard overview:**  
 Displays vehicle count and active field personnel  
 Reports number of trips made each day

**Quantity tracking:**  
 Monitors waste collected at processing facility  
 Tracks waste quantity deposited at landfill daily



- Dashboard or WA based reporting for chronic spot removal
- Register for marking deep cleaning activities at significant locations
- Grievance register for noting and implementing solutions
- SwachtaApp tracker for monitoring

# TENDER CONDITIONS

Head	Suggestive Clauses/Scope of work
<p><b>Primary Collection and Transportaion</b></p>	<ol style="list-style-type: none"> <li><b>1. Scope of work</b> - 100% Collection and transportation of segregated waste</li> <li><b>2.if outsourcing vehicles-</b> details and no. of vehicles providing, provision for additional vehicle for emergency breakdown.</li> <li><b>3.GPS tracing system</b> on vehicles and weekly reporting/ availability of dashboard service</li> <li>4.Labor attendance, replacement, arrangement for backlog and monitoring of work, Health and safety, training frequency, min. wedges norm</li> <li><b>5.Monthly report-</b> Quantity of waste collected and transported on a daily basis , workers attendance report, vehicle status- daily trips, working status</li> <li><b>6.Suggestive Clause</b> - Chronic spot should reduce over the time while claiming the 100% collection coverage for residential and commercial pockets</li> </ol>

