



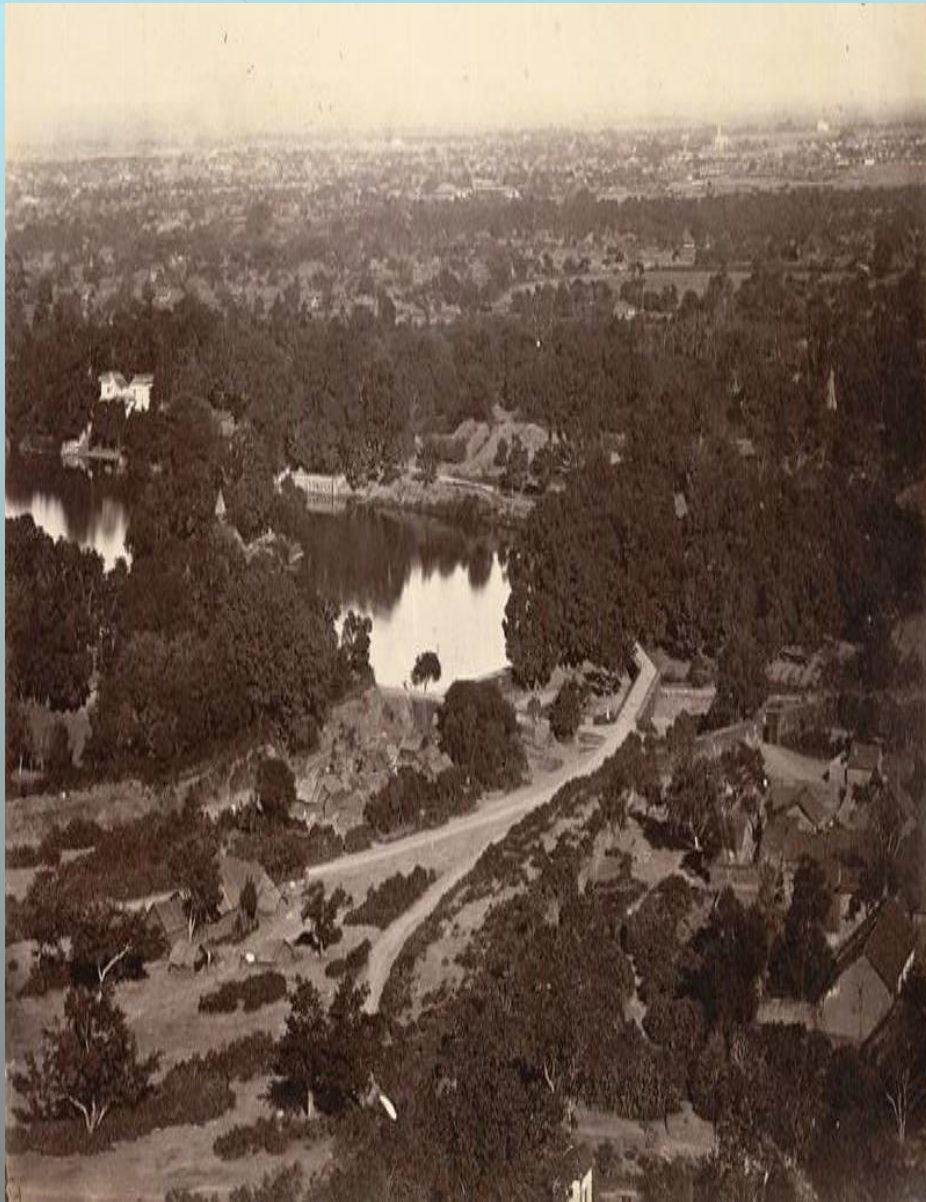
# Solid Waste Management Department Pune Municipal Corporation





**PUNE CITY 1960**

**PUNE CITY - 2018**







**Pune generates 2000 -2100 tons of solid waste per day.**



**“WASTE IS NOT WASTE UNTILL WASTED”**

# BACKGROUND

Rapid urbanization  
Changing consumer habits  
Space constraints for processing

Change in quality and  
composition of waste generated

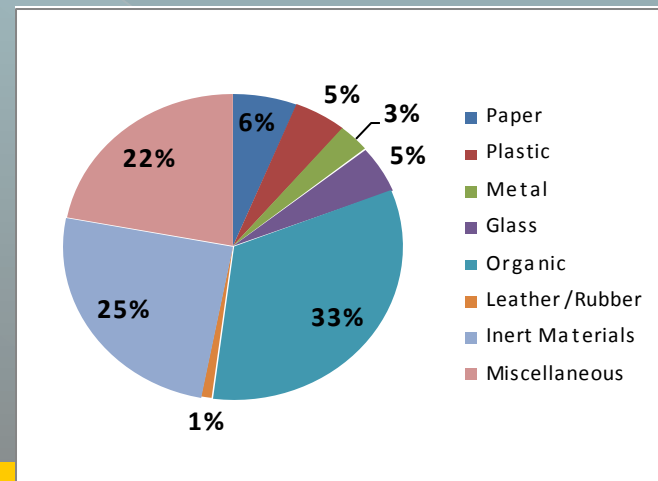
Innovative and sustainable  
solutions

Segregation at source and  
decentralised processing of  
waste

# Sources and Composition of MSW

SN	Source of generation	Quantity(MT)	% of total
1	Household	950	69.1
2	Street sweeping & drainage cleaning	140	10.2
3	Hotels & restaurants	150	10.9
4	Markets / commercial area	50	3.6
5	C and D Waste	75	5.5
6	Fruit, vegetable, Vish meat market waste	7.5	0.5
7	Biomedical waste	1.8	0.1

Description	Percentage
Organic Matter	45 to 50
Recyclables from Residential & Commercial	35 to 40
Inert Material	10 to 15
Other Parameters	<ul style="list-style-type: none"> <li>• Density</li> <li>• GCV</li> <li>• C/N</li> </ul>
	<ul style="list-style-type: none"> <li>• 437 Kg/m<sup>3</sup></li> <li>• 937Kcal/Kg</li> <li>• 22.85</li> </ul>



# INTEGRATED SOLID WASTE MANAGEMENT



Vehicle Name	Nos.
Tipper Trucks	160
Compactors	24
Dumper Placers	85
Bulk Refuse Carrier (B.R.C.)	59
Mechanical Sweepers	02
Other	119
<b>Total</b>	<b>449</b>

Year	Population	Waste Generation (TPD)
2011	3,115,431	1374
2021	4,487,573	2677
2031	6,211,404	4125
2041	8,597,417	6071

# OVERVIEW OF WASTE MANAGEMENT

- 160 trucks collect waste door-to-door, collecting an average of 225-250 tons per day.
- 700 containers and buckets dispersed around Pune.
- Ward wise average- 350 to 750 gms per capita per day
- Construction and demolition waste generation –150-180 TPD
- Garden waste generation – 50-60 TPD
- Hotel Waste Collection- 120-125TPD
- Biomedical waste – 5-6 TPD



# VIDEO CLIP



# Process

Collection

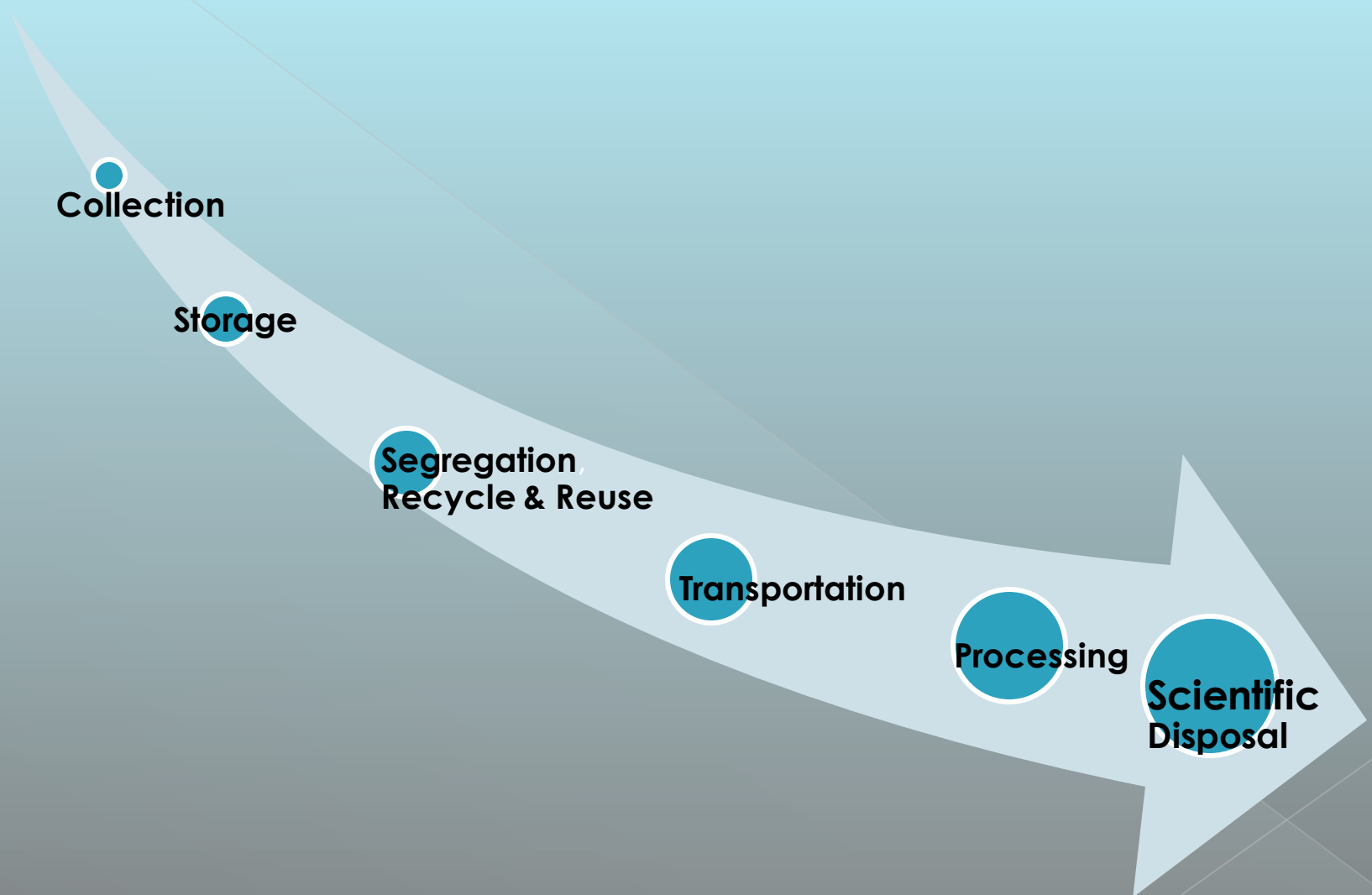
Storage

Segregation,  
Recycle & Reuse

Transportation

Processing

Scientific  
Disposal



# Overall SWM system



## Primary collection

- Slums
- Non slums
- Commercial



## Secondary Transportation

- From DTDC to transfer station
- From transfer station to processing / landfill



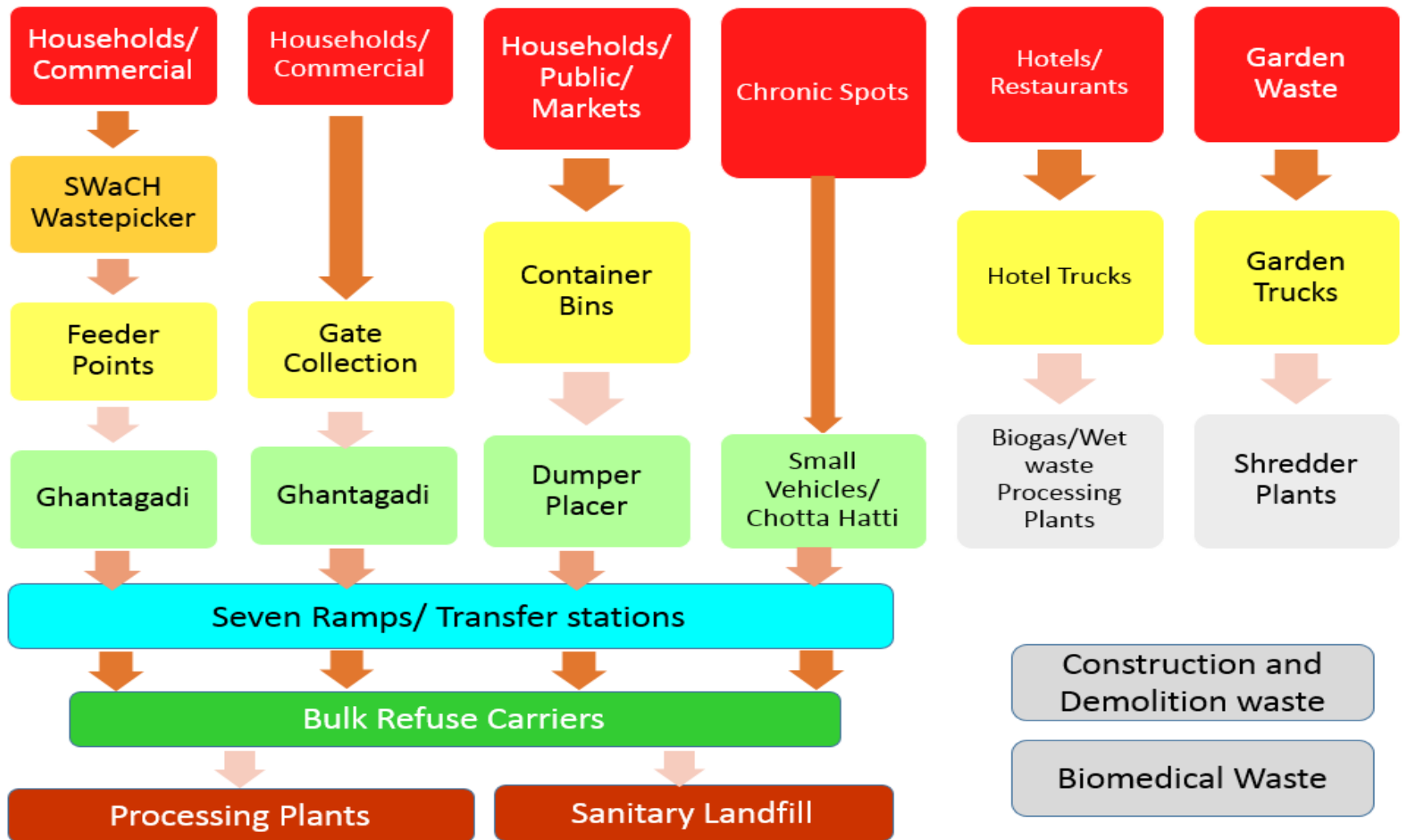
## Processing and landfill

- Wet
- Dry
- Mixed
- Specialized
- Scientific landfill





# Flow of waste

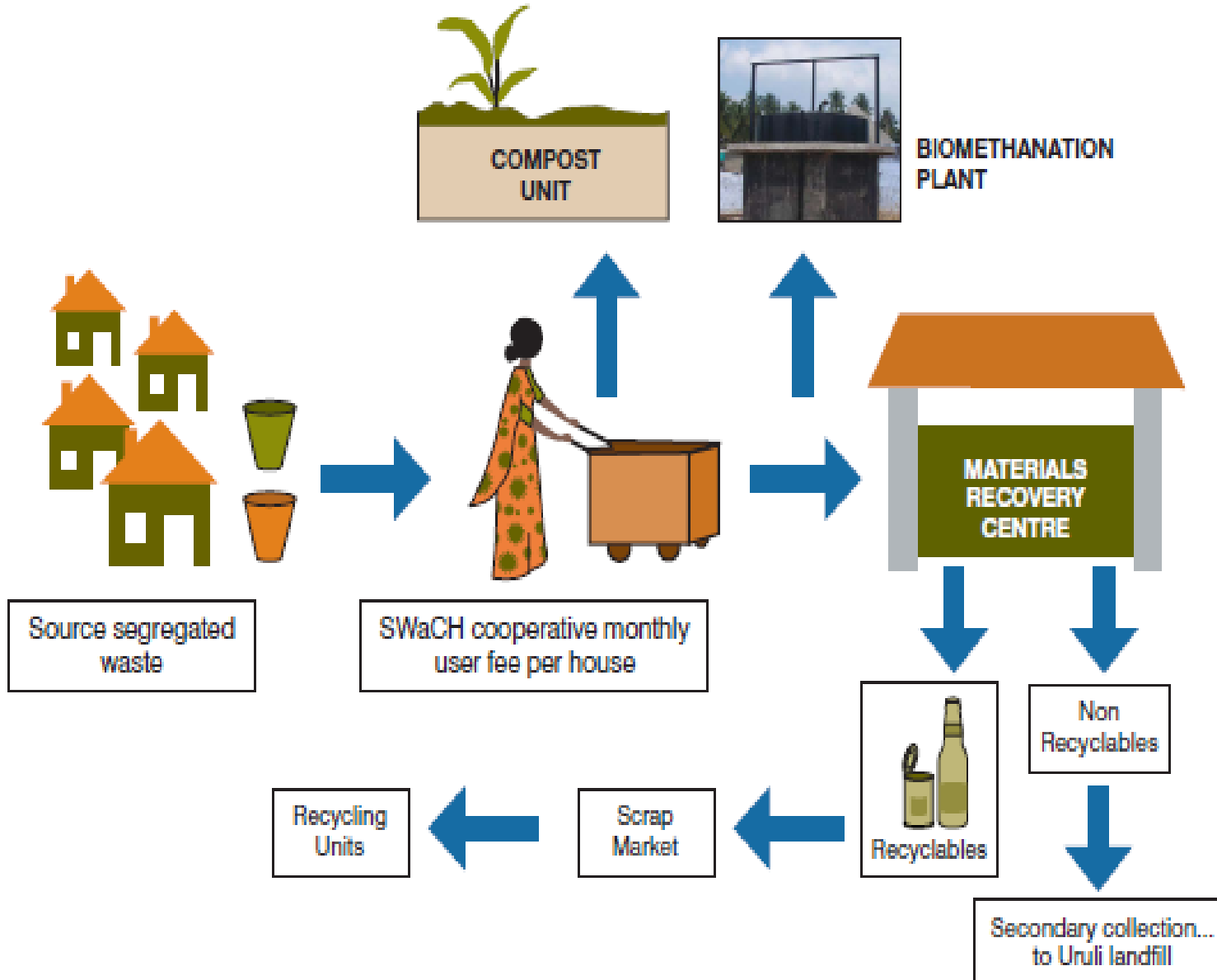


# PMC -SWaCH MODEL

- ❖ Segregation by citizens and user fee based model
- ❖ Better conditions of work for waste pickers
- ❖ Cleaner waste for recycling industry
- ❖ Reduction in municipal expenses for waste management
- ❖ Compliance of MSW 2000 rules
- ❖ Decentralized waste management and processing
- ❖ Climate change mitigation
- ❖ Poverty Alleviation
- ❖ Public Private Partnership
- ❖ Better waste management



# GRAPHIC ILLUSTRATION OF MODEL





# Integrating Informal Sector – SWaCH Model

- Pune city's efforts to partner with waste pickers organizations to provide better service – 2850 waste pickers cover about 0.45 Million Households
- PMC pays for management and equipment cost
- Health insurance provided by PMC
- Recent MOU – 7000 WPs will cater services to the entire city.



# Before and After



# Primary Collection

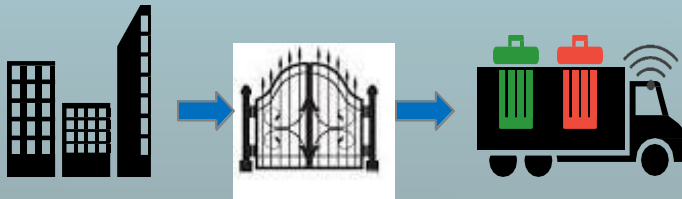
## Methods of primary collection

### 1. Door to door collection



50%

### 2. Gate Collection from Households by ghandagadi directly



15%

### 3. Community bin collection by Dumper Placers



32%

### 4. Chronic spots –



3%





# INTERMEDIATE TRANSFER STATION



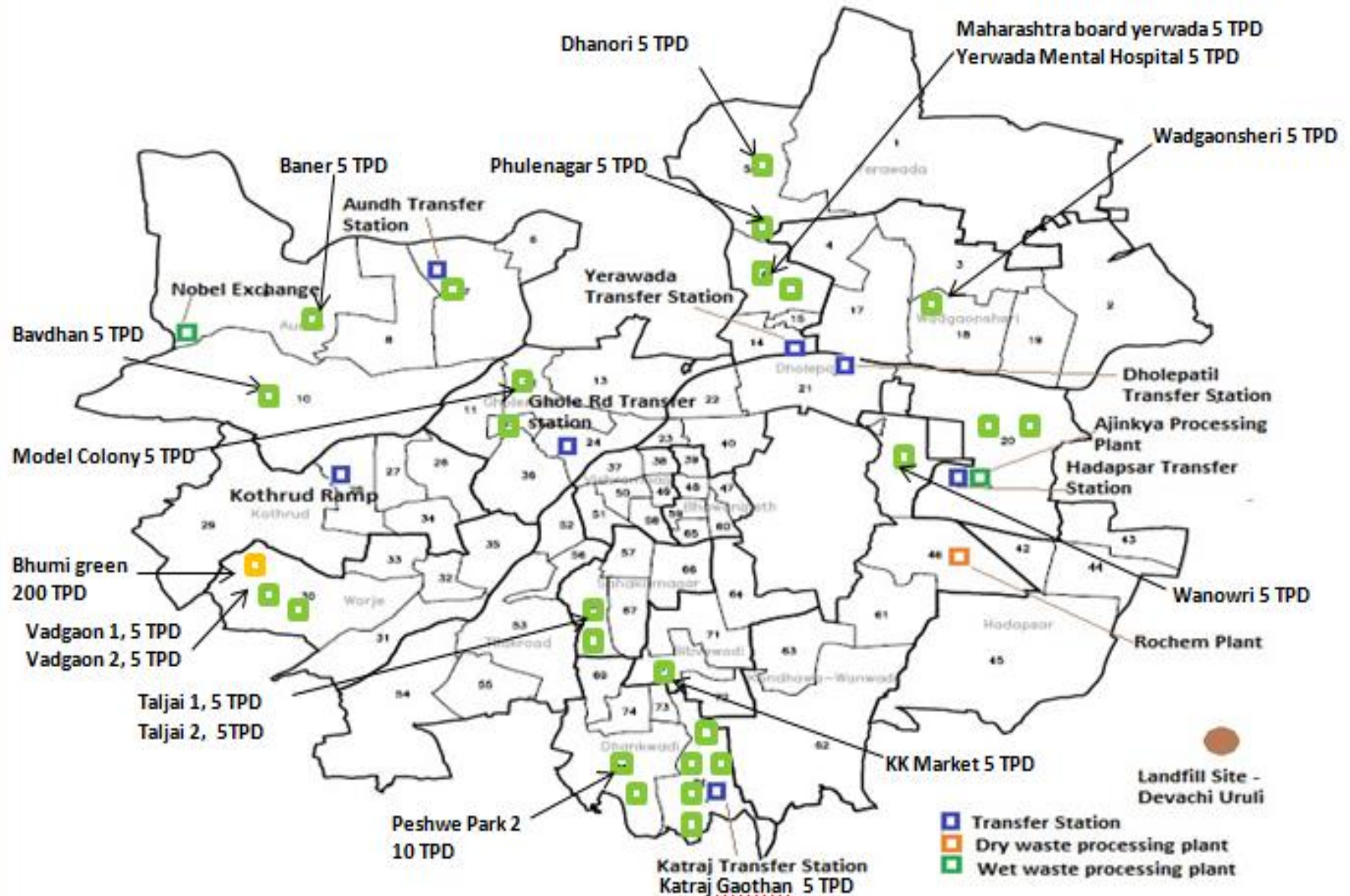
# CURRENT PROCESSING OF WASTE

- Since June 2010; scientific processing and scientific landfilling.
- Decentralized waste processing plants operational at institutional and society level.

<b>Bhumi Green Solutions Pvt. Ltd.</b>	<ul style="list-style-type: none"> <li>• 200 TPD; Compost</li> <li>• Hadapsar Ramp and Ram Tekdi Industrial Estate</li> </ul>
<b>Mechanical compost, Thermal compost &amp; Microorganism</b>	<ul style="list-style-type: none"> <li>• 50-100 TPD; Vermi- compost and compost</li> <li>• 13 decentralized plants</li> </ul>
<b>Biomethanation</b>	<ul style="list-style-type: none"> <li>• 125TPD; Electricity and Compost</li> <li>• 25 Decentralized Plants</li> </ul>
<b>Noble Exchange Pvt. Sol.</b>	<ul style="list-style-type: none"> <li>• 300 TPD; Bio CNG</li> <li>• Location: Baner and Talegaon</li> </ul>
<b>A.D. Eco Solution Green Solutions Adarsh Construction</b>	<ul style="list-style-type: none"> <li>• 50 TPD ; Mechanical + manual Segregation; Katraj</li> <li>• 25 TPD ; Mechanical + manual Segregation; Dhayari</li> <li>• 50 TPD ; Mechanical + manual Segregation ; Ramtekdi</li> </ul>
<b>Rochem Separation Systems</b>	<ul style="list-style-type: none"> <li>• 300-350 TPD; RDF and Compost</li> <li>• Ram Tekdi Hadapsar</li> </ul>



# Processing plants and transfer stations across the city





**WASTE  
PROCESSING**

**BIO  
CONVERSION**

**BIOGAS**

**COMPOSTING**

**VERMI  
COMPOSTING**

**MECHANICAL  
COMPOSTING**

**THERMAL  
CONVERSION**

**INCINERATION**

**PYROLYSIS**

**GASIFICATION**

**PELLITIZATION (RDF)**

## COMPOSTING

### • Vermiculture

Society level disposal technique

### • Critical factors

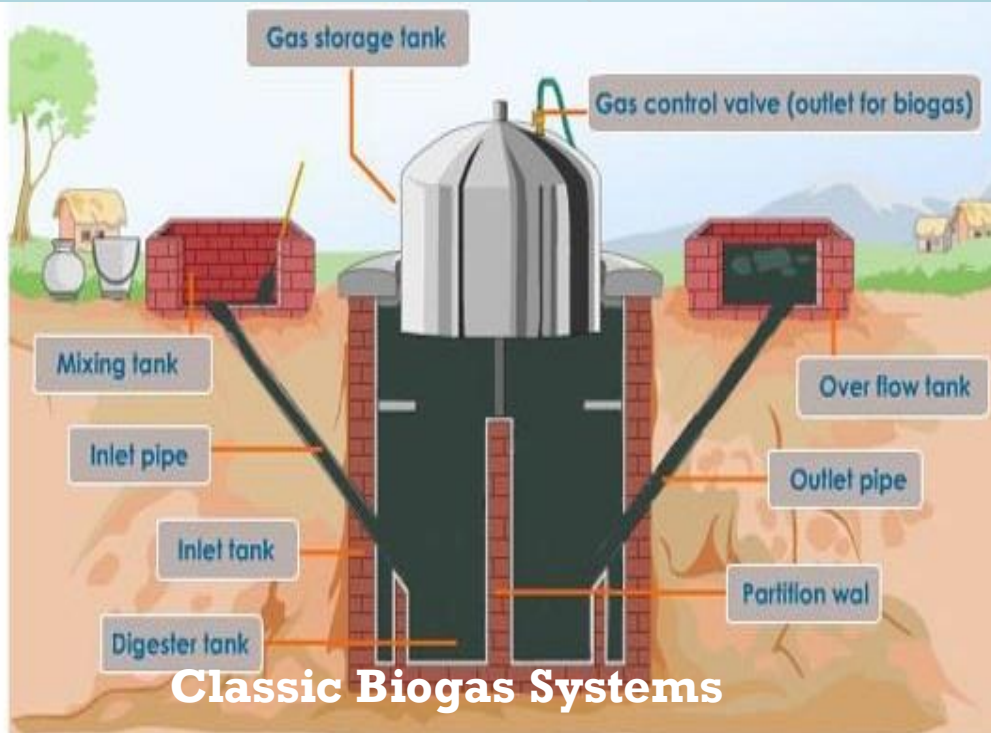
- Moisture
- Temperature
- Expert maintenance needed



## VERMICULTURE BINS

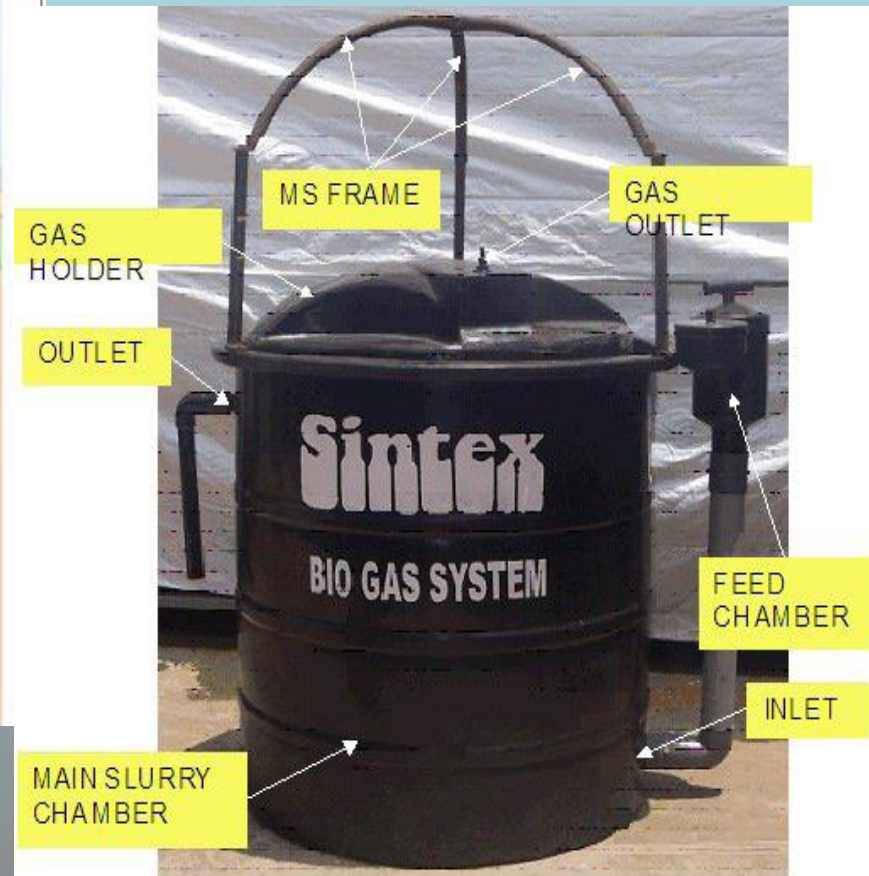


# Anaerobic biogas digesters



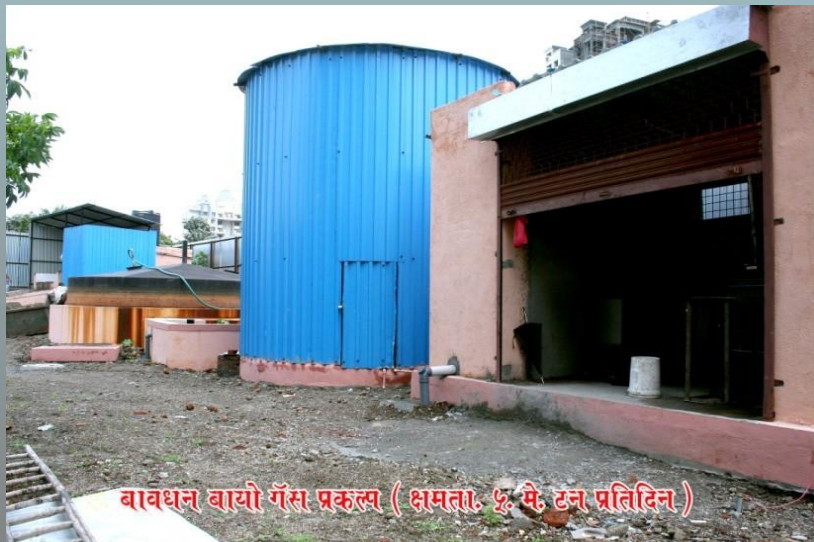
**Classic Biogas Systems**

## Portable Biogas Systems





# Bio Methanation Plants



Description	Value
Biogas Generation	300+5% m <sup>3</sup> /day
CaloriVic Value	4800–5000 Kcal/cum
Engine EfViciency	25%
Electricity Generation	1.5 kWh/cum of Biogas
Equivalent Electricity Generation	450kWh/day
Auxiliary Power requirement	@50 kWh/day
Net Surplus Electricity for sale	400 kWh/day



# Refuse derived fuels

- **Conversion of waste to energy is a process of waste disposal to result in the production of usable form of energy**
- **Thus refuse derived fuel (RDF) or solid recovered fuel/ specified recovered fuel (SRF) is a fuel produced by shredding and dehydrating solid waste (MSW) with a waste converter technology**
- **Pelletization**
- **Briquetting**



# BIO - CNG

BIO-CNG is the purified form of biogas from which all the unwanted gases are removed to get more than 93 per cent of pure methane gas.

NobleExchange Environment Solutions Pune LLP,  
Talegaon, Pune.



It will help in reducing the import of diesel up to 50 per cent  
It is cost-effective  
It is pollution free

ARCHITECT  
AMIT SAWALAKHE

PH : 9689990600 | Mail - amit.archin@gmail.com



# Sanitary Waste Management

- Sanitary Napkin vending machines installed in 12 schools
- 3 Sanitary Napkin Incinerators units installed in ladies hostel/girls and schools toilets
- 700-800 napkins incinerated per unit per day



## **MODE OF IMPLEMENTATION - STRATEGIC APPROACH**

**1) Domestic Scale - Privately Owned - Bungalow's / Flats / Housing Complexes / Hotels / Institutes/ Resorts./ Residential Colonies. (50 Kg. to 2 TPD)**

ÿ 31 Nos. Biomethanation plants at Housing Society levels.

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**2) Medium Scale (Decentralized Manner) - Owned by ULB's (5 - 10 TPD)**

ÿ 25 Decentralized Biomethanation Plants installed & are in operations - Processing @ 100-120 TPD Wastes and Generating @ 600 KW electricity.



## PPP APPROACH

Tax rebate given by PMC for eco-friendly measures practiced by citizen.



DETAILS	No. of Properties
Solar	4075
Vermiculture	10429
Solar & Vermiculture	7254
Vermiculture & Rain Harvesting	1024
TOTAL	22782

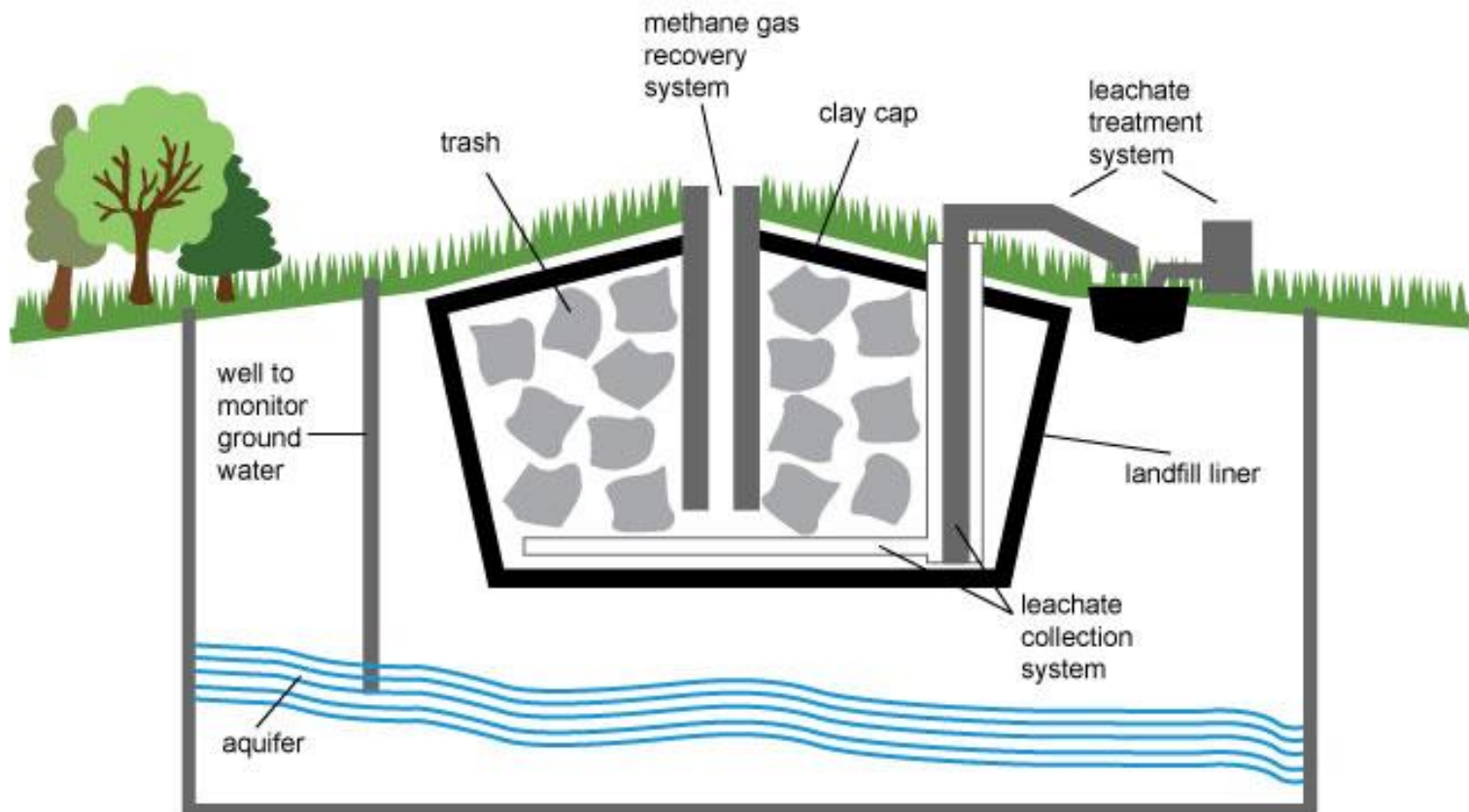
# LANDFILL: Contamination of ground water

- **During landfill site operation, a liquid known as leachate is produced.**
- **It is a mixture of organic degradation products, liquid waste and rainwater.**
- **It has a high organic carbon content, high concentrations of nitrogen and is usually slightly acidic**
- **The liquid is highly toxic and can pollute land, groundwater and waterways.**



# SCIENTIFIC LANDFILL

## Modern landfill



Source: Adapted from National Energy Education Development Project (public domain)

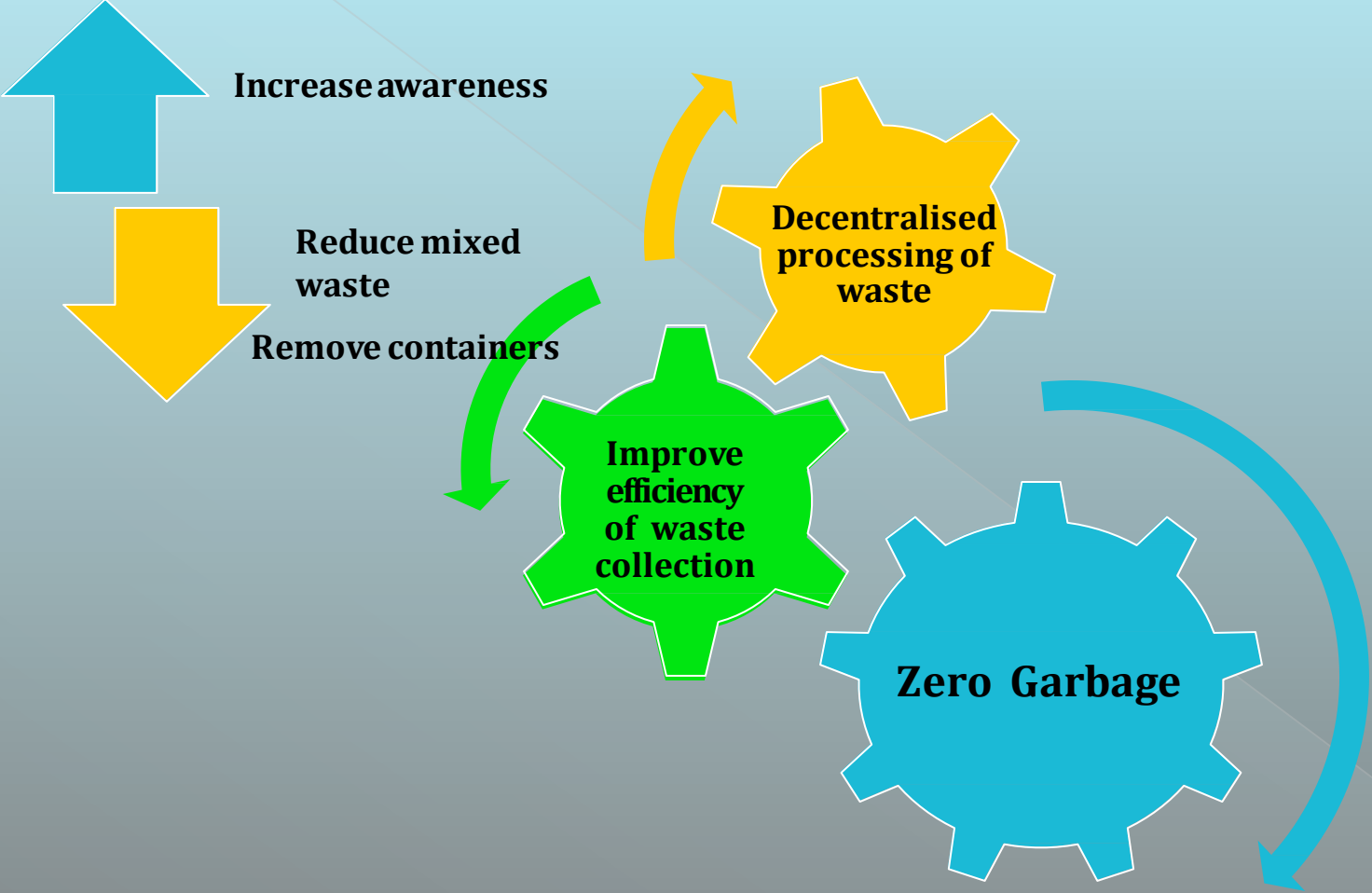


# What is Zero Waste?

- **“Zero waste” means that garbage should be reused locally to avoid sending the trash to landfills.**
  - ⊞ **Alleviates both environmental issues related to landfills as well as city maintenance costs.**
- **How to reuse: Enhanced recycling of plastic, glass, metal and paper and harness potential of organic waste through investment in biogas, composting and other technologies.**
  - ⊞ **Ultimate goal: Create *value* out of waste to produce a paradigm shift from garbage as disposable to garbage as a renewable resource.**



# Zero Waste Model



# Key Elements of Zero Garbage Model

1. Segregation at Source

2. Doorstep collection of Segregated Waste

3. Further sorting and segregation of dry waste and linkage with scrap dealers

4. Organic waste to biogas or other processing plant

5. Systems for handling specialized waste (C&D, E Waste, Garden Waste)



# Zero Garbage Pune



## WHAT IS THE MEANING OF 'ZERO GARBAGE'?

1

**ELIMINATING NEED FOR LANDFILLS** by reusing organic waste through biogas, composting and other technology and recycling plastic, paper, glass, metal, etc.

2

**ADDING VALUE TO WASTE** through use of innovative technologies to reuse organic waste and enhancing recycling through segregation and doorstep collection.

3

**CREATING A PARADIGM SHIFT** from garbage as disposal to garbage as a renewable resource by changing attitudes about the value and potential of trash.

## WHO DOES IT HELP? ZERO GARBAGE MODEL HAS WIDE-RANGING BENEFITS



### RESIDENTS

- Cleaner streets and neighborhoods.
- Improved quality of life by reducing health risks, such as dengue fever and malaria, associated with garbage piles.
- Doorstep collection service at low cost.



### WASTE PICKERS

- Improved quality of life with integration into doorstep collection to eliminate need to climb in community waste bins.
- Better health because of new conditions.
- Higher, more stable income.



### GOVERNMENT

- Reduced transportation and landfill maintenance costs.
- Citizens forced to take responsibility for waste generation.
- Cleaner, more appealing city.

### PHASE 1 WARDS

Warje Karve Nagar  
Kothrud  
Aundh  
Ghole Road  
Dhole Patil  
Sangamwadi  
Nagar Road  
Kasaba Visram  
Tilak Road  
Sahakaranagar  
Bhavani Peth  
Hadpsar  
Bibvewadi  
Dhankwadi (a)  
Dhankwadi (b)

**Contact:** Dr. Ketki Ghatge, Zonal Medical Officer for PMC, at 9689931364 or Saroj Badgujar, Deputy Manager for Janwani, at 9970078596.

# Zero Waste ward

- ❖ **PMC initiated “Zero Waste Ward” model pilot project in PMC’s Katraj ward in 2010**
- ❖ **Till date, the Zero Waste model has been rolled out to 20 Prabhags covering almost 2.61 Lacs properties and roughly 8.5 lacs residents**

*Based on its success, the model is being rolled out in Pune Municipal Corporation in a phased manner.*





# Eco-friendly Ganesh Utsav

- Tank is filled with solution made up of baking powder, which helps to dissolve Plaster of Paris (PoP) and turn the residue into fertilizer.
- Offerings to the lord are converted to holi colours



# For Ganesh idol immersion... Follow an Eco-friendly Solution!!!

## Benefits

- Prevention of water pollution on large scale
- Liquid residue can be used as fertilizer for plants
- Multiple uses of calcium carbonate (sludge) which is a by-product
- Very simple to implement!

Plaster of Paris (calcium sulphate) is not soluble in water. Extensive research has given simple solution for dissolving POP Ganesh idols in water using ammonium bicarbonate (Baking Soda).

**It is simple and safe – you can easily do it at home!**



**Step 1:** Take a bucket in which the idol can be fully immersed. Fill it with water and add ammonium bicarbonate powder weighing approximately same as weight of Ganesh idol.



**Step 2:** Remove Nirmalya and other decorative items from the Ganesh Idol. Then immerse the Ganesh idol in the solution prepared in the step 1.



**Step 3:** Gently stir the mixture in the container every 2 to 3 hours. In approximately 48 hours, Ganesh idol will get completely dissolved. Sludge, that settles at the bottom of the container is calcium carbonate.



**Step 4:** The liquid left is ammonium sulphate which is a popular fertilizer and can be used as such, for watering plants and lawns.



# Scientific treatment of waste



- The total CO<sub>2</sub> equivalent emissions could have been 5.58 times the current emissions in case PMC had not installed the scientific technologies to process MSW in Pune city

# AWARENESS PROGRAMS



**Organised Area**  
(Societies and  
Commercial  
complexes)

## **Rallies and Meetings with housing societies**

Poster exhibition and video on segregation shown in Societies

Games to help spread awareness about segregation

Surprise Visit to check compliance of segregation

Issue notice from PMC for compost pits and segregation of garbage

**Un Organized Area**  
(Slums and  
Gaothan)

Awareness Rallies

Door to Door awareness

## **Street play , puppet shows**

Surprise Audit to check compliance of segregation

Meetings with SHGs, Ganesh Madals and other



# Segregation - Approach

PPP- - with help of NGOs and waste picker' s Organization (like SWaCH).

Pune Trash Solution – Zero Garbage Ward project

Awareness- - Through IEC.

Incentives- - Distribution of dry and wet waste bins to households and tax rebate for practicing ecofriendly methods

Bell ringing vehicles – 160 nos for separate collection of waste

Establishment of Separate system for Garden Cutting and 8

Shredder Machines Vixed at various location for garden waste processing

Separate system for hotel waste collection through 23 trucks

Post 2000 constructions have compulsion of insitu wet waste management

# PMC's Complaint redressal system



**Pune Municipal Corporation**



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@pmcpune



/pmcfmc



feedback@punecorporation.org



carepmc.wordpress.com



/puneconnect



complaint.punecorporation.org



YouTube.com/pmccare

# ACHIEVEMENT @ A GLANCE

## • SWaCH model :

- ∞ Saved more than Rs. 15 crores per annum in waste handling costs
- ∞ Collect recyclable materials that amount to 20% of municipal solid waste
- ∞ They save Greenhouse Gas Emissions of 2,94,316 Metric Tonnes of Carbon Dioxide Equivalent (mtCO<sub>2</sub>-eq) per annum (2006)

## • Zero Garbage Ward

- ∞ Improved service delivery of DTDC and segregation of waste and reduced transportation cost.
- ∞ ISO Certification for Decentralized Solid Waste Management System: Easy to transfer and replicate

## • Energy generation : About 1 MW energy from 100 tons of organic waste using biogas (*Pay back period 5--6Years*)

## • 100 percent scientific disposal since 2010 and no open Dumping – *Scientific land Filling & Capping*

# CONCLUSION

- Pune Municipal Corporation has a head start in MSWM over other ULBs in India.
- The ethos and working culture of the MSWM staff at all levels is conducive to up-gradation of the existing treatment and disposal options.
- The 2043 horizon will require management of about 6000 TPD waste with state of the art reduction technologies for resource & energy recovery.
- Higher degree of mechanization and enhanced monitoring techniques will need to be employed.
- Emphasis will also shift to full consumption of treated waste products within the city limits.
- Emphasis will also be on reduction of residues to go into landfill.



# CONCLUSION

- The city has taken multi dimensional approach to overcome the challenges of urbanization.
- The solution lies in using different technologies tailor made to solve the specific needs of the problems at local level.
- Citizen and Governance have come together and mutually agreed to execute solutions.
- Pune- An Emerging ECO-Friendly City.



**Thank you.**