

# *Opportunities For Waste Management Business in India*

*By*

*Prof.(Dr.) Arun D. Sawant,  
Director (India)*

*Waste to Energy Research and Technology Council*



**For Global WtERT Congress 2023  
Zhejiang University, Hangzhou  
China**

**November 6<sup>th</sup> - 7<sup>th</sup> , 2023**

# Issues and Challenges of Waste Management and Business in India

Lack of awareness

Lack of collection and segregation  
at source

Issues &  
Challenges

India becoming ground for e-  
waste

Scarcity of land

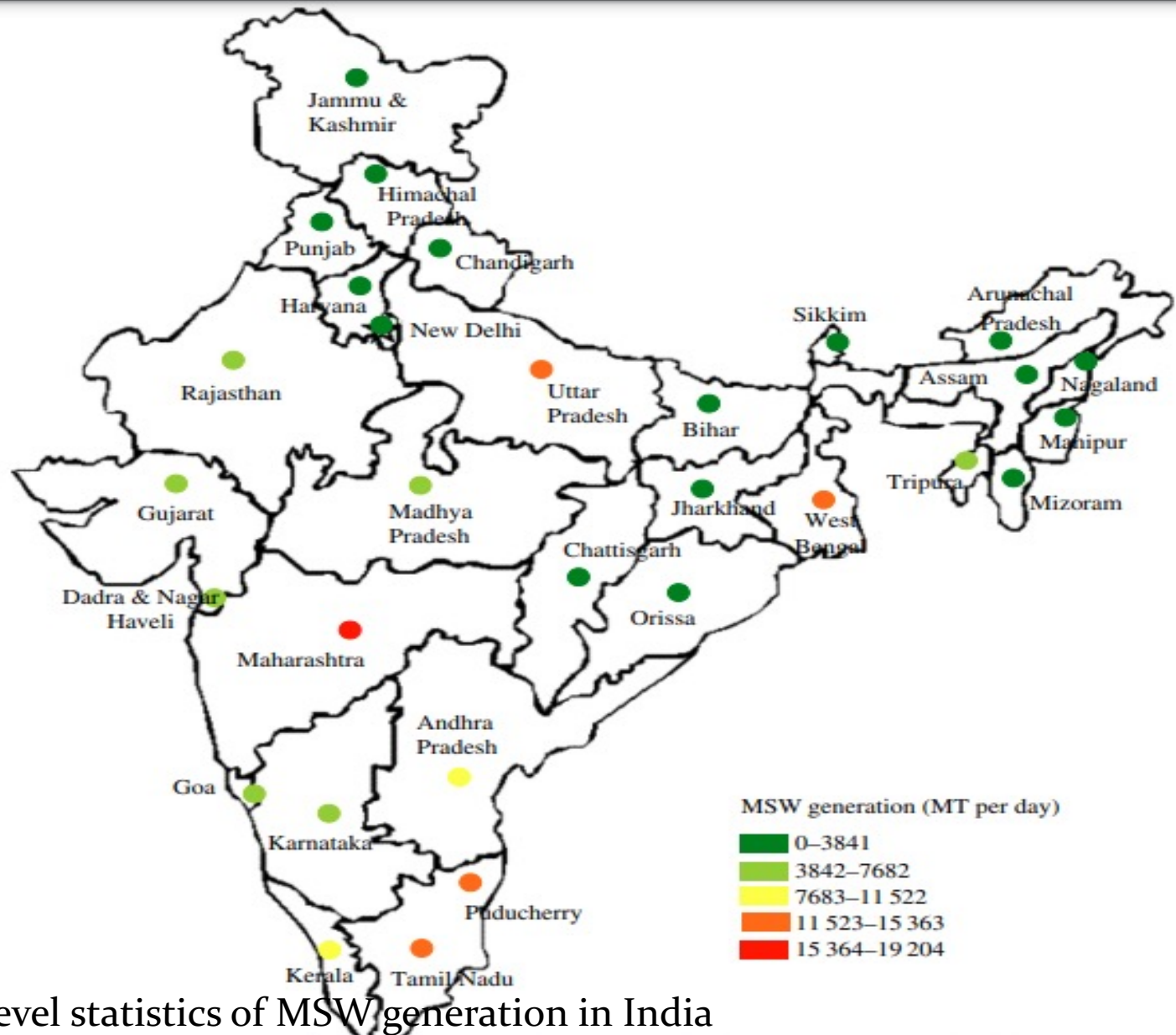
## Waste Generation in India

- Rapid urbanization and improved living standards led to increased per capita waste generation 0.4 to 0.5 kg/day.
- Currently, 1,60,000 TPD of municipal solid waste is being generated in India.
- Currently 68.8 million tons will increase to 160 million tons by 2040.
- Composition of dry waste : Organic 51%, Inert 31%, Recyclable 7.5%
- Main focus is on reduction at source, recycling reuse .
- Major activities - land filling and Composting.

## Waste Generation Scenario

- Calorific value of Combustible material is in the range of 1700-2500 kcal/kg
- WtE plants in India ---- 14 ( 8 are non -operational )
- For WtE---India needs over 270 Plants at the rate of 600 TPD
- India has only 7 operational plants of WtE & some small units of gasification, 7 LFG recovery facilities capturing 7.4 million tons CO<sub>2</sub> equivalent
- Technologies available in India-----Composting, Biomethanation, RDF, Gasification, Pyrolysis, Bioreactors, WtE .

# Geographical statistic of waste generation



State-level statistics of MSW generation in India

# Dumping Ground , Mumbai



# Waste Generation & Disposal – Major Cities

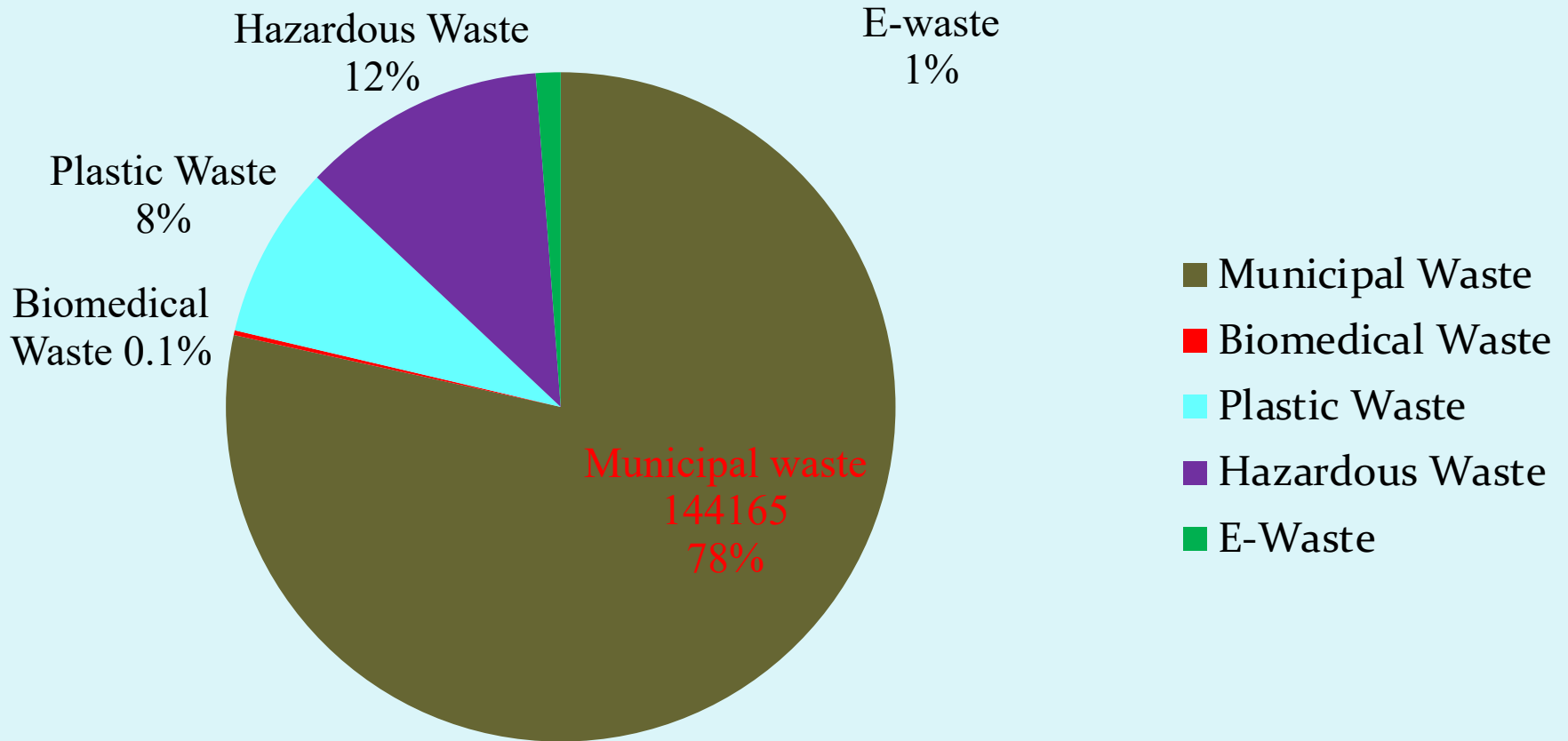
- 36 % (8 out of 22) cities generate more than 1000 TPD of waste (Ahmedabad, Delhi, Greater Mumbai, Jaipur, Kanpur, Lucknow, Pune and Surat)
- 13.6 % (3 out of 22) cities generate waste between 500-1000 TPD (Indore, Ludhiana and Vadodara)
- 50 % (11 out of 22) cities generate less than 500 TPD of waste (Agartala, Asansol, Chandigarh, Faridabad, Guwahati, Jamshedpur, Kochi, Kozhikode, Mangalore, Mysore and Shimla)

## Situation after Waste Generation

- India is the world's second highest populated country of 1.46 billion (census 2011) with over 4% population growth.
- In cities and industrial complexes piles of garbage and wastes of all kinds littered everywhere have become common sight.
- Currently, in India 0.16 million TPD of MSW and about 0.2 million TPD industrial waste is being generated.
- A substantial amount of these wastes is extremely hazardous to the living organisms including human beings as by and large it spreads into natural resources.



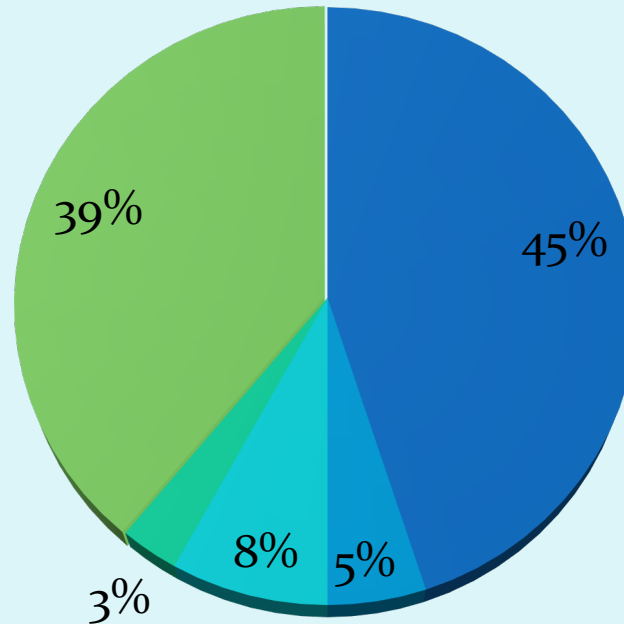
# Gross Composition of Solid Waste



Total MSW Generation in India: 160000 TPD

# Percentage Composition of MSW

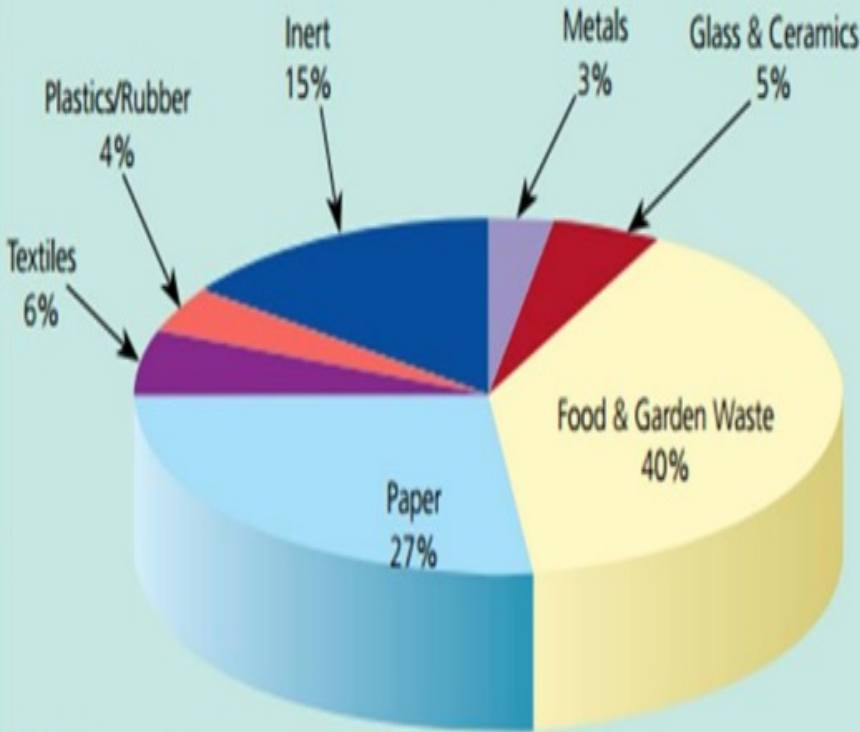
■ Compostible    
 ■ Plastic    
 ■ Paper    
 ■ Metals & Glass    
 ■ Miscellaneous



Source: Waste Characterization Study 2023

# Typical Composition of MSW – Indian Cities

**COMPOSITION OF MUNICIPAL SOLID WASTE IN TYPICAL INDIAN CITIES**



**Total Organic Fraction** - 40%  
**Combustible Fraction** - 37%  
**Inert** - 15%  
**Recyclables** - 8%

Source : CPHEEO Manual on MSW

Component	% Range	% Typical
Food waste	50-80	70
Paper	4-10	6
Cardboard	4-8	5
Plastics	1-4	2
Textiles	6-15	10
Rubber	1-4	2
Garden trimming	30-80	60
Wood	15-40	20
Tin cans	2-4	3
Leather	8-12	10
Glass	1-4	2
Non ferrous metals	2-4	2
Dirt, ashes,	6-12	8

# Need for WtE Technology in India

- The growth of annual waste generation estimated to be 1-1.33% .
- 68.8 million tones of MSW and 38 million gallons of sewage in urban areas holds large energy potential
- Electricity needs are increasing.
- Enhancing Metro Rail demands power generation ( Delhi metro using )
- Estimated potential of energy generation from Urban and Industrial Organic waste 5690 MW
- Potential from Urban solid waste (1427 MW) ,Urban liquid waste( 375MW),paper liquid waste (254 MW) processing and preserving meat liquid waste (182 MW)
- India has over 35,000 Ulb's as a source for MSW.
- Waste combustion is a proven technology.
- WtE is Preferred by large & growing cities because of the strong attribute of the Technology – namely Volume Reduction.

# Major Constraints Faced by the Indian Waste to Energy Sector

- Waste-to-Energy is just 2 decade old concept in India.
- Most of the proven and commercial technologies in respect of urban wastes were required to be imported;
- The costs of the projects especially based on biomethanation technology are high.
- In view of low level of non-compliance of MSW Rules by ULB's for segregation results in non availability of waste at the plant site.
- Lack of financial resources with ULB's and LB's.
- Constrains for allotment of lands.

# Waste Management Rules

<b>Sr. no</b>	<b>MoEF&amp; CC ( Ministry) Rules</b>	<b>Year</b>
1	Hazardous Wastes Management Rules	1989, 2008, 2016
2	Municipal Solid Waste Management & Handling Rules	2000
3	The Batteries (Management & Handling Rules	2001
4	Biomedical Waste Management Rules	1998
5	Biomedical Waste Handling & Management Rules	2016
6	Solid Waste Management Rules	2016
7	E-waste (Management & Handling) Rules	2011,2016
8	Construction & Demolition Waste Management Rules	2016
9	Plastic Waste Management & Handling Rules	2016,2018

# Power Tariff in India

## MINISTRY - CERC HAS FIXED A LEVELLIZED TARIFF:

MSW Rs. 6.50 per kWh

RDF - Rs. 7.59 per kWh ( applicable for 20 years)

Directions and guidelines generated for 100% power purchase.

Duty concessions and Excise duty benefits are available for imported equipments.

# WtE technology providers operating in India

## **Hitachi Zosen India Pvt. Ltd:**

Having their registered office in Gurgaon and engineering office set-up in Hyderabad

Operating in India since August 2012

Successfully installed 1x600 TPD WTE plant in Jabalpur, under operation since 2016 May. Almost 99% of the WTE plant equipment had been sourced in India.

## **JFE Engineering India Private Limited**

100% subsidiary to JFE Engineering Corporation

Operating from Pune.

## **CNIM Martin**

Operating from Chennai



# Resources of Equipment Manufactures in India

- **Waste Crane**
- **KONE / DEMAG**
  - Head office in Pune and Manufacturing facility also in Pune
  - Other 7 local offices in India
  - More than 50 Years of WTE experience and successfully supplied Grab Cranes to more than 500 WTE plants across the Globe.
- **APR Bright**
  - Successfully supplied Two nos. Grab Cranes in Jabalpur with Hitachi Zosen India.
  - Currently operating from Baddi, Himachal Pradesh.
  - Having the enough potential to supply the WTE plant Grab Cranes and Bottom Ash cranes.

# Resources of Equipment Manufactures in India

- **WtE Boiler:** BHEL, ISGEC Heavy Industries Ltd. Thermax India Ltd, Thermal System Hyderabad Pvt. Ltd  
Thyssenkrup Industries India Pvt Ltd
- **Flue Gas Treatment Technology:** Hitachi Zosen India,
- **Combustion Grate :** Hitachi Zosen India
- **Bottom Ash Extractor:** Hitachi Zosen India
- **Hydraulics:** Veljen, Hydac, Bosch Rexroth
- **Turbine:** Siemens, Triveni, Manturbo
- **Air Cooled Condensor:** GEA Cooling Systems, Paharpur Cooling Towers Ltd.
- **Water Treatment Plant:** Ion Exchange, Thermax, Triveni
- **Plant Electricals :** Siemens, L &T, ABB, Schnider
- **Feed Water Pumps:** KSB, Sulzer, Flowserve
- **Air Compressors:** Atlas Copco, Ingersol Rand India  
Kirloskar Ltd, India
-

# Successful WtE Projects in India

- A 600 TPD WtE Project with 11.5 MW electricity Generation commissioned by Hitachi Zosen at Jabalpur, Madhya Pradesh in **2016**
- A 1350 TPD WtE Project with 16 MW electricity Generation commissioned by OP Jindal Group at Okhla, New Delhi in **2012**
- A 1200 TPD WtE Project with 12 MW electricity Generation commissioned by IL&FS , at Gazhipur, New Delhi in **2016**
- A 1200 TPD WtE Project with 23 MW electricity Generation commissioned by Ramky Group at Narela, New Delhi in **2017**

# Successful WtE Projects in India

**Essel Jabalpur Project**  
**600 TPD, 11.5 MW**  
**Commissioned in May 2016**



**Timarpur Okhla WtE Plant by OP  
Jindal Group**  
**1350 TPD, 16 MW**  
**Commissioned in January 2012**



# Successful WtE Projects in India

**Gazhipur WtE Plant by IL&FS Environment**  
**1200 TPD, 12 MW**  
**Commissioned in 2016**



**Ramky Delhi Project**  
**1200 TPD, 24 MW**  
**Commissioned in February 2017**



# Successful WtE Projects in India

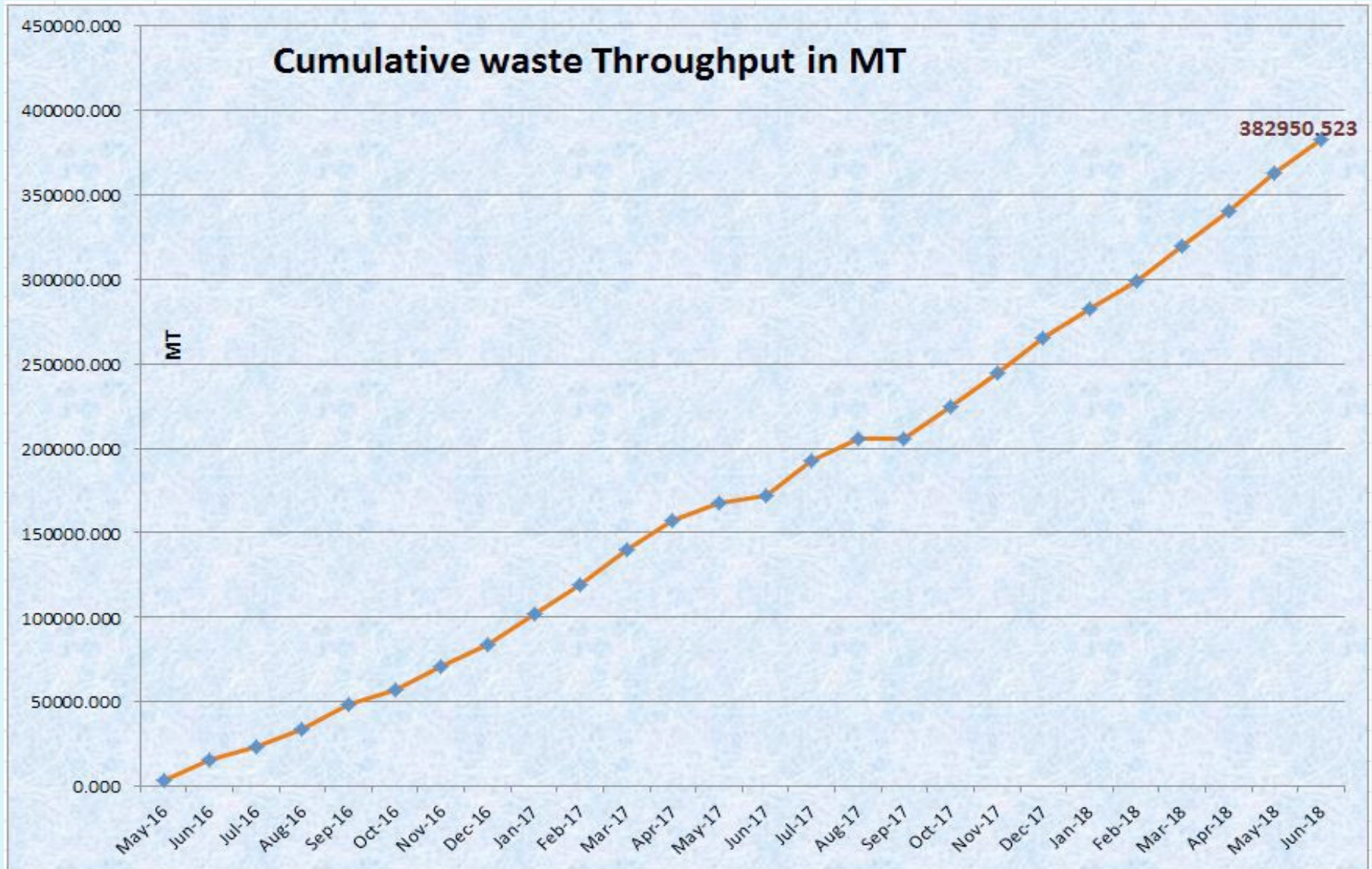
**Essel Jabalpur Project , 600 TPD, 11.5 MW  
Commissioned in May 2016**



# Transformation of a 30-acres open dump to a 10-acres WTE plant, Jabalpur

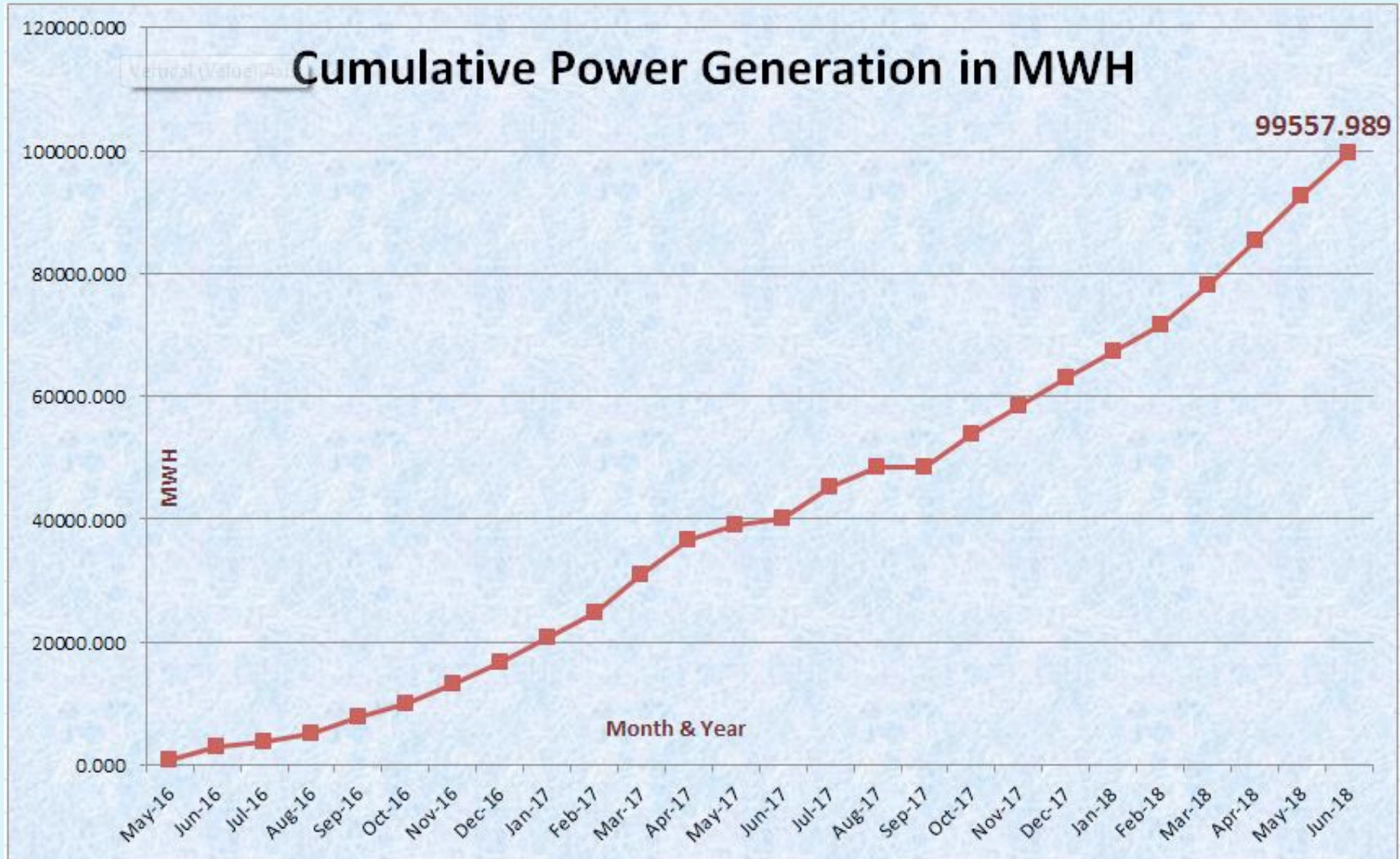


# Jabalpur plant-Cumulative Waste Throughput





# Jabalpur plant-Cumulative Power Generation 37



# TIMARPUR-OKHLA WASTE-TO-ENERGY PLANT

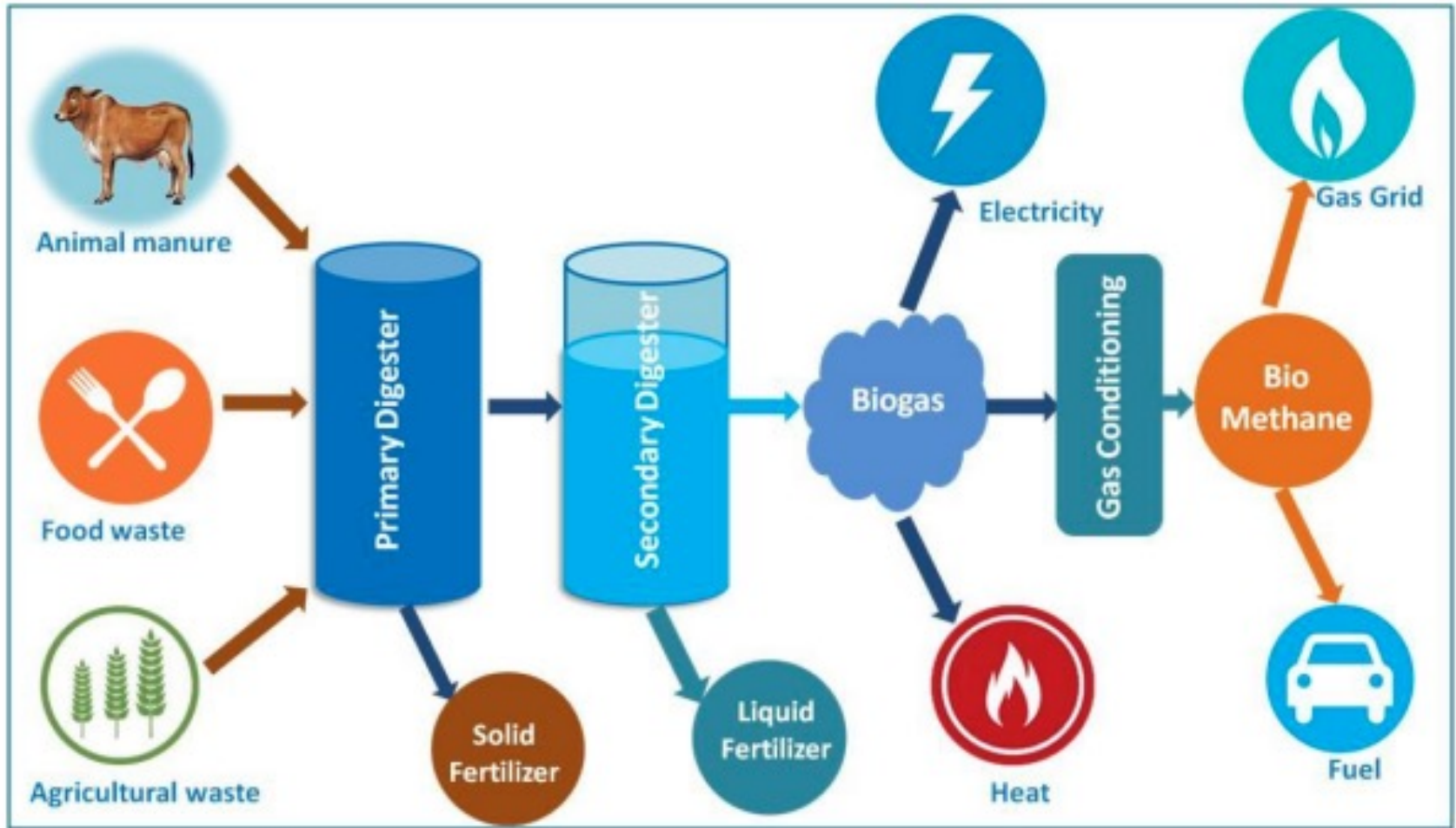
## Plant Performance

- 35 Lakh Metric Ton Garbage handled and scientifically disposed off so far.
- Average plant load factor 95-98%.
- Successfully operating for last Six years & Seven Months.
- There is a Technology stability even in the severe rainy season also plant has run with our the support of Auxiliary fuel.
- After 5 years successful operation Turbine overhauling has done.
- After 4 Years of successful running Boiler grate bars replaced.

# Successful Bio-Methanation plant of IOC Faridabad ,India

<b>Year of plant start-up:</b>	2018-19
<b>Location:</b>	India
<b>Technology:</b>	Waste to Energy  Conversion of various organic wastes such as food waste, municipal solid waste and crop residues to biogas
<b>Plant capacity:</b>	5 Ton biomass/day
<b>Operational experience achieved:</b>	4500 hr; total accumulated volume of fuel produced
<b>Total Capital Expenditure:</b>	0.4 Million USD
<b>Principle feedstocks:</b>	Food waste, municipal solid waste and crop residues
<b>Feedstock Capacity:</b>	1500 T/y
<b>Products/markets:</b>	Transport fuel, electricity, fertilizers
<b>Technology Readiness Level (TRL):</b>	TRL 8 – system complete and qualified

# Schematic Diagram, IOC Plant(BM)



Block diagram of bio-methanation of organic waste

# The Waste Management Startups are Making Profit in India

- Swatch Bharat Initiative of Government pushing Waste Management Program.
- Providing growth opportunities for innovative solutions.
- Electronic and Biomedical waste are under special attention.
- Each player with unique style of collection and treatment are encouraged to establish.
- Most of the e-waste management companies are partnering with major waste generating Industries..

# Prospective WtE Market in India

## India Waste-to-Energy Market Market Size

CAGR >2.56%



Study Period 2018 - 2028

Base Year For Estimation 2022

Forecast Data Period 2023 - 2028

Historical Data Period 2018 - 2021

CAGR > 2.56 %

Market Concentration Low

### Major Players



# Share of Technologies in Waste Management

Market Share, by Technology, India, 2022



Numerous startups are focusing on developing innovative approaches for waste disposal in an environment-friendly manner.

## India Waste Management Market Leaders

- 1 A2Z Green Waste Management Ltd
- 2 BVG India Ltd
- 3 Ecowise Waste Management Pvt. Ltd
- 4 Tatva Global Environment Ltd
- 5 Hanjer Biotech Energies Pvt. Ltd

### Market Concentration





# Business Opportunities in Waste to Energy Sector

- Business opportunities are present in every component of the waste to energy value chain.
- The varied business opportunities exist along the MSW to energy value chain
- Indian Waste to Energy market is estimated at USD 1.1 billion in 2023 (Mordor Intelligence Report) with expected rise of 2.56% (CAGR)
- In Swachha Bharat Abhiyan (Clean India Movement) favorable guidelines are issued i.e including WtE categorized as a renewable technology and supported by various subsidiaries and incentives.

# Business Value Chain

MSW to Energy Value Chain	Business Opportunities
<p>Primary collection and segregation of inert, dry organics and others.</p>	<p>Collection of reusable plastics and metals for sale in local market.                      Waste Processing and sell RDF pellets to biomass power plants.                      Mobilizing construction debris to make tiles and bricks</p>
<p>Separation of wet organic wastes</p>	<p>Production and sale compost to bio fertilizer firms.                      Biogas based power generation from sludge for selling it to the grid.</p>
<p>Secondary collection and storage</p>	<p>Maintenance of transfer stations                      High throughput screening of materials for recycling, energy recovery and land fill disposals.</p>
<p>Recycling of wastes</p>	<p>Recyclable commodity transactions from transfer stations                      Sale of recycled plastic or metal granules                      Conversion of processed wastes to industrial commodities</p>

# Continued...

<b>Transportation and logistics</b>	<b>Transporting solid waste from the source to the landfill or to the processing centers for energy recovery.</b> <b>Revenues from automobile manufacturing and sales to corporate bodies and contract holders</b>
<b>MSW to energy recovery</b>	<b>Production of machineries and equipment's for energy recovery technologies</b> <b>Decentralized technology installations.</b> <b>Power generation and sale of power</b> <b>Production and sale of processed organic feed stocks from MSW</b> <b>Income from Certified Emission Reductions(CER's)</b>
<b>Management of wastes at dumpsite</b>	<b>Design and construction of secured landfills</b> <b>Urban landscape development at abandoned landfills</b>
<b>Organization/financing for service and value chain enterprises</b>	<b>Debt and equity financing</b>

**Thank You**