

Overview of municipal solid waste management in India

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Preparing for Urban Challenges of 21st Century: Solid Waste Management
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Key facts



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- Present municipal solid waste generation is estimated at 42 million tonnes per annum
- Solid waste generation is considered largely a urban phenomenon
- Cities are considered to be engine of growth but are witness to deteriorating urban services including MSWM
- Uncontrolled disposal of MSW is not only source of environmental pollution but is also contributing to emission of GHGs
- Increasing waste generation would require increasing cost for its management

MSW characteristics in Indian cities

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Parameter	Unit	Range
Compostable	%	30 – 55
Recyclable (Plastics, Paper, Metal, Glass etc)	%	5 – 15
Inter including construction & demolition waste	%	40 - 55
Carbon/Nitrogen (C/N)	Ratio	14 – 53
Moisture	%	17 – 65
Calorific Value	kcal/kg	520 – 3766

Source: CPCB

Key features of MSW management

- Recyclable content of the MSW is picked up by waste pickers and send for recycling
- India reports high recycling rate of 70% though most of it happens in informal sector
- C&D waste presently disposed on land but can be recycled
- High moisture content and low calorific value of organic fraction of Indian MSW makes it more amenable to biochemical conversion

Performance of ULBs

S/N	Performance Indicator	Service Level Benchmark (in percent)	Current Average Performance (in percent)
1	Household Coverage	100	47.7
2	Collection Efficiency	100	75.3
3	MSW Segregation	100	19.5
4	MSW Recovery	100	31.73
5	Scientific Disposal;	100	8.0
6	Cost Recovery	100	17.3
7	User Charges Collection Efficiency	90	31.4
8	Complaint Redressal	80	89.1

Source: SLB databook, MoUD, 2008-09

Technologies used of MSW processing and disposal

- Aerobic composting
 - Windrow
 - In-vessel composting
 - Vermicomposting
- Anaerobic digestion
- Incineration/cement kilns
- Use of RDF/fluff for energy generation
- Landfilling with harvesting LFG
- Pyrolysis/gasification
- Plasma torch

Aerobic Composting



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» Advantages:

- Eliminates more waste volume than any other non-thermal technology
- Significant field experience

» Disadvantages:

- Requires energy for aeration or land area for turning
- Returns more carbon to the atmosphere than any non-thermal technology



•“Windrow” Composting Facility

Vermicomposting



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» Advantages:

- Increase soil fertility
- Compost produced is superior to windrow composting

» Disadvantages:

- Not suitable for certain type of food waste (meat, dairy products, grease)
- Earthworms need to be protected
- More vulnerable to fluctuating environment



•Vermicoposting yard

Anaerobic Digestion/Biomethanation

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» Advantages:

- Can be small-scale with no external power source required
- Totally enclosed system and modular construction
- Odors and visible pollution reduced

» Disadvantages

- Highly capital intensive
- Requires high degree of biodegradable material



•Biomethanation unit

Waste Combustion for Energy/Incineration **teri**

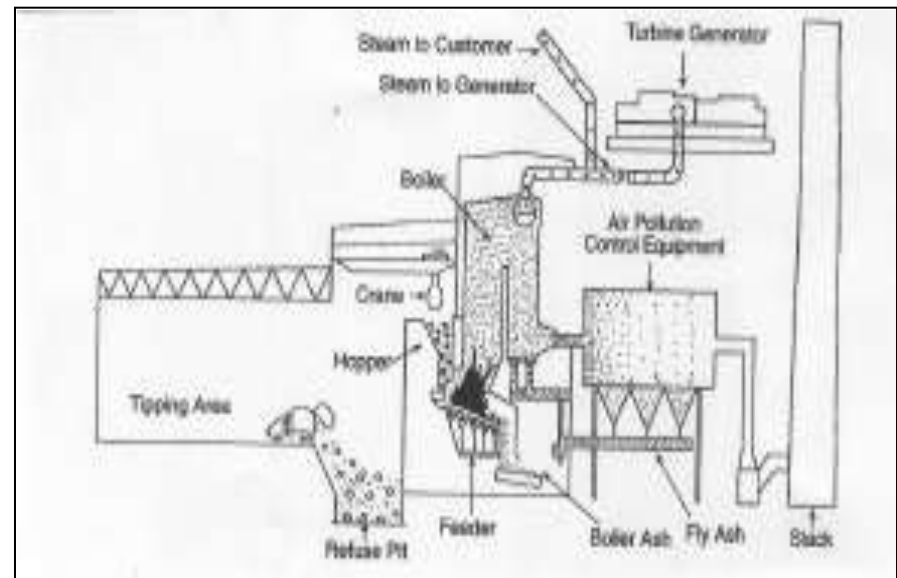
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» Advantages:

- Most suitable for high calorific value waste (paper, plastics, wood)
- Relatively free of noise and odour; requires small land area

» Disadvantages:

- Low heating value-not ideal for energy recovery
- Toxic metals lead to increased air emissions
- High capital and O&M costs



•Schematic of Incineration Process

Densification/Pelletization



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» Advantages:

- High energy content
- Convenient for storage and transport

» Disadvantages:

- High energy consumption for crushing and drying
- Inorganic content tends to reduce effectiveness
- Only conducive during periods of lower rainfall
- May require gas cleanup to avoid air emissions



•MSW Pellets

Conventional Landfill with Gas Extraction **teri**

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» Advantages:

- Low cost energy recovery due to scale economies
- Controlled LFG recovers high percentage of total gas potential

» Disadvantages

- Uncontrolled, methane gas easily escapes
- Requires significant landfill infrastructure
- Requires very high volumes of waste and large land areas



•LFG extraction setup

« Bioreactor Landfill with Gas Extraction

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» Advantages:

- Rapid organic waste conversion / stabilization
- Maximum landfill gas capture for energy projects
- More efficient use of landfill space due to rapid settlement

» Disadvantages

- Requires high organic composition to be a cost-effective option
- Limited technical experience



•Yolo County California Bioreactor

Driving force for avoiding landfilling

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- Availability of land becoming a problem
- Therefore increasing distances for transportation
- MSW Rules also prohibit disposal of organics and recyclables

Insights from MSW-to-Energy International Experience

- » Information on processes is limited by secrecy claims
- » No large-scale implementation experience for most new cutting-edge technologies
- » Waste statistics and data are poor; extrapolations are dubious
- » Advocates and experts tend to popularize unproven and inappropriate technologies
- » Large amounts of development money during the early stages generally do not yield sustainable markets for the technology
- » Technology failures are seldom reported – technology promotions continue despite failings

Thank you