CPWD roles & responsibilities

• Integrated construction management including designing
• Post construction maintenance of capital assets (perpetuity/full asset life)
• Dismantling and disposal management
• Technical advisory to Government of India (GoI)

Jawaharlal Nehru Bhawan (MEA headquarters), Delhi: 31,504 sqm
Indira Paryavaran Bhawan, Delhi: 9,565 sqm

Software Technology Park of India (STPI) at EPI Park, Greater Noida: 3780 sqm

Rajya Sabha MPs’ flats, Delhi: 27,895 sqm
Jwala heri-Bhera enclave underpass, Delhi

Four level crossing at Azadpur, Delhi
Ambedkar Bhawan at Ambedkar University: 24,552 sqm

Chemical Engineering Dept., NIT Warangal: 26,000 sqm
Reality

- Individual/Institutional/Bulk generation of different types of waste

Total municipal solid waste (MSW) per annum

- 62,000,000 tonnes (T)
- 7,900,000 T
- 5,600,000 T
- 1,500,000 T
- 170,000 T

- Hazardous waste
- Plastic waste
- E-waste
- Bio medical waste
Challenges

- **Weak estimations:** average 200-600g of municipal waste is generated per capita/day. **165 million T projected in 2030**

- **Poor management & technical capacity:** Of 62 MT, only 75-80% (43 MT) gets collected and only 22-28% of this waste is processed and treated. Collection efficiency in below 50% in small cities

- **High system inefficiency:** solid waste management takes up majority of municipal resources (about Rs. 500 to Rs. 1500 per tonne and 75% of employees)

- **Highly unsafe and insanitary:** poor handling and disposal leads to disease transmission, injury especially in ragpickers and habitants near landfills, ground and surface water contamination, greenhouse gas emissions, property damage and discouragement of tourism activities
Interventions

2000 - MSW(M&H) Rules and Manual on Municipal SWM

2005 - TAG Report on MSW

2008 - National Urban Sanitation Policy

2010 - National Mission on Sustainable Habitat

2013 - Draft MSW Rules

Waste Management Rules, 2016
Interventions

• Waste management rules 2016:
  – Address different typologies
  – cover area beyond municipal limits
  – Make waste management an inherent responsibility of the generator
  – Impose fines and penalties on non-compliance
  – Enforce to manage waste in partnership with local bodies
  – Encourage to strive for ways to make waste management efficient
Waste typologies & rules
Waste typologies & rules

- Solid Waste Management Rules 2016
- Plastic Waste Management Rules 2016
- Hazardous Waste Management Rules 2016
- E-Waste Management Rules 2016
Waste typologies & rules

Category 1 (5000-20,000 sqm built-up area):
  • onsite (preferably natural) treatment systems, reuse treated effluent, dispose residual sludge as per MoUD-CPEEHO manual, 2013

Category 2 & 3 (20,000-150,000 sqm built-up area):
  • install onsite sewage treatment plant of 100% treatment capacity (dual piping system mandatory for category 3); reuse treated waste water on site for landscape, flushing, cooling tower, and other end-uses.

Solid waste: provide for segregation and ensure collection in separate streams.
  • Category 2 & 3 - Organic waste compost/Vermiculture pit with a minimum capacity of 0.3 kg/person/day; hand over non-biodegradable waste to authorized recyclers
Waste typologies & rules

Solid Waste Management Rules 2016

Plastic Waste Management Rules 2016

Hazardous Waste Management Rules 2016

E-Waste Management Rules 2016

Bio-medical Waste Management Rules 2016

Methodology
Methodology

collection → segregation → treatment → disposal

segregation → collection → transport → treatment → disposal
Methodology

Segregation

Primary collection

Collection areas
- Open waste storage sites
- Masonry bins
- Cement concrete cylinder bins
- Dhalao/covered rooms/space
- Covered metal/plastic containers

Upto 1.1 cu.m bins
2 to 5 cu.m bins
Above 5 cu.m containers

Secondary collection

Processing/Treatment

Material recovery

Disposal

Animal cart, Tractors, Non tipping Truck, Tipping Truck, Dumper Placers, Refuse collectors, Compactors, JCB/loader

Buyer
<table>
<thead>
<tr>
<th>Actor</th>
<th>Duties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of environment forest and climate change</td>
<td>constitute ‘Central Monitoring Committee’ to monitor and review every year</td>
</tr>
<tr>
<td>Ministry of urban development</td>
<td>frame National Policy on SWM and coordinate with States/UTs,</td>
</tr>
<tr>
<td>Ministry of chemicals and fertilisers</td>
<td>assist in market development for city compost</td>
</tr>
<tr>
<td>Ministry of agriculture</td>
<td>make flexible Fertilizer Control Order, promote utilization of compost, testing facility for compost and issue guidelines</td>
</tr>
<tr>
<td>Ministry of power</td>
<td>fix tariff of power generation from W-T-E project and ensure distribution through companies</td>
</tr>
<tr>
<td>Ministry of new and renewable energy sources</td>
<td>facilitate infrastructure for waste-to-Energy plants and provide subsidy</td>
</tr>
<tr>
<td>State and local administrative bodies</td>
<td>Prepare policies, plans, guidelines and identify landfill and processing sites</td>
</tr>
<tr>
<td>Central/ State pollution control boards</td>
<td>Coordinate with SPCBs, review technologies, monitor, issue authorization and regulate</td>
</tr>
<tr>
<td>Manufacturers or brand owners of disposable products</td>
<td>Ensure environmentally sound management, till end-of-life of the packaging products</td>
</tr>
<tr>
<td>Owners of industrial units</td>
<td>shall use RDF within 100 km</td>
</tr>
</tbody>
</table>
Municipal solid waste

- Includes every domestic, institutional, commercial and other non-residential solid waste generated within municipal boundaries.
- Excludes industrial waste, hazardous waste, bio-medical waste, e-waste, lead-acid batteries.
- **Bulk waste generator**: average waste generation above 100 kg/day.

**Composition of MSW in India**

<table>
<thead>
<tr>
<th>Particular</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>40-60%</td>
</tr>
<tr>
<td>Ash and fine earth (inerts)</td>
<td>30-40%</td>
</tr>
<tr>
<td>Paper</td>
<td>3-6%</td>
</tr>
<tr>
<td>Plastic, glass and metals</td>
<td>Each less than 1%</td>
</tr>
<tr>
<td>Recyclables</td>
<td>17.5%</td>
</tr>
</tbody>
</table>

*Source: Central Pollution Control Board, 2014*
Duties of waste generator

• segregate and store the waste in suitable bins and handover segregated wastes to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time
• wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities and shall place the same in the bin meant for dry waste or non-bio-degradable waste;
• store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 201
• store horticulture waste and garden waste generated from his premises separately in his own premises and dispose of as per the directions of the local body from time to time.
• No waste generator shall throw, burn or bury the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.
• All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.
# Segregation

<table>
<thead>
<tr>
<th>Biodegradable (wet)</th>
<th>Food and other organic waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-biodegradable (dry)</td>
<td>Plastic, Paper, Metal, wood, inert street sweepings, etc.</td>
</tr>
<tr>
<td>Domestic Hazardous waste</td>
<td>Diapers, Napkins, paint drums, pesticide cans, CFL bulbs, tube lights, mosquito repellents, used batteries, expired batteries, etc.</td>
</tr>
</tbody>
</table>
On site treatment

- Mandatory to compost organic waste on site with area above 20,000 sqm.
- See schedule Ii for quality checks

Pit Composting

Mechanised Composting

Vermi Composting
## Treatment technologies

<table>
<thead>
<tr>
<th>PROCESSES/TECHNOLOGY</th>
<th>HOUSEHOLD LEVEL</th>
<th>BUILDING LEVEL</th>
<th>NEIGHBOURHOOD LEVEL</th>
<th>CITY LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segregation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recycling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerobic composting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vermi composting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windrow composting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incineration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bio-methanation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other provisions

• Preference shall be given to decentralised processing to minimize transportation cost and environmental impacts:
  – Composting, bio-methanation, bio-stabilisation, refuse derived fuel
  – Waste to energy (>=1500 Kcal/kg): incineration, gasification, pyrolysis, coprocessing
• Check frequently for odour and hygiene conditions in decentralised waste processing facilities
• Waste processing, treatment or disposal facility required if the volume of waste exceeds 5 tonnes per day or one for every lakh population
• Waste deposition centres for domestic hazardous waste, where one centre is set up for the area of twenty square kilometres in a census town
• No landfills in hilly areas; land to be identified in plains within 25 km. Stringent rules as per ULB including charges
## Integrated SWM hierarchy

<table>
<thead>
<tr>
<th>Level</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>At Source Reduction &amp; Reuse</strong>&lt;br&gt;Waste minimization and sustainable use/multi use of products (e.g. reuse of carry bags/packaging jars)</td>
</tr>
<tr>
<td>2</td>
<td><strong>Recycling</strong>&lt;br&gt;Processing non-biodegradable waste to recover commercially valuable materials (e.g. plastic, paper, metal, glass and e-waste recycling)</td>
</tr>
<tr>
<td>3</td>
<td><strong>Composting</strong>&lt;br&gt;Processing organic waste to recover compost (e.g. windrow composting, in-vessel composting, vermi composting)</td>
</tr>
<tr>
<td>4</td>
<td><strong>Waste to Energy</strong>&lt;br&gt;Recovering energy before final disposal of waste (e.g. RDF, biomethanation, co-processing of combustible non-biodegradable dry fraction of MSW, incineration)</td>
</tr>
<tr>
<td>5</td>
<td><strong>Landfills</strong>&lt;br&gt;Safe disposal of inert residual waste at sanitary landfills</td>
</tr>
</tbody>
</table>
Why such preference?

- Challenges:
  - Capital intensive
  - Operational and maintenance issues
  - Weak compliance
  - Lack of data on waste and its characteristics
  - Inappropriate technology selection (ex. Un-engineered landfills, see Schedule 1, clause C and D)
- For ex:
  - the first large-scale MSW incinerator built at Timarpur, New Delhi in 1987 had a capacity to process 300 tonnes per day and cost Rs. 250 million (US$ 5.7 million). It failed
  - Okhla waste to energy plant is non-compliant. Waste to energy plants need to be beyond 6 km from residential areas and should produce refuse derived fuel (RDF)

Source: NEERI, 2015
Plastic waste

• “plastic” means material which contains as an essential ingredient a high polymer such as:
  – polyethylene terephthalate (PET),
  – high density polyethylene (HDPE),
  – Vinyl (V),
  – low density polyethylene (LDPE),
  – polypropylene (PP),
  – polystyrene resins (PS),
  – multi-materials like acrylonitrile butadiene styrene (ABS), polyphenylene oxide (PPO), polycarbonate (PC), Polybutylene terephthalate (PBT);
Typologies

PET  HDPE  V  LDPE  PP  PS  OTHER

[Safest Choice] [Use with Caution] [Avoid]

PET

HDPE

LDPE

PP

PS
Duties of waste generator

• Minimize generation and segregate
• Hand over segregated plastic to registered waste pickers’, registered recyclers or waste collection agencies
• pay such user fee or charge as may be specified in the bye-laws of the local bodies
• Every person responsible for organising an event in open space, which involves service of food stuff in plastic or multi-layered packaging shall segregate and manage the waste
Other provisions

• Recyclable plastic waste to be channelled to registered plastic waste recycler. Recycling shall conform to IS 14534:1998

• Local bodies shall encourage the use of plastic waste (preferably the plastic waste which cannot be further recycled) for road construction as per Indian Road Congress guidelines or energy recovery or waste to oil etc

• No pigments or colourants to be used in plastic bags and packaging, if so only those in conformity with IS 9833:1981

• Recycled plastic not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff

• carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness

• No plastic to be sold or used as raw material

• Carry bags made from compostable plastics shall conform to the Indian Standard: IS 17088:2008. No thickness norm applicable.

• Phase out non-recyclable multilayered plastic in two years

Primary responsibility for collection of used multi-layered plastic sachet or pouches or packaging is of Producers, Importers and Brand Owners who introduce the products in the market. Submit management plan to SPCBs
Plastic waste to roads

**Step 1:** Plastics waste (bags, cups, bottles) made out of PE, PP, and PS cut into a size between 2.36mm and 4.75mm using a shredding machine.

**Step 2:** The aggregate mix is heated to 165°C (as per the HRS specification) and transferred to the mixing chamber. The amount of plastic to be added is @8% of bitumen.
Plastic waste to roads

**Step 3:**
- Similarly the bitumen is to be heated up to a maximum of 160 °C (HRS Specification) to have good binding and to prevent weak bonding. (Monitoring the temperature is very important).

**Step 4:** At the mixing chamber, the shredded plastics waste is to be added. It get coated uniformly over the aggregate within 30 to 60 seconds, giving an oily look.
Plastic waste to roads

**Step 5:**
- The plastics waste coated aggregate is mixed with got bitumen and the resulted mix is used for road construction. The roller used is 8-ton capacity.

**Step 6:** The road laying temperature is between 110°C to 120 °C. And the rollers are used have capacity 8-ton generally.
Hazardous Waste

Broadly defined as wastes that because of their physical and/or chemical characteristics pose a risk to human health and the environment such that they merit special management. See schedules.
Hazardous waste

• Schedule I: **Processes generated hazardous waste**. For ex: extraction or production of petrochemicals, copper, lead, aluminium, phenol, acids, metal surface treatment, leather tanneries, electronics, pulp and paper, etc.
Hazardous waste

• Schedule II (any of the below):
  – Class A **Based on leachable concentration limits**  
    [Toxicity Characteristic Leaching Procedure (TCLP) or Soluble Threshold Limit Concentration (STLC)]. In mg/l, for ex. Mercury is 0.2, lead is 5, benzene is 0.5
  – Class B: **Based on Total Threshold Limit Concentration** (TTLC). In mg/kg, for ex. Asbestos
  – CLASS C : **Based on hazardous Characteristics** - flammable, corrosive, reactive or explosive, toxic, etc.
Hazardous waste

• Schedule III: list of materials for import export, based on Basel convention

• Schedule IV:
  – List of commonly recyclable hazardous wastes. Ex. Lead acid batteries, parts of e-waste, paint residues, waste oil

• Schedule V:
  – Used oils for recycling, fuels derived for waste oil
## How is it generated?

<table>
<thead>
<tr>
<th>Processes generating hazardous waste</th>
<th>Waste Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrels / containers used for handling of hazardous wastes/chemicals</td>
<td>Sludge from treatment of waste water arising out of cleaning / disposal of barrels / containers</td>
</tr>
<tr>
<td>Handling of hazardous chemicals and wastes</td>
<td>Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes</td>
</tr>
<tr>
<td>Use of paints, pigments, lacquers, varnishes and inks</td>
<td>Process wastes, residues and sludges</td>
</tr>
<tr>
<td>Asbestos or asbestos-containing materials</td>
<td>Asbestos-containing residues</td>
</tr>
<tr>
<td>Cleaning, emptying and maintenance of petroleum oil storage tanks</td>
<td>Sludge and filters contaminated with oil</td>
</tr>
</tbody>
</table>
Why is it necessary to handle hazardous waste properly?

- Can readily explode or undergo violent reactions. Normally unstable and readily undergoes violent change without detonating.

- Can readily catch fire and sustain combustion. Give off a flammable vapour at temperature less than 60°C.

- Not necessarily combustible, may, by yielding oxygen cause, or contribute to, the combustion of other materials.

- Can be acute in the form of oral (LD$_{50}$<2500mg/kg), dermal (LD$_{50}$<4300 mg/kg), inhalation (LC$_{50}$<10,000ppm).

- Substances or Wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact.

- Are acidic or alkaline and can readily corrode or dissolve flesh, metal, or other materials. pH$\leq$2 or pH$\geq$12.5.

- If released, present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation or toxic effects upon biotic systems or both.
What must the generator/occupier do?

The occupier shall be responsible for safe and environmentally sound management of hazardous and other wastes.

Either send or sold to an authorised actual user or dispose off in an authorised disposal facility.

Transport from an occupier’s establishment to an authorised actual user or to an authorised disposal facility in accordance with the provisions of these rules.

For treatment and disposal by the operator of a facility, shall give to the operator of that facility, such specific information as may be needed for safe storage and disposal.

The occupier shall take all the steps while managing hazardous and other wastes to contain contaminants and prevent accidents and limit their consequences on human beings and the environment.

Provide persons working in the site with appropriate training, equipment and the information necessary to ensure their safety.
Types of facilities

- **Facilities**: *Common* or *Captive*
  - **Common**: a facility identified and established individually or jointly or severally by the State Government, occupier, operator of a facility or any association of occupiers that shall be used as common facility by multiple occupiers or actual users for treatment, storage and disposal of the hazardous and other wastes
  - **Captive**: a facility developed within the premises of an occupier for treatment, storage and disposal of wastes generated during manufacture, processing, treatment, package, storage, transportation, use, destruction, collection, conversion, offering for sale or transport
Storage

The occupiers of facilities may store the hazardous and other wastes for a period not exceeding ninety days and shall maintain a record of sale, transfer, storage, recycling, recovery, pre-processing, co-processing and utilisation of such wastes and make these records available for inspection:
Handling

- Operator of common facility or occupier of a captive facility shall maintain records of hazardous and other wastes handled.
- Mark date of beginning of storage and label as “HAZARDOUS WASTE” both in English and local language.
- Prepare an emergency response plan, comprising:
  - Identifications of actions
  - Risk-likelihood mapping
  - Preventive measures
  - Curative measures
  - Staff training
  - Outreach to concerned authorities

Sample Datasheet

* Fill up above table separately for indigenous and imported waste.

Form 3

[See rules 6(5), 13(7), 14(6), 16(5) and 20 (1)]

FORMAT FOR MAINTAINING RECORDS OF HAZARDOUS AND OTHER WASTES

1. Name and address of the facility
2. Date of issuance of authorisation and its reference number
3. Description of hazardous and other wastes handled (Generated or Received)

<table>
<thead>
<tr>
<th>Date</th>
<th>Type of waste</th>
<th>Total quantity (Metric Tonnes)</th>
<th>Method of Storage</th>
<th>Destined to or received from</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Date wise description of management of hazardous and other wastes including products sent and to whom in case of recyclers or pre-processor or utiliser:
5. Date of environmental monitoring (as per authorisation or guidelines of Central Pollution Control Board):

Sample Datasheet

Signature of occupier
Treatment

- **Identification of site:** State Government, occupier, operator of a facility or any association of occupiers shall individually or jointly.

- **Facility compliances/details:**
  - Location of site with layout map;
  - Safe storage of the waste and storage capacity;
  - The treatment processes and their capacities;
  - Secured landfills;
  - Incineration, if any;
  - Leachate collection and treatment system;
  - Fire fighting systems;
  - Environmental management plan including monitoring;
  - Arrangement for transportation of waste from generators.
The responsibility of safe transport shall be either of the sender or the receiver whosoever arranges the transport and has the necessary authorisation for transport from the concerned State Pollution Control Board.
Transportation

### FORM 8
[See rules 17 (1) and 18 (2)]

**LABELLING OF CONTAINERS OF HAZARDOUS AND OTHER WASTE**

<table>
<thead>
<tr>
<th>Handle with care</th>
<th>Incompatible wastes and substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste category and characteristics as per Part C of Schedules II and III of these rules</td>
<td>........................................</td>
</tr>
<tr>
<td>Total quantity</td>
<td>Date of storage</td>
</tr>
<tr>
<td>Physical State of the waste (Solid/Semi-solid/liquid):</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sender's name and address</th>
<th>Receiver's name and address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone...................</td>
<td>Phone...................</td>
</tr>
<tr>
<td>E-mail........................</td>
<td>E-mail........................</td>
</tr>
<tr>
<td>Tel. and Fax No...............</td>
<td>Tel. and Fax No...............</td>
</tr>
<tr>
<td>Contact person...............</td>
<td>Contact person...............</td>
</tr>
<tr>
<td>In case of emergency please Contact ..................</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. Background colour of label - **fluorescent yellow**.
2. The word, 'HAZARDOUS WASTES' and 'HANDLE WITH CARE' to be prominent and written in red, in Hindi, English and in vernacular language.
3. The word 'OTHER WASTES' to be written prominently in orange, in Hindi, English and in vernacular language.
4. Label should be of non-washable material and weather proof.
Transportation

FORM 9
[See rule 18 (2)]

TRANSPORT EMERGENCY (TREM) CARD
[To be carried by the transporter during transportation of hazardous and other wastes, provided by the sender of waste]

1. Characteristics of hazardous and other wastes:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Type of waste</th>
<th>Physical properties/ Chemical constituents</th>
<th>Exposure hazards</th>
<th>First Aid requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Procedure to be followed in case of fire
3. Procedure to be followed in case of spillage/accident/explosion
4. For expert services, please contact
   (i) Name and Address
   (ii) Telephone No.

HAZARDOUS WASTE

Waste Name
(No abbreviations or chemical formulas)

Halogenated Solvent Waste

Hazardous Constituents

Chloromethane 12
Dichloromethane 25
Acetic Acid 60

Hazard(s)
(Check all that apply)

Ignitable X Corrosive X Reactive X Oxidizer
X Halogen X Toxic

Container Fill Date: __10/32/2010___

Generated by: Jane Jones Ext: 2123
Biomedical Waste
Why is it necessary to manage BMW?
How much Bio Medical Waste is produced

Currently, your sewage probably ends up untreated in a water body. 17% of the urban population do not have sanitation services while 50-70% of waste is dumped untreated into the water bodies.

1-2 Kg / Bed / Day

in a hospital or 0.6kg in a clinic

53.25%

Health Care Facilities dispose off waste without proper procedure

28% is left untreated

Source: Ministry of Environment, Forests and Climate Change
Segregation

Yellow coloured non-chlorinated plastic bags

Red coloured non-chlorinated plastic bags

White/translucent coloured non-chlorinated plastic bags

Blue coloured non-chlorinated plastic bags
Bulk generator (wet MSW)

Source: S. Mani, 2014
Bulk generator (Dry MSW)
Common solid waste treatment facility

Source: S. Mani, 2014
Construction & Demolition waste

Source: S. Mani, 2014
Thank you