MUNICIPAL SOLID WASTE MANAGEMENT (CE30078)

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Solid Waste

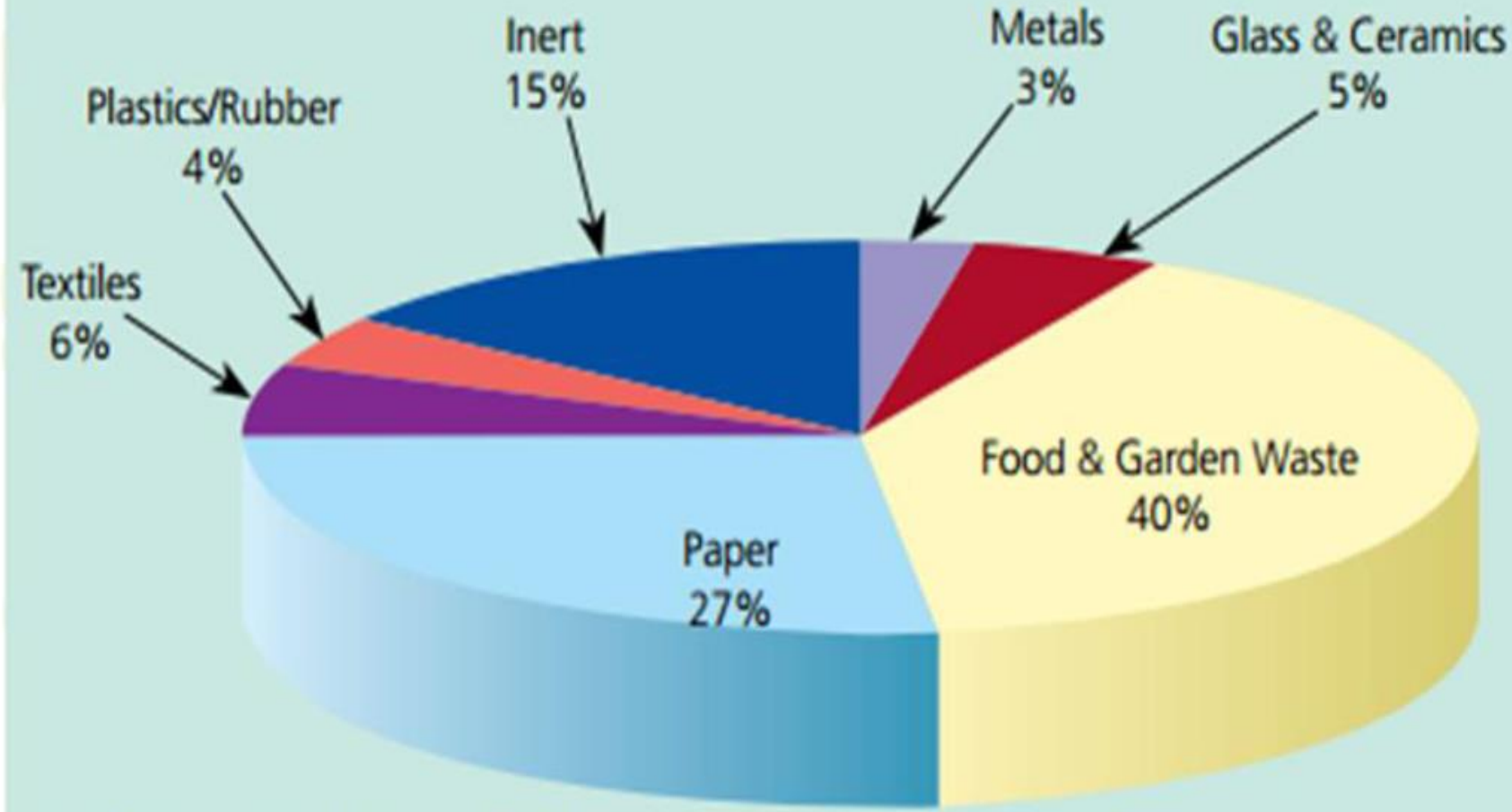
Solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste

excluding

industrial waste, bio-medical waste and e-waste, battery waste & radioactive waste

MoEF&CC, 2016

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

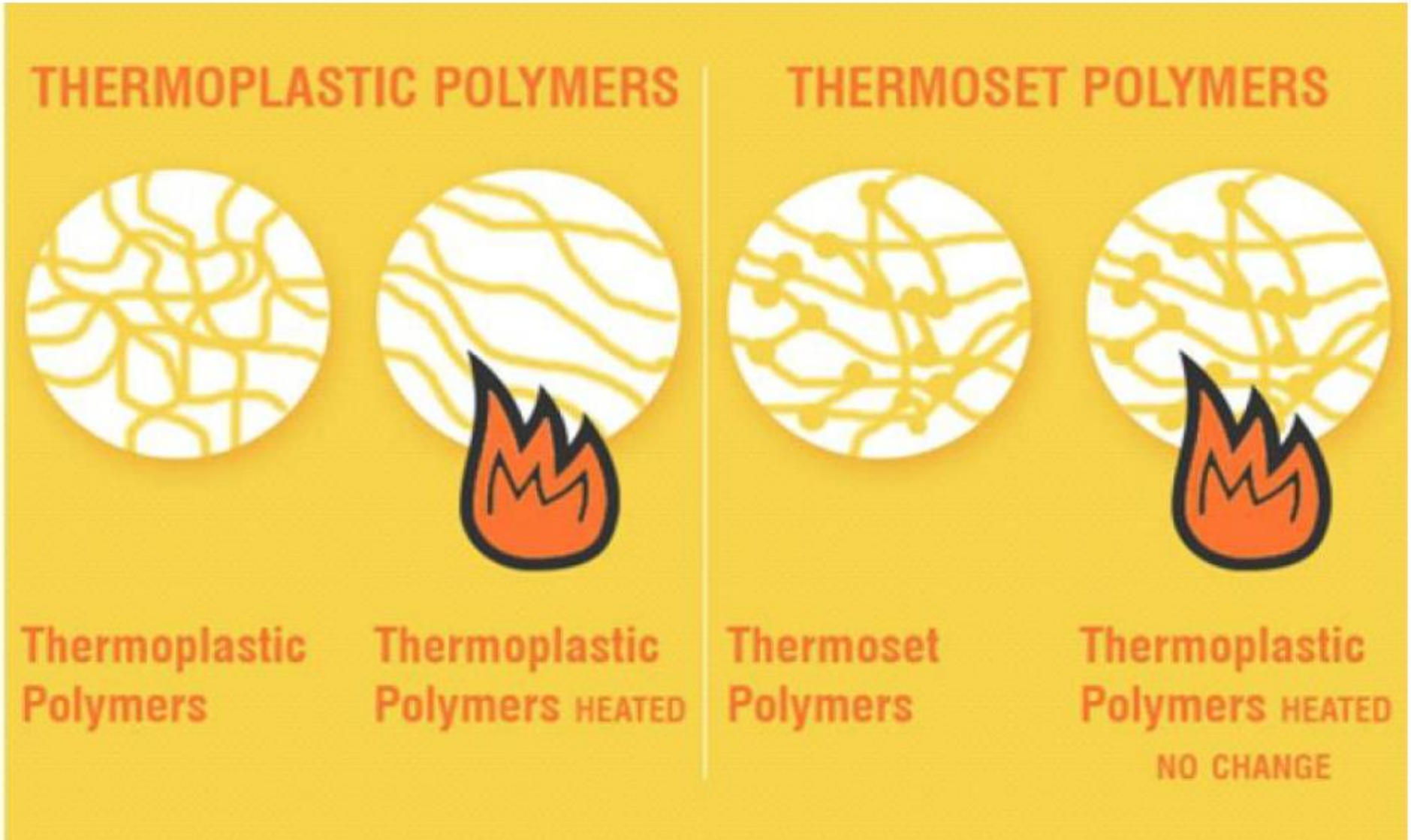
Terminologies

Term	Definition	Examples	Key Characteristics
Garbage	Organic or biodegradable waste, typically generated from kitchens and food-related activities.	Food scraps, vegetable peels, spoiled food.	Decomposes naturally, can be composted.
Rubbish	Non-biodegradable and non-recyclable waste items that are discarded due to being no longer useful.	Broken glass, plastic wrappers, old furniture.	Non-decomposable, often sent to landfills or incineration.
Scrap	Leftover materials, often metallic or otherwise recyclable, that can be processed and reused.	Metal shavings, leftover construction steel.	High potential for recycling and reuse.
Debris	Broken or scattered remains of larger objects, often generated from construction, demolition, or disaster.	Rubble, bricks, concrete pieces, tree branches.	May require special handling due to bulk or contamination.

Plastic Waste

“Plastic waste” means any plastic discarded after use or after their intended use is over

Plastics (behaviour wrt Heating)



Thermoplastics

Ex: polypropylene, PVC, polystyrene, PET, polycarbonate

Thermoset plastics

Ex: epoxy, silicone, polyurethane

Plastic (type of resins)

S. No.	Symbol	Short Name	Scientific Name	Uses
1		PET	Polyethylene terephthalate	Soft drink bottles, furniture, carpet, paneling etc.
2		HDPE	High-density polyethylene	Bottles, carry bags, milk pouches, recycling bins, agricultural pipe, base cups, playground equipment etc.
3		PVC	Polyvinyl chloride	Pipe, Window profile, fencing, flooring, shower curtains, lawn chairs, non -food bottles and children's toys etc.
4		LDPE	Low-density polyethylene	Plastic bags, various containers, dispensing bottles, wash bottles, tubing etc.
5		PP	Polypropylene	Auto parts, industrial fibers, food containers, dishware etc.
6		PS	Polystyrene	Cafeteria trays, plastic utensils, toys, video cassettes and cases, clamshell containers, insulation board etc.
7		O	Other	Thermoset Plastics, Multilayer and Laminates, Bakelite, Polycarbonate, Nylon SMC, FRP etc.

Construction & Demolition Waste

“Construction and demolition waste" means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure

Electronic Waste

Waste from Electrical & Electronic equipment (WEEE)

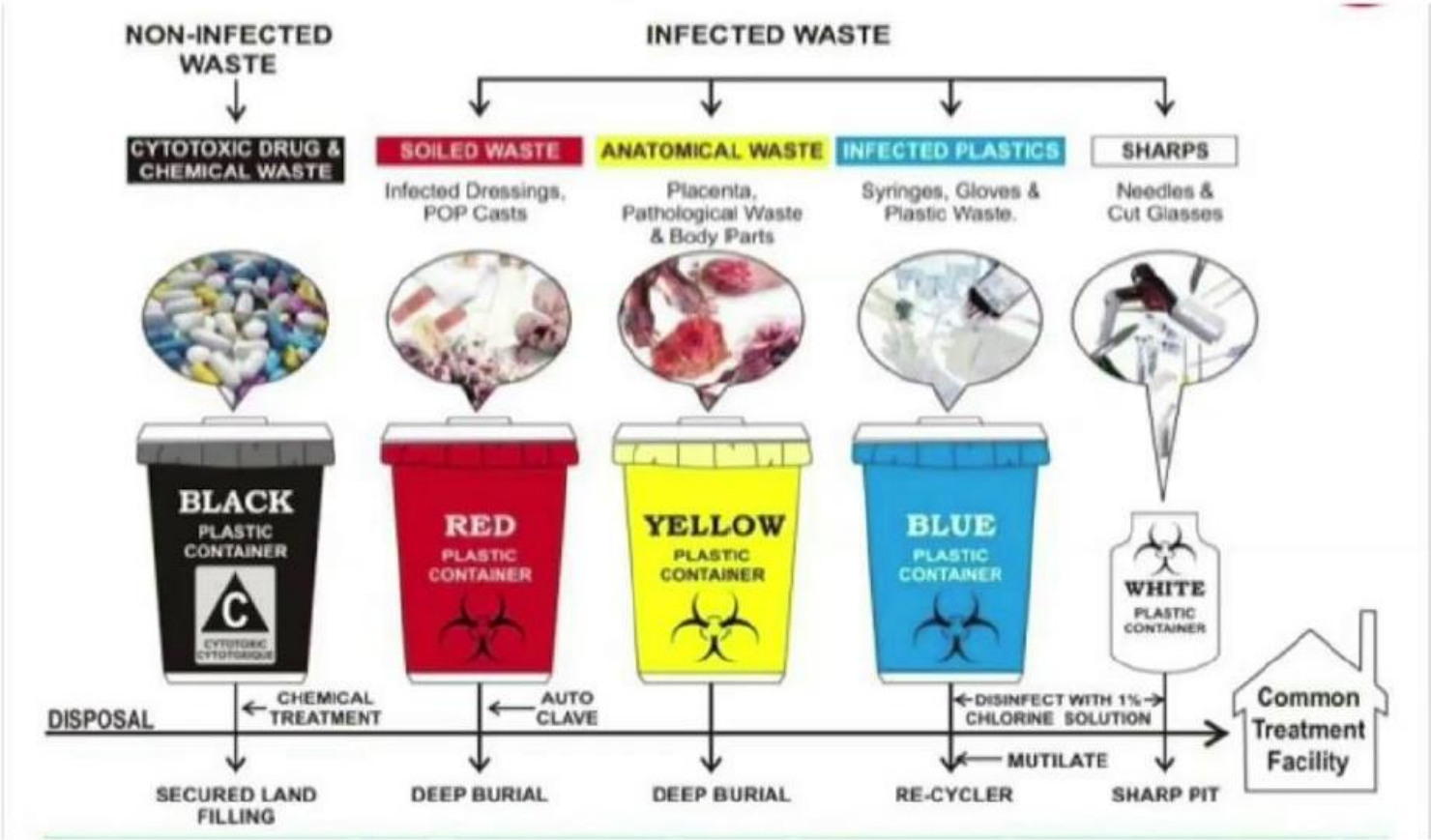
'E-waste' means electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes

Hazardous Waste

"Hazardous waste" means any waste which by reason of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment, whether alone or in contact with other wastes or substances

"domestic hazardous waste" means discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles and syringes and contaminated gauge, etc., generated at the household level

Bio-medical Waste



“Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps

Colour	Type of Bio-medical waste
Yellow	**Human and animal anatomical waste, soiled waste, expired medicine, chemical waste, clinical laboratory waste.**
Red	**Contaminated Waste** Blood bags, Laboratory cultures, stocks or specimens of microorganisms
White (Translucent)	**Waste sharps including Metals** Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated
Blue	**Glassware** Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes. **Metallic Body Implants**

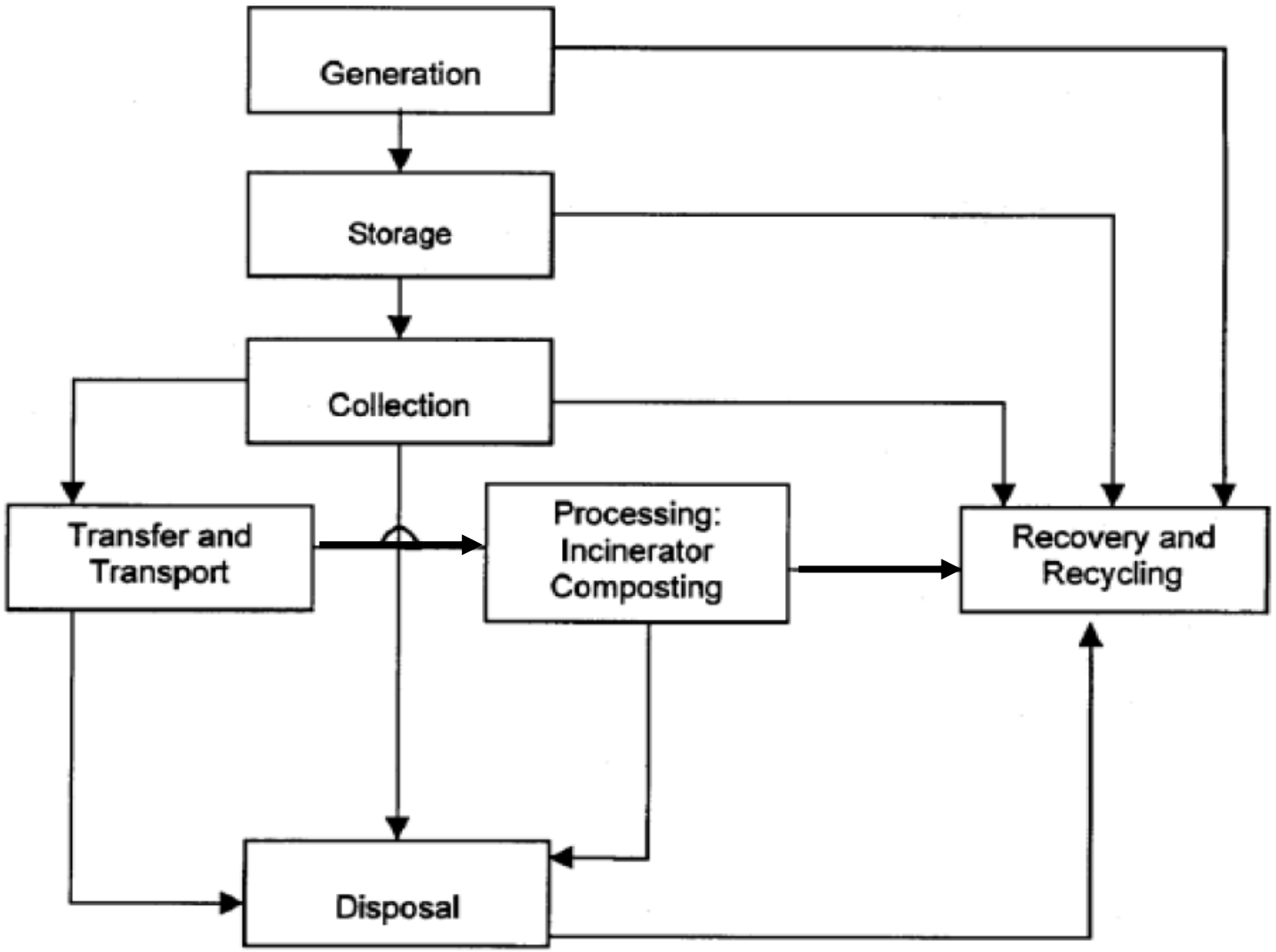
WASTE MANAGEMENT RULES BY MOEF&CC

- Solid Waste Management Rules 2016
- Plastic Waste Management Rules 2016
- Electronic Waste Management Rules 2016
- Construction & Demolition Waste Management Rules 2016
- Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016
- Bio-medical Waste Management Rules 2016
- Battery Waste Management Rules 2020
- Atomic Energy (Radiation Protection) Rules 2004

SOLID WASTE MANAGEMENT

- May be defined as the discipline associated with the *control*, *generation*, *storage*, *collection*, *transfer and transport*, *processing and disposal* of solid waste.

Functional Elements of a Solid Waste Management System



Effective Solid Waste Management as per SWM Rules 2016

Step 1 : Segregation at source

Step 2 : Primary Collection Service at the Door step

Step 3: Secondary Storage

Step-4 : Transfer and Transport of waste

Step 5 : Treatment / Processing of Waste

Step 6 : Final Disposal of Waste at Engineered Landfills

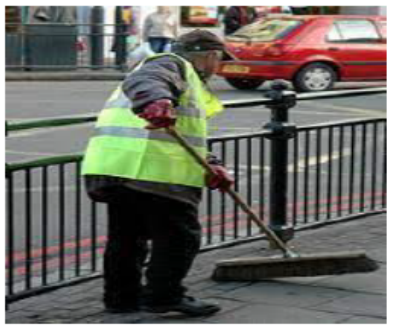
Step 1 Segregation at source

1. Wastes from bulk waste generators and household waste generators (Wet, Dry and Hazardous)
2. Store street sweeping and silt separately and transport to waste disposal site through MRF
3. Store C&D waste separately as and when generated and handover to ULB representative

Step 2 Primary Collection Service

Collecting, lifting and removal of segregated solid waste from source of its generation

Stream-1
Collect from the door step – Biodegradable (wet organic) waste, residual recyclable and combustible wastes stored at households, shops and establishments – In separate vehicles/compartments and deliver at the respective processing facility through MRF (Material Recovery Facility).



Stream-2
Collect and transport separately inert waste such as street sweeping and silt from the drain and take directly to waste disposal site through MRF without mixing with waste collected from the doorstep.

Stream-3
Construction and demolition waste to be collected separately and utilized for making bricks, paver blocks, aggregate or any other useful product in terms of C&D Waste Management Rules, 2016

Step 3 : Secondary Storage

Temporary containment of solid waste after collection at secondary waste storage depots or MRFs or bins for onward transportation of the waste to the processing or disposal facility

- Temporary Storage for domestic waste (Wet and Dry)
- Temporary Storage of inert street waste and silt at least 4 per sq.km.
- Temporary Storage for domestic hazardous waste (at least one centre per 20 sq.km area)

Step 4: Transfer and Transport of waste

Use covered vehicles which synchronize with primary collection/secondary storage system

Avoid multiple & manual handling of waste

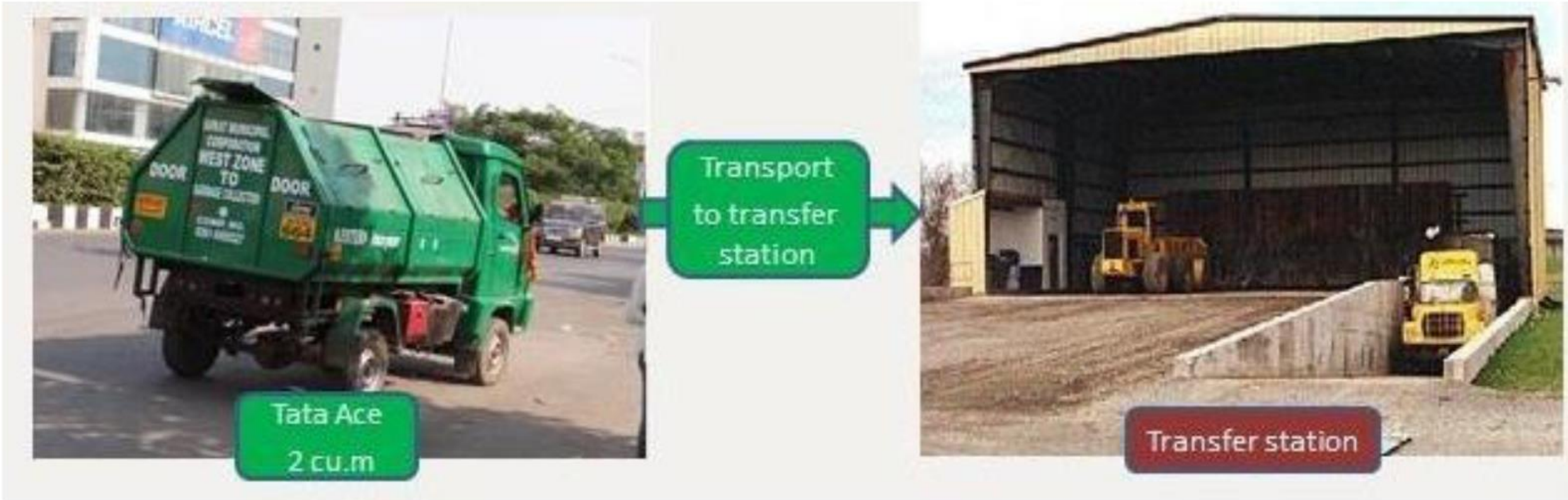
Ensure regular transportation of segregated waste to respective processing and/or disposal facilities

Transfer station

1. For cost effective transportation of waste from collection areas, set up transfer stations if distance to be travelled for delivery of waste at treatment/disposal facility exceeds 15 km
2. Provide material recovery facility, if possible, to facilitate recovery of recyclables by waste pickers.
3. Provide a weigh bridge to keep record of the waste handed.

Transfer Station

Facility created to receive solid waste from collection areas and transport in bulk in covered vehicles or containers to waste processing and, or, disposal facilities



Step 5 : Treatment / Processing of Waste

Biochemical Conversion

(i) Composting

(ii) Biomethanation

Thermal Conversion

(i) Combustion

(ii) Gasification

(iii) Pyrolysis

Step 6: Final Disposal of Waste at Engineered Landfills

Only rejects from the treatment plants and inert waste to be land filled

Precious land must be saved and bio degradable, recyclable wastes and C&D waste should not be allowed to be landfilled

THANK YOU