Solid Waste Management

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Solid Waste

- **Solid waste** refers to all types of garbage, refuse, or sludge from water, treatment or water supply, plant as a result of household, industrial, commercial, mining or agricultural activities.
- **Solid waste management** refers to collection, transport, processing, recycling, disposal, and monitoring of solid waste.

Types of Solid Waste

- On the **basis of its source**, solid waste can be grouped into three categories-
  - **Municipal solid waste-** household waste, construction debris, sanitation residue and street waste
  - **Industrial or Hazardous waste** – from various industries and the leftover raw materials
  - **Biomedical waste or hospital waste-** anatomical waste medicines, excreta, blood syringes, gowns masks, etc.

Types of Solid waste

Municipal solid waste

Industrial or Hazardous waste

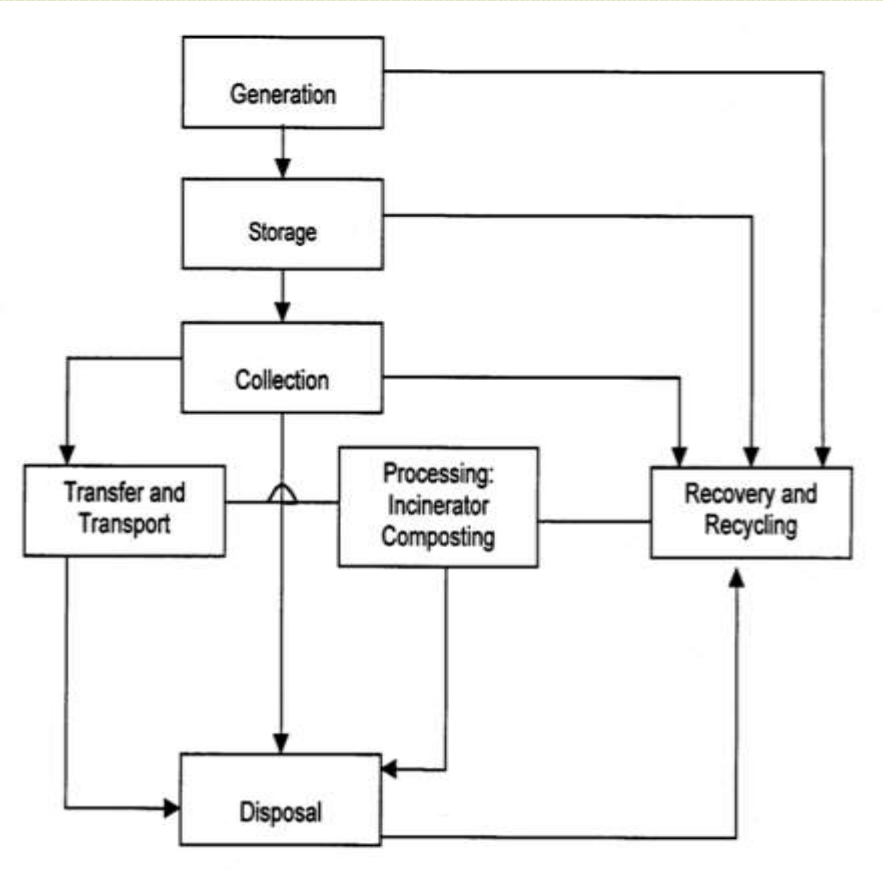
Biomedical waste or hospital waste

Source of Solid waste

Waste category	Source
Residential	Food wastes, plastics, paper, glass, leather, cardboard, metals, yard wastes, ashes, tires, batteries, old mattresses
Industrial	Packaging wastes, ashes, chemicals, cans, plastics, metal parts
Commercial	Thin and thick plastics, food wastes, metals, paper, glass, wood, cardboard materials
Institutional	Wood, paper, metals, cardboard materials, electronics
Construction and Demolition	Steel materials, concrete, wood, plastics, rubber, copper wires, dirt and glass.
Agriculture	Agricultural wastes, spoiled food, pesticide containers
Biomedical	Syringes, bandages, used gloves, catheter, urine bags, drugs, paper, plastics, food wastes, sanitary napkins and diapers, chemicals.
E-Waste	Electronic items like used TVs, transistors, tape recorders, computer cabinets, mother boards, CDs, cassettes, mouse, wires, cords, switches., chargers.

Municipal Solid Waste Management- Functional elements

1. Waste generation
2. Waste storage
3. Waste collection
4. Transfer and transport
5. Processing
6. Recovery and recycling
7. Waste disposal

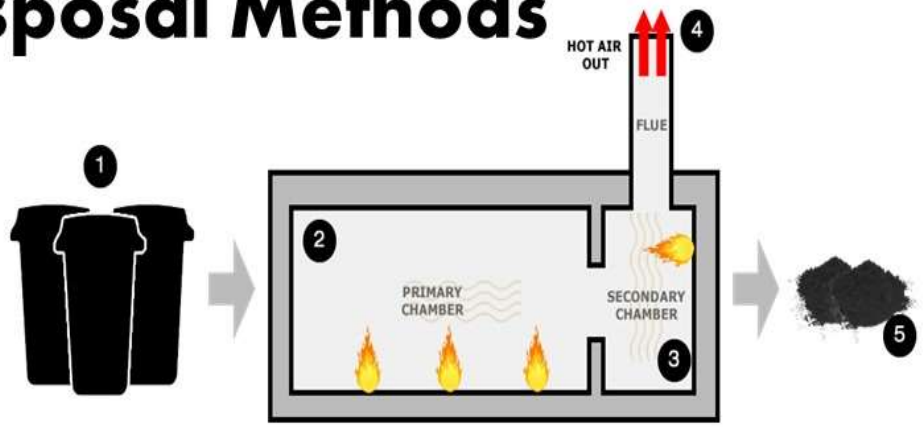


Waste Segregation

Disposal Methods

Waste Disposal Methods

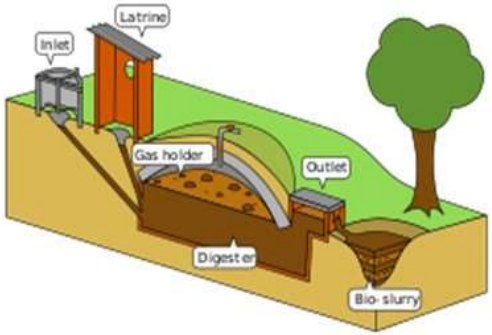
Landfill



Incineration

Composting

Vermi-Composting



Biogas Generation

Disposal Methods (Composting)

- The process of composting starts with the organic wastes being buried under layers of soil and then, are left to decay under the action of microorganisms such as bacteria and fungi.
- This results in the formation of nutrient-rich manure.
- Besides enriching the soil, composting also increases the water retention capacity.
- In agriculture, it is the best alternative to chemical fertilizers.

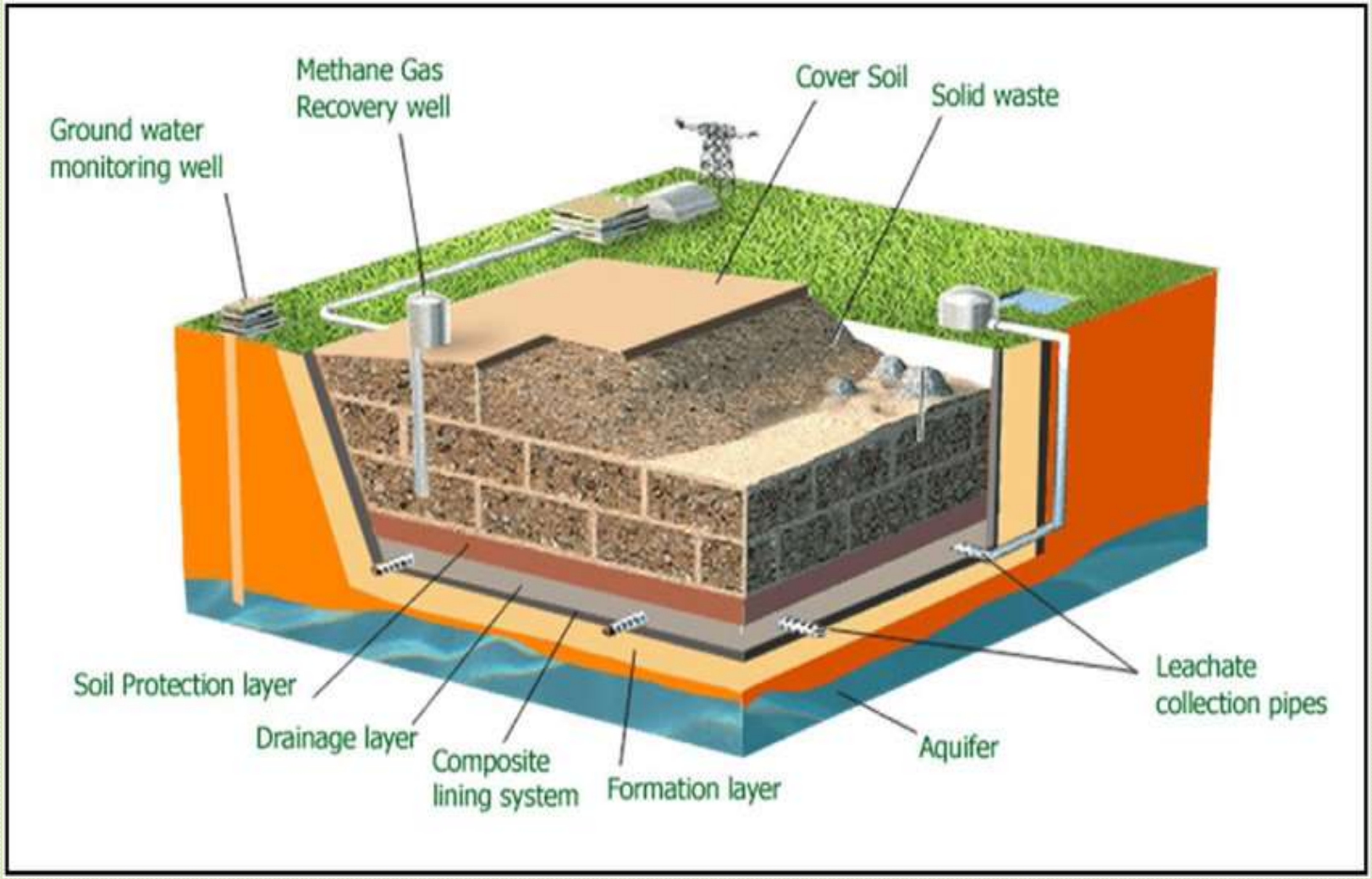
Composting


Grass clippings
Kitchen scraps
Garden trimmings
Food scraps
Leaves
Compost
Using the natural process of decay to change organic wastes into a valuable humus-like material called compost

Disposal Methods (Landfilling)

- In this process, the waste that cannot be reused or recycled is separated out and spread as a thin layer in low-lying areas across a city.
- A layer of soil is added after each layer of garbage.
- However, once this process is complete, the area is declared unfit for construction of buildings for the next 20 years.
- It can only be used as a playground or a park.

Landfill site



Hazardous Waste Management

- **Hazardous waste management** is a process to ensure the storage, treatment and disposal of hazardous waste is conducted in a manner that protects the health and safety of people and the environment.
- **Hazardous waste** is solid waste that has hazardous waste characteristics or is a listed hazardous waste.
- Examples - Batteries containing toxic metals (zinc, lead or mercury), Radioactive materials, Wastes from hospitals & pathology Labs, Toxic Chemicals

Hazardous waste

- The hazardous substance may exhibit one or more of the following hazardous characteristics:
  - ignitability, or something flammable.
  - corrosivity, or something that can rust or decompose.
  - reactivity, or something explosive.
  - toxicity, or something poisonous.

Types of hazardous waste

- **Radioactive substance:**
  - Substances that emit ionizing radiation
  - prolonged exposure often results in damage to living organisms.
  - of special concern because they persist for a long period.
- **Chemicals:**
  - Synthetic organics, inorganic metals, salts, acids and bases, and flammables and explosives.
  - they are highly toxic to most life forms.

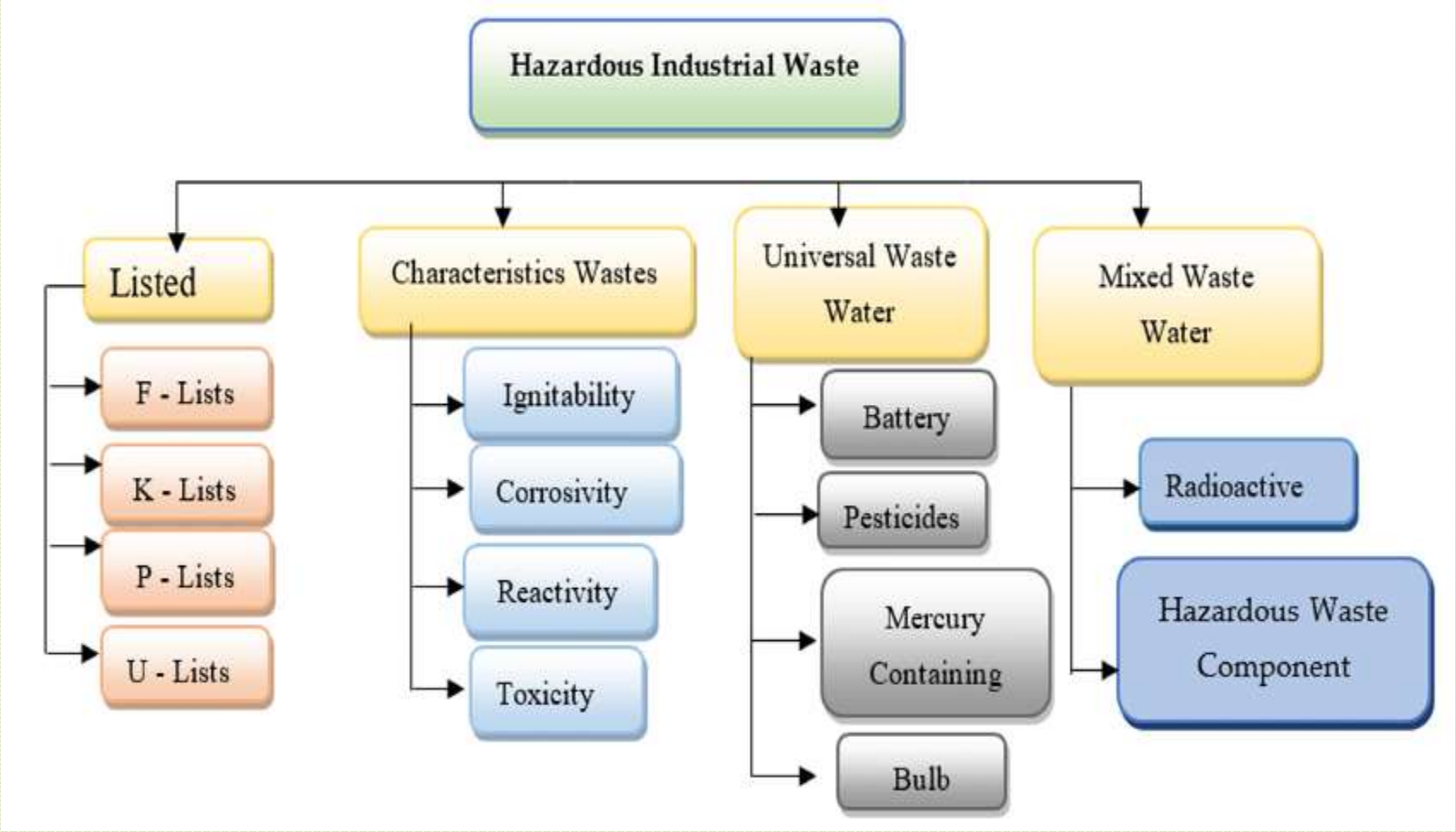
Types of hazardous waste

- **Biomedical wastes:**
  - The principal sources are hospitals and biological research facilities.
  - includes malignant tissues discarded during surgical procedures and contaminated materials, such as hypodermic needles, bandages and outdated drugs.
- **Flammable wastes:**
  - Most flammable wastes are also identified as hazardous chemical wastes.
  - Typical examples include organic solvents, oils, plasticizers and organic sludge's.

Types of hazardous waste

- **Explosives:**
  - Explosive hazardous wastes are mainly ordnance (artillery) materials, i.e., the wastes resulting from ordnance manufacturing and some industrial gases.

Classification of hazardous waste



Classification of hazardous waste

Hazardous Waste Classification	Examples	EPA Listing
Nonspecific source hazardous wastes	methylene chloride, TCE	F
Specific process hazardous wastes	wood preservation, pigment mfg. sludges	K
Acutely toxic discarded chemicals Potential injury/death with only small exposures; IDLH	arsenicals, cyanides	P
Toxic discard chemicals Carcinogenic, mutagenic, teratogenic; toxic, but not IDLH	acetone, creosote	U

Sources of Hazardous waste

Sources of Hazardous waste

Hazardous wastes	Sources
Heavy metals	
Arsenic	Mining, Tobacco smoke, processing of textiles, paper, glass etc.
Cadmium	Mining, fertilizer industry, battery waste
Chromium	Mining areas, Tanneries
Lead	Lead-acid battery smelters
Manganese	Mining areas
Mercury	Chlor-alkali industry, paper industry, mining, fuel burning
Nickel	Mining, metal refining
Pesticides	Insecticides
Hydrocarbons	
Benzene	Petrochemical industries, volcanoes, gasoline, crude oil
Vinyl chloride	Plastics, hazardous waste sites
Organic chemicals	
Dioxins	Waste incineration, herbicides, metal smelting
PCBs	Fluorescent lights, E-waste, Hydraulic fluid

Thank You