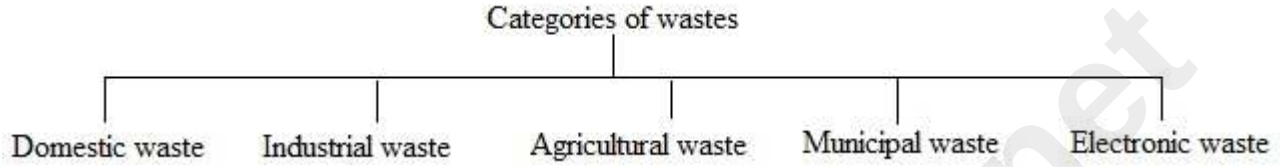
Waste Generation and Management

- **Waste** is any substance which is discarded after its primary use, or it is worthless, defective and of no further use. Examples: Spoilt food, vegetable peels, leaves, wood, grass, paper, leather, cotton, cattle dung etc.

- **Categories of Wastes**



- Waste that is generated from domestic activities such as washing, bathing, cooking etc. is called **domestic waste**. Examples: Fruit and vegetable peels, leftover food, waste paper etc.

- Sources of domestic waste include kitchen waste, plastics etc.

- Waste which is generated by industries is called **industrial waste**. Examples: Chemicals, paint residues, oil, ash, sludge, heavy metals etc.

- Sources of industrial waste include mining operations, cement industries and oil refineries.

- Waste such as animal manure, plant leaves, bark, flowers etc. which is generated from plants and animals is called **agricultural waste, farm waste** or **garden waste**. Examples: Residues of fertilisers, pesticides, insecticides and other chemicals.

- Sources of agricultural waste include agricultural residue, pesticides and fertilisers.

- Waste generated from domestic, industrial and commercial activities is called **municipal solid waste** or **urban waste**. Examples: Garbage and plastic bags, glasses, metals, fibre, paper, rubber, discharge from hospitals, hotels etc. are all included under municipal wastes.

- Sources of municipal waste include the household discharge of excreta, discharge from public toilets, degradable wastes and non-degradable wastes.

- Discarded electrical appliances, such as old television sets, computers, radios, mobile phones, fluorescent tubes, medical instruments, toys and lead acid batteries all fall into the category of **e-wastes** or **electronic waste**.

- Broken or discarded glass equipment, waste chemicals, condemned machines and plant and animal wastes from biology laboratories and culture rooms are some of the wastes generated at science laboratory and research centres.

Methods of safe disposal of wastes

A. Segregation

- One should separate the degradable waste from the non-degradable waste.
- Proper segregation of waste helps the municipal authorities to decompose and dispose off the organic part of the wastes easily.
- Segregation involves separating the refuse into three main categories—reusable, degradable and non-degradable wastes.

B. Dumping

- Non-degradable wastes such as plastic, pesticides, fibres etc. can be dumped or buried in specially dug up pits at far off places away from the human habitation.

C. Composting

- The rotting and conversion of organic waste into manure is known as composting. The product formed after composting is called compost.
- The household garbage as well as farmland wastes can all be converted into useful compost.
- The use of compost improves the fertility of the soil as it provides nutrients to the soil.
- Dry composting toilets are a hygienic and cost-effective solution to dispose off the human wastes.
- A major drawback of composting is that, due to a lack of adequate knowledge most of the people do not segregate the wastes in their homes, which hampers the process of composting.

D. Drainage/Sewer system

- A sewer system is a channel of pipelines which carries sewage from the houses, offices, hospitals etc. through drainage pipes to the sewer mains of the city.
- The sewer mains flow into progressively larger pipes until they reach the waste water treatment plant.

E. Effluent treatment plants

- Municipal and industrial waste water is treated in waste water treatment plants or effluent treatment plants before they are released into the water bodies.
- In primary treatment, the waste water is first passed through bar screens, where large objects such as sticks, plastic packets and cans are removed.
- The secondary treatment is a biological process used to remove dissolved and suspended organic matter.
- The tertiary treatment is a chemical process in which the dissolved chemicals, metals and even pathogens are removed from the waste water. It varies with the composition of waste water.

F. Incineration

- Incineration is a method in which the waste is burnt at very high temperatures.
- The hazardous bio-medical wastes, such as discarded medicines, toxic drugs, human anatomical wastes, blood, pus, microbiological and biotechnological wastes etc. are usually disposed of by incineration.
- Incineration helps to reduce the weight and volume of waste and converts the toxic wastes into less toxic or even non-toxic substances. Electricity can be generated from the heat released during burning.
- This method releases fumes and harmful substances.
- Incineration should be carried out at very high temperatures.
- Incinerators should be equipped with pollution control devices.

G. Scrubbers

- Scrubbers are devices used to remove both, gaseous and particulate matter.
- Wet scrubbers are used in chemical, metallurgical and mining industries to trap the sulphur dioxide (SO_2), ammonia (NH_3), metal fumes etc.

H. Electrostatic precipitator

- In an electrostatic precipitator, gas or an air stream containing dust, smoke soot and other particulate matter is passed through a chamber containing electrically charged plates.
- Up to 90% of the particulate matter in the thermal plants can be removed by electrostatic precipitators.

I. Disposal of e-waste

- The rag pickers and waste dealers collect the discarded electronic gadgets. They remove the usable components and extract the secondary raw materials. This recycling process however can cause various health problems and can even lead to cancer.
- Most electronic goods contain a variety of materials and metals which can be recycled for future use.
- If recycling has to be carried out, then it must be done carefully under skilled supervision.