UNIT-5 (SOLID WASTE MANAGEMENT & NOICE POLLUTION)

Waste is defined as unwanted and unusable materials and is regarded as a substance which is of no use. Waste that we see in our surroundings is also known as **garbage.** Garbage is mainly considered as a solid waste that includes wastes from our houses (domestic waste), wastes from schools, offices, etc (municipal wastes) and wastes from industries and factories (industrial wastes).

- A waste can be defined as any unwanted and useless material.
- The waste can be either solid, liquid or gaseous.
- **Solid Waste** in general can be defined as 'As a material which has negligible value to the producer and there is no direct consumption of the generated waste'.
- It is generated due to various activities that can be residual and commercial, agricultural, etc.
- Whatever the origin, content or hazard potential is, solid waste must be managed systematically to ensure environmental best practices.

SOLID WASTE MANAGEMENT

- **Solid Waste Management** is defined as the discipline associated with control of generation, storage, collection, transport or transfer, processing and disposal of solid waste materials.
- Solid waste management includes planning, administrative, financial, engineering and legal functions in the process of solving problems arising from waste materials.
- The primary goal of solid waste management is reducing and eliminating adverse impacts of waste materials on human health and environment to support economic development and superior quality of life.

SOURCES

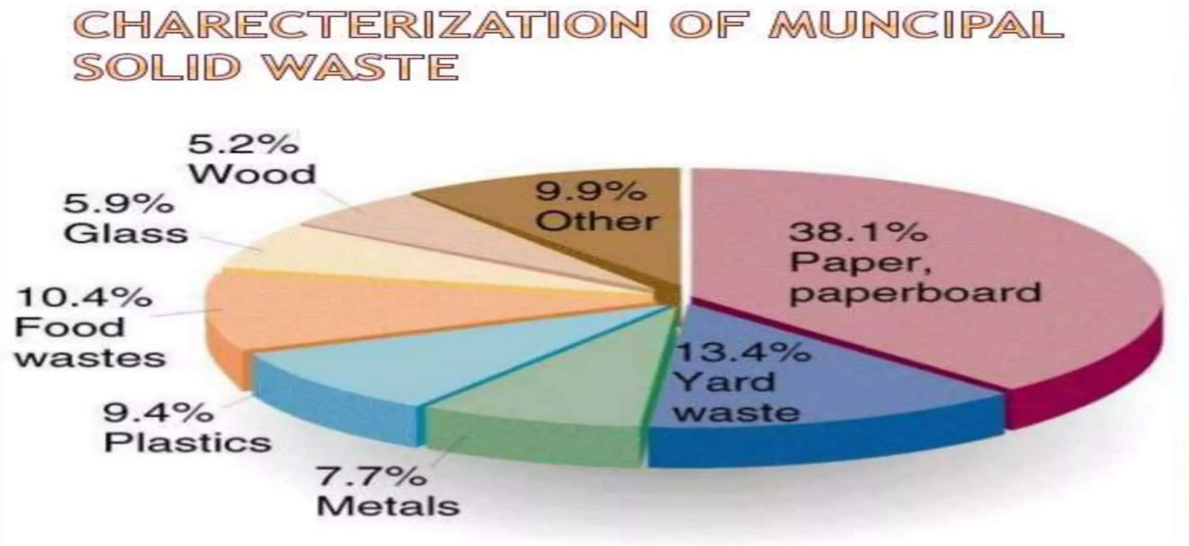
- There are many sources of solid wastes such as :
- Municipal solid waste – street sweeping, sewage treatment plant waste, waste from schools and other institution.
- Domestic waste – Garbage, rubbish, paints, paper, glasses, old toys, old clothes, spoiled food, etc.
- Commercial waste – From different stores and offices.
- Mining – From coal mining, strip mining, etc.
- Agricultural waste – Fertilizers and pesticide containers, organic waste, etc.
- Hospital waste – Disposable syringes, swabs, body fluids, bandages, etc.
- Industrial waste – solvents, resins, metals, plastics, rubber, leather, abrasives, sludge's, etc.
- E waste – Waste like wires, circuits, mobile phones etc.

CLASSIFICATION

- **Source-based classification**
- **Type-based classification**

Source-based classification

- **Residential**: This refers to wastes from dwellings, apartments, etc., and consists of leftover food, vegetable peels, plastic, clothes, ashes, etc.
- **Commercial:** generated from stores, restaurants, markets, hotels, motels, auto-repair shops, medical facilities, etc.
- **Institutional**
- **Municipal**
- **Industrial**
- **Agricultural**



Type-based classification

Garbage:

This refers to animal and vegetable wastes resulting from the handling, sale, storage, preparation, cooking and serving of food. Garbage comprising these wastes contains putrescible (rotting) organic matter, which produces an obnoxious odour and attracts rats and other vermin (which carry disease, e.g. rodents). It, therefore, requires special attention in storage, handling and disposal.

Ashes and residues:

These are substances remaining from the burning of wood, coal, charcoal, coke and other combustible materials for cooking and heating in houses, institutions and small industrial establishments. When produced in large quantities, as in power-generation plants and factories, these are classified as industrial wastes. Ashes consist of fine powdery residue, cinders (a small piece of partly burnt coal or wood that has stopped giving off flames but still has combustible matter in it) and clinker often mixed with small pieces of metal and glass. Since ashes and residues are almost entirely inorganic, they are valuable in landfills.

Combustible and Non-combustible wastes:

These consist of wastes generated from households, institutions, commercial activities, etc., excluding food wastes and other highly putrescible material. Typically, *while combustible material consists of paper, cardboard, textile, rubber, garden trimmings, etc., non-combustible material consists of such items as glass, crockery, tin and aluminium cans, ferrous and non-ferrous material and dirt.*

Bulky wastes:

These include large household appliances such as refrigerators, washing machines, furniture, crates (a slatted wooden case used for transporting goods), vehicle parts, tyres, wood, trees and branches. Since these household wastes cannot be accommodated in normal storage containers, they require a special collection mechanism.

Street wastes:

These refer to wastes that are collected from streets, walkways, alleys, parks and vacant plots, and include paper, cardboard, plastics, dirt, leaves and other vegetable matter. Littering in public places is indeed a widespread and acute problem in many countries including India, and a solid waste management system must address this menace appropriately.

Biodegradable and Non-biodegradable wastes:

Biodegradable wastes mainly refer to substances consisting of organic matter such as leftover food, vegetable and fruit peels, paper, textile, wood, etc., generated from various household and industrial activities. Because of the action of micro-organisms, these wastes are degraded from complex to simpler compounds. Non-biodegradable wastes consist of inorganic and recyclable materials such as plastic, glass, cans, metals

Category	Type of waste	Approximate time taken to degenerate
Biodegradable	Organic waste such as vegetable and fruit peels, leftover foodstuff, etc.	A week or two.
	Paper	10–30 days
	Cotton cloth	2–5 months
	Woollen items	1 year
	Wood	10–15 years
Non-biodegradable	Tin, aluminium, and other metal items such as cans	100–500 years
	Plastic bags	One million years
	Glass bottles	Undetermined

Public health aspects

- Solid waste changes properties of soil, air, and water causing pollution.
- Solid waste produces foul smell, breeds insects and organism.
- Leads to spread of many diseases, infections, etc affecting human and animal population.
- Harmful chemicals are released into the environment.

- ✓ Chemical poisoning through chemical inhalation
- ✓ Uncollected waste can obstruct the storm water runoff resulting in flood
- ✓ Low birth weight
- ✓ Cancer
- ✓ Congenital malformations
- ✓ Neurological disease
- ✓ Nausea and vomiting
- ✓ Increase in hospitalization of diabetic residents living near hazard waste sites.
- ✓ Mercury toxicity from eating fish with high levels of mercury.

Effects of Solid Waste on Animals and Aquatics life

- ✓ Increase in mercury level in fish due to disposal of mercury in the rivers.
- ✓ Plastic found in oceans ingested by birds
- ✓ Resulted in high algal population in rivers and sea.
- ✓ Degrades water and soil quality

DISPOSAL OF WASTES

METHODS OF DISPOSAL

- The methods of waste disposal are:
  - »Dumping
  - »Controlled Tipping or Sanitary Land-fill
  - »Incineration
  - »Composting

DUMPING

- Refuse is dumped in low lying areas.
- As a result of bacterial action, refuse decreases considerably in volume and is converted gradually into humus.

The drawbacks of DUMPING are:-

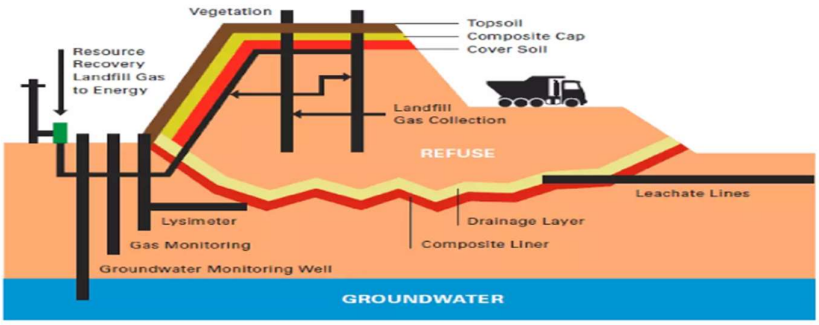
- The refuse is exposed to files and rodents.
- Drainage from dumps contributes to the pollution of surface and ground water.
- A WHO Expert Committee (1967) condemned dumping as " a most insanitary method that creates public health hazards, a nuisance, and severe pollution of the environment".

CONTROLLED TIPPING/ SANITARY LANDFILL

B. LANDFILLING

- A landfill site is a site for the disposal of waste materials by burial and is the oldest form of waste treatment.
- Waste is directly dumped into mining voids or borrow pits. Disposed waste is compacted and covered with soil.
- Gases generated by the decomposing waste materials are often burnt to generate power.
- Landfilling can be done by three methods :

1) Trench method
2) Area method
3) Ramp method

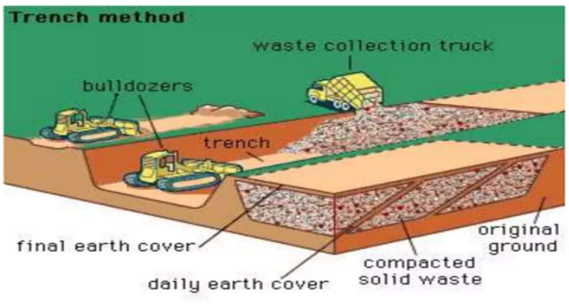


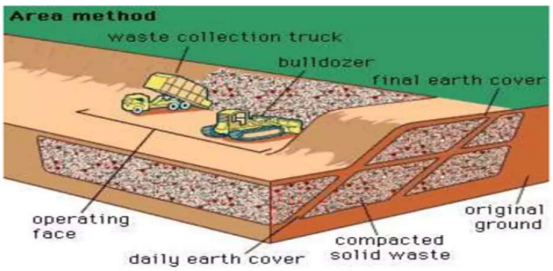
1. TRENCH METHOD

- The trench method consists of an excavated trench into which the solid wastes are spread, compacted and covered.
- The trench method is best suited for nearly level land where the water table is not near the surface.

2. AREA METHOD

- The area method is best suited for flat or gently sloping areas where some land depressions may exist.
- The wastes are spread, compacted and then covered.





3. RAMP METHOD

- It is also know as depression method.
- The slope or ramp is sometimes used in combination with the other two methods. The wastes are spread on an existing slope, compacted and covered.

➢ Advantages :

✓ Landfill site is a cheap waste disposal option.

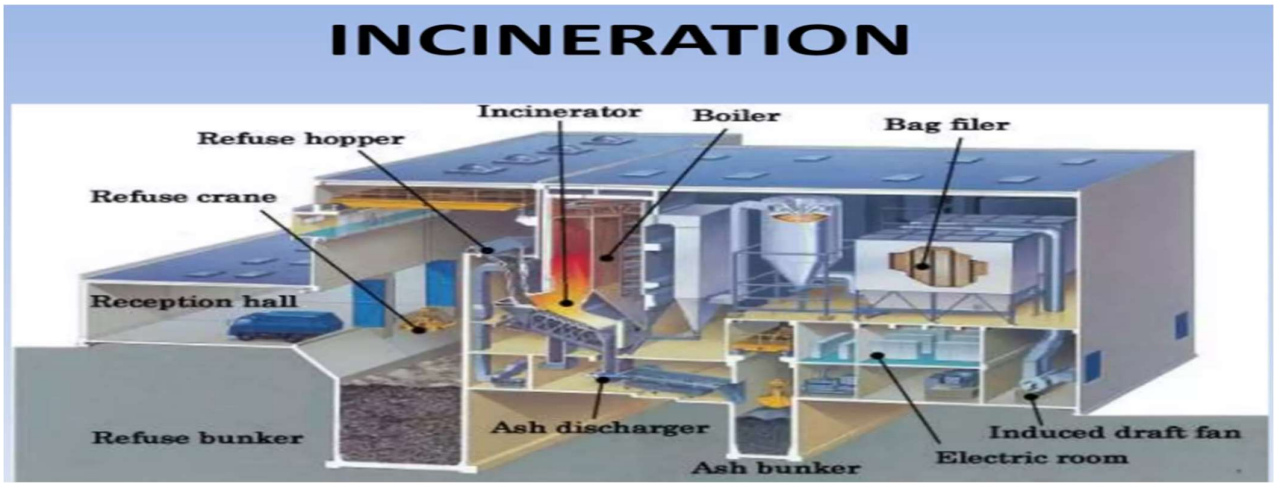
✓ The gases given off by the landfill site could be collected and used for generating power.

✓ Lots of different types of waste can be disposed of by landfill in comparison to other waste disposal method.

➢ Disadvantages :

✓ Landfills can pollute air, water and also the soil.

✓ Landfill can contribute to the global warming.



C. INCINERATION

- Incineration is a waste management technology that involves the combustion of organic materials and/or substances.
- It is carried out at high temperature.
- The waste material is converted into ash, flue gases, particulates and heat.
- Types of incinerators :

i. Moving grate
ii. Fixed grate
iii. Fluidized bed
iv. Rotary kiln

➢ Advantages :

✓ Less space requirement.

✓ Hygienic process.

➢ Disadvantages :

✓ Expensive process.

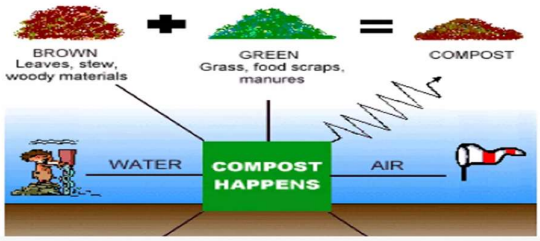
✓ Special care required.

A. COMPOSTING

- It is controlled biological decomposition of organic matter, such as food and yard wastes, into humus.
- Composting is the natural process of 'rotting' or decomposition of organic matter by microorganisms under controlled conditions.
- It can be anaerobic and aerobic.
- This process takes about 4 to 6 weeks.

➢ <u>Benefits of composting :</u>

✓ Provides nutrients to the soil.
✓ Increases beneficial soil organisms.
✓ Protects soil from erosion.
✓ Assists pollution remediation.



- The entire process of composting is complete in 4 to 6 weeks.
- This method of composting is in vogue in some of the developed countries, e.g., Holland, Germany, Switzerland, Israel.
- The Government of India is considering plants in selected cities.
- Cities such as Delhi, Nagpur, Mumbai, Chennai, Pune, Allahabad, Hyderabad, Lucknow, and Kanpur have offered to join the Government for setting up pilot plants for mechanical composting.

RECOVERY AND RECYCLING OF PAPER, GLASS, METALS, AND PLASTIC

RECOVERY

Process to recover useful material from mixed waste.

Material Recovery Facility are specialized plants that receives, separates and prepares recyclable materials for marketing to end-user manufacturers.

Recycling

Used, reused, or reclaimed.

Use of the material as a source raw material, involves physical transformation

- Reused: The direct use or reuse of a secondary material without prior reclamation
- Reclaimed: regeneration of wastes or recovery of usable materials from wastes
- Wastes are regenerated when they are processed to remove contaminants in a way that restores them to their usable condition materials that must be reclaimed/recycled prior to use or reuse .

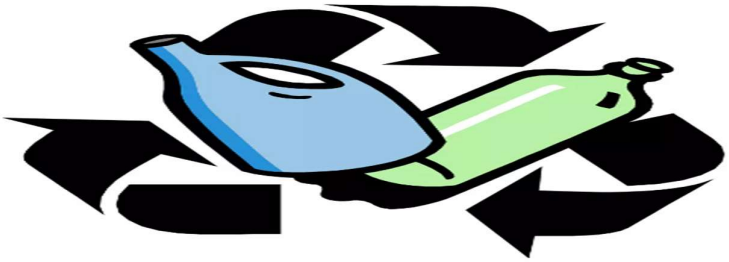
Aluminum

- This is the most recycled material in the U.S. because of economy.
- Making new aluminum cans from used cans takes 95 percent less energy and 20 recycled cans can be made with the energy needed to produce one can using virgin ore.
- Approximately 2/3 of cans are recycled each year, saving 19 million barrels of oil annually.
- Aluminum foils are contaminated hence not accepted.

Paper

- U.S. currently recycles 49% of its paper and paperboard.
- Denmark, recycles about 97% of its paper.
- USA export about 19% of recycled paper.
- In India we produce 14.6 million tonnes of waste paper out of which we recycle only 26%.
- Recycling one short ton paper we save 17 full grow trees, 26 m3 fresh water ,4100 kW-Hour of energy and fuel equivalent to 3 year use of average family.
- Low grade paper is recycled to make containerboard or corrugated containers.
- High grade paper is de-inked and used again as paper pulp.

Recyclable Plastics



1 - PET (Polyethylene terephthalate)

- PET is used to make soft drink bottles, peanut butter jars, etc.
- PET can be recycled into fiberfill for sleeping bags, carpet fibers, rope, and pillows.
- In recycling process it is depolymerized to ethylene glycol & Terephthalic acid which are repolymerised to quality resins.

2 - HDPE (High-density polyethylene)

- HDPE is found in milk jugs, butter tubs, detergent bottles, and motor oil bottles.
- HDPE can be recycled into flowerpots, trashcans, traffic barrier cones, and detergent bottles.

3 - PVC (Polyvinyl chloride)

- PVC is used in shampoo and cooking oil bottles & fast-food service items.
- Recycled products include nonfood containers, shower curtains, truck bed liners, drainage pipes etc.

4 - LDPE (Low-density polyethylene)

- LDPE is found in grocery bags, bread bags, shrink-wrap, and margarine tub tops.
- LDPE can be recycled into new grocery bags.

Glass

- U.S. recycles about 36% of its glass containers.
- It costs less to recycle glass than to make new glass.
- Mixed color glass "cullet" is used for paving glassphalt, a glass/asphalt mixture.
- May be used in building products such as brick, ceramic and terrazzo tiles

SOURCES OF NOISE POLLUTION

Noise Pollution

- Noise pollution refers to undesirable sound.
- Sound which generates horrible discomfort on ear.
- Also known as Environmental noise or Sound pollution.

- Noise
  - Any unwanted sound that do not need or want to hear.
  - It is measured in decibels dB
  - Average noise level is 97.60dB
  - Normal speech has a sound level of approximately 60dB
  - Sound above 120dB can cause discomfort to ears

EFFECTS OF NOISE POLLUTION

- Hearing Problems
- Health Issues
- Sleeping Disorders
- Cardiovascular Disease
- Communication Problems
- Effects On Wildlife

- **Hearing problems**
  - Any unwanted sound that our ear have not been built to filter can cause problems within body
  - Our ears can take a certain range of sound without getting damaged
  - Man made noises such as jackhammers, horns even vehicles can also be too loud for hearing range
- Constant exposure to loud sounds can easily result in the damage of our ear drums and loss of hearing

- **Health Issues**
  - Excessive noise pollution in working areas such as offices, construction sites, bars and even in homes can influence psychological health.
  - Studies show that occurrence of aggressive behavior, disturbance of sleep, constant stress, fatigue and hypertension are linked to excessive noise level
  - Can cause more severe and chronic health issues
- **Communication problems**
  - high decibel noise can put trouble and may not allow people to communicate freely this may lead to misunderstanding
- **Effect On Wildlife**
  - Wildlife faces more problems than humans because they are more dependent on sounds.
  - Animals have a better sense of hearing than us since their survival depends on it.
  - Pets react more aggressively in household where there is constant noise

NOISE POLLUTION CAN BE CONTROLED

- There is no any solution to reduce noise pollution
- On personal level everybody can help reducing noise in their homes by lowering the volume of the radio, music system and television
- Removal of public loudspeakers is another way
- Controlling sound levels in clubs, bars, parties and disco
- Better urbanization can help to reduce noise
- Machines can be placed away from residential areas
- Moving away from noisy areas.

Sources of Noise pollution

- Automobiles
- Factories
- Industries
- Air – crafts
- Use of pressure horns
- Recreational noise of loud speakers with full volume particularly at night.
- Domestic noise – radio, transistors, TV sets
- Noise levels – acute near railways junctions, traffic round – about , but terminals & airports.

Frequency – it is denoted as Hertz Hz. The human hear can hear frequencies from about 20 – 20,000 Hz but this range is reduced with age

Source of noise	Sound Level dB
Whispers	10
Speech 2-3 people	73
Speech on radio	80
Music on radio	85
Children shouting	79
Children crying	80
Vacuum cleaner	76
Piano	86