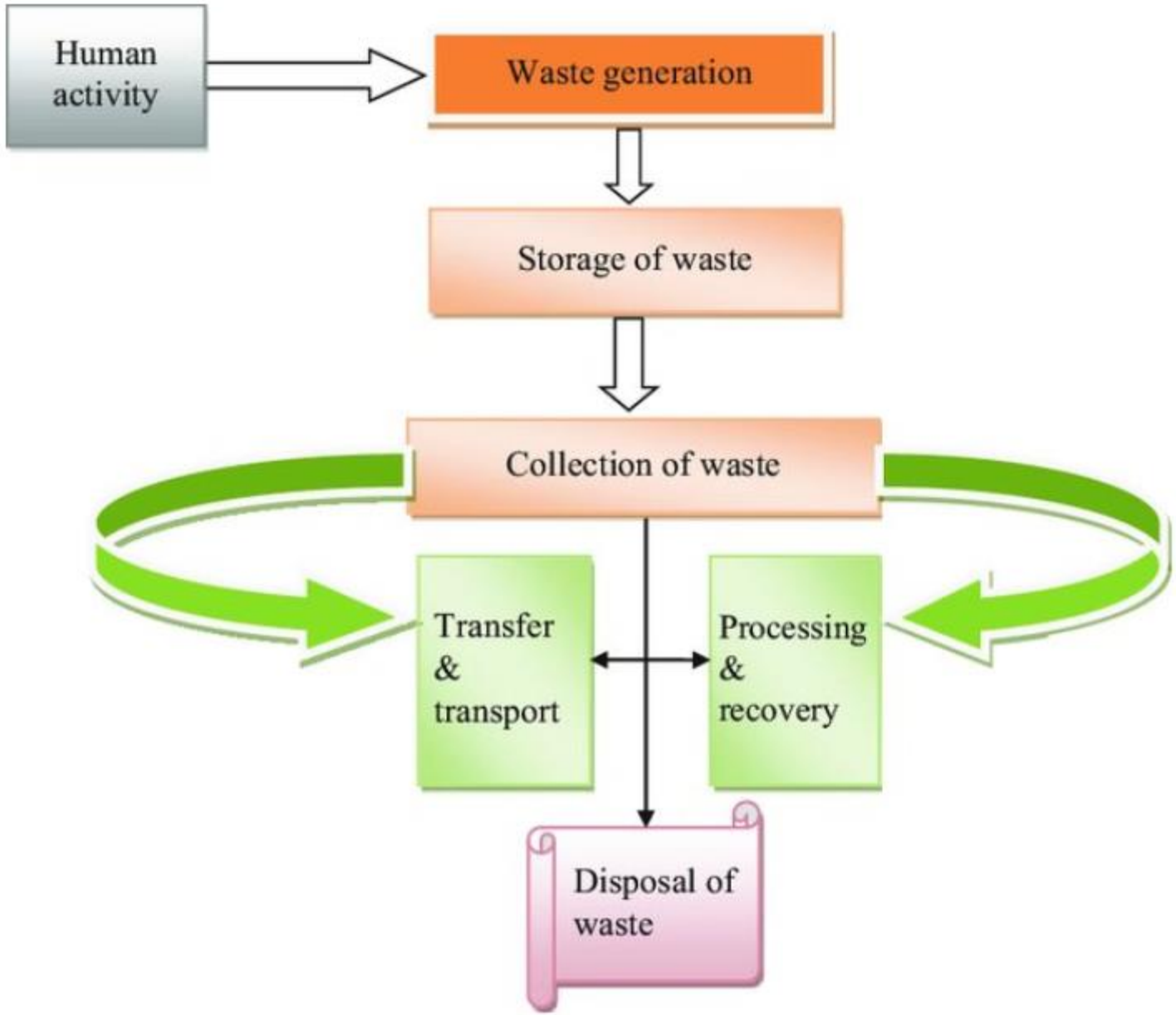
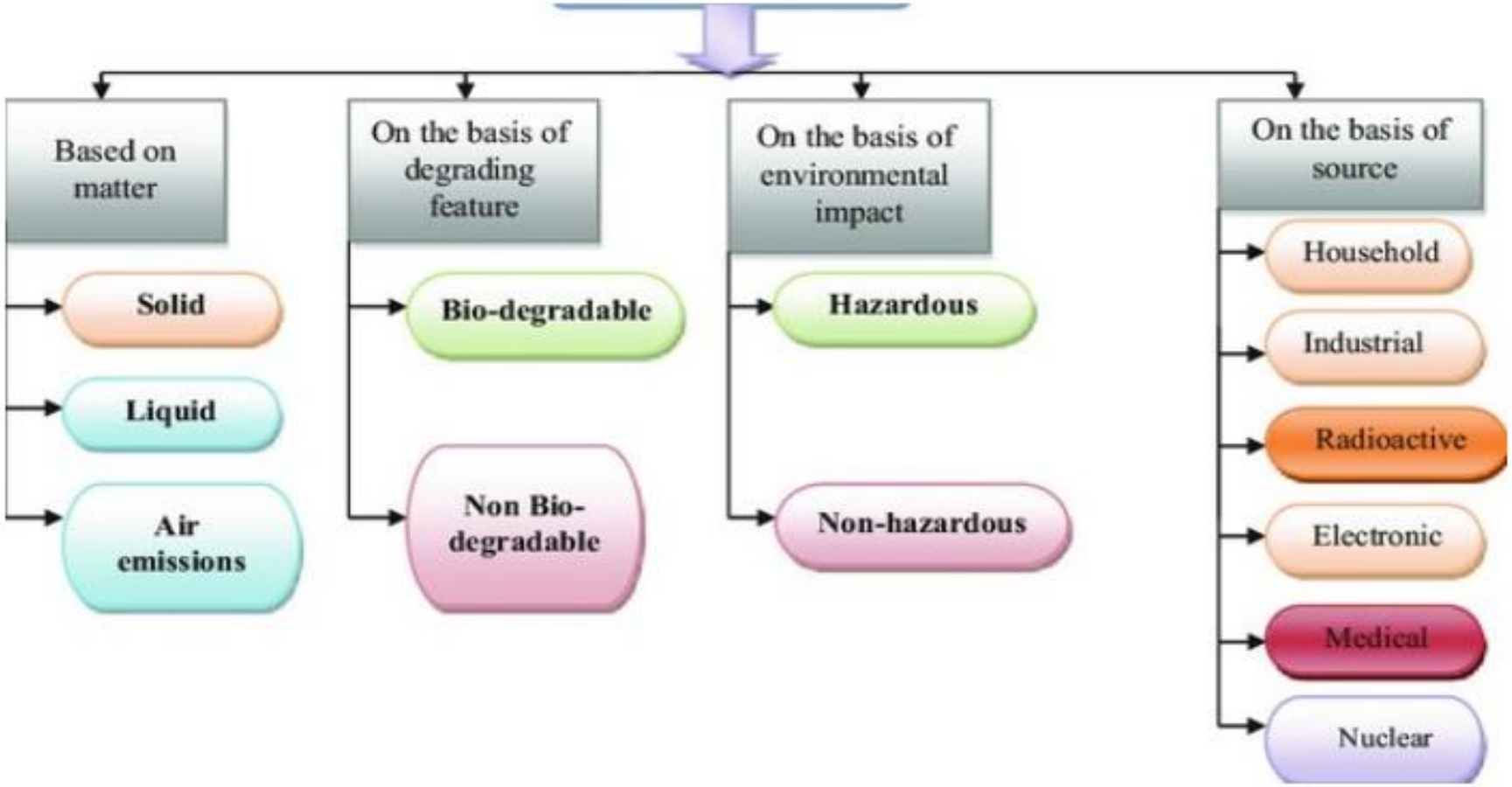
Waste management

- Waste management is all those activities and actions required to manage waste from its generation to its final disposal
- This includes collection, transport, treatment and disposal of waste together with monitoring and regulation
- The ultimate objective of waste management is to achieve sustainable waste practices that balance the needs of human societies with the preservation of environmental quality and the conservation of resources.


Human activity
Waste generation
Storage of waste
Collection of waste
Transfer & transport
Processing & recovery
Disposal of waste

Classification of Waste



A biodegradable substance can be defined as a material which can be decomposed by microorganisms or decomposers and not be adding to any type of pollution.

Example-Paper, Food waste, Human waste, Dead animals and plants, Slaughterhouse waste etc.

A substance that cannot break down or dissolve naturally and causes pollution is referred to as non-biodegradable waste.

Example- Metal, aluminium cans, tires, paint, poisonous chemicals, and plastics

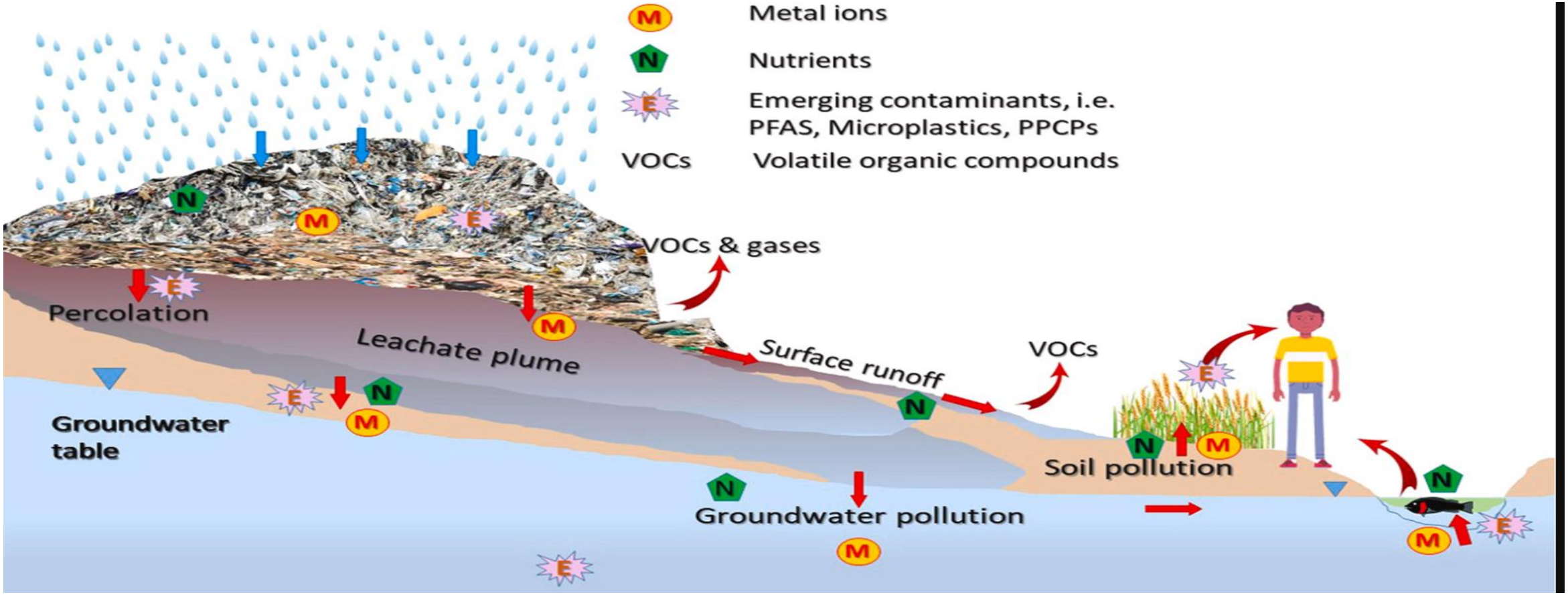
Solid Waste

Solid waste encompasses any material that are discarded, abandoned, or unwanted and are not in liquid nor gas form.

Sources of Solid Waste	**Residential** (community /house)	**Commercial Centre** (Small lot shop, office, shooping complex, etc)	**Institutional** (school, hospital, university, college)	**Industrial** (Factory)	City Centre (Road and drainage)
Type of solid waste	Food waste, clothes,newspapers, papers, bottles, can, furniture waste etc.	Vary type of papers and boxes, food cointaner or food waste, bottles, the empty boxes, can etc.	Garden waste, office waste, papers, furniture waste etc.	Office waste, Processing waste, plastic waste, cafeteria waste etc.	Vary type of garden waste, construction and demolition waste, disaster waste likes flood , public waste etc.

Effects of Improper Solid Waste Management

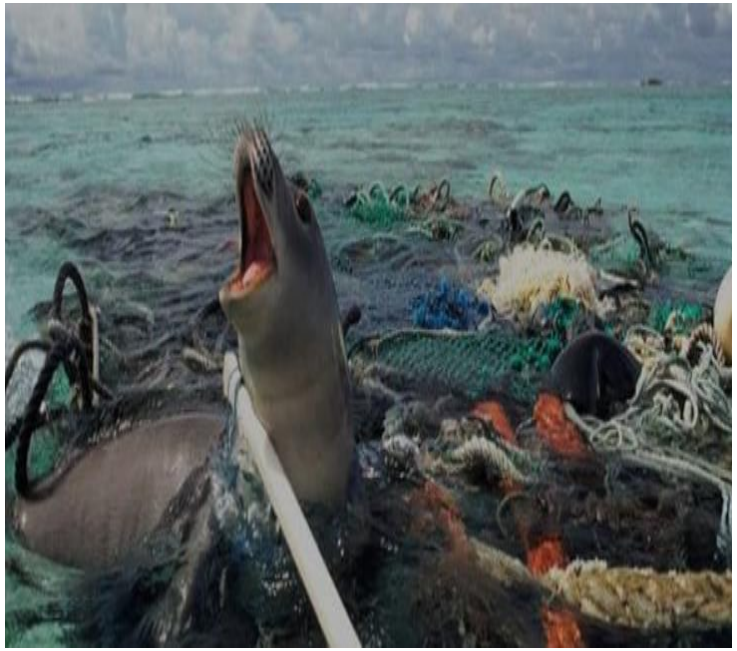
1. Improper dumping of wastes and leachate from landfills contaminates surface and groundwater supplies and the surrounding land resources



2. MSW clogs drains and create breeding place for insects leading to diseases like cholera, dengue etc..



3. Improper waste management harm ecosystem and wildlife habitats



4. Greenhouse gases such as methane and CO2 are generated from decomposition of organic materials in landfills

Landfill gas pollution

5. Litter and improperly managed waste can degrade the aesthetic of urban and rural areas

Bali, Indonesia

Solid Waste Management

The term solid waste management mainly refers to the complete process of collecting, treating and disposing of solid wastes.

1. encourage practices such as source reduction and reuse for minimum waste disposal

Example

- Buy loose products, such as fruits and vegetables, instead of pre-packaged packs.
- Reuse and repair of waste items

2. Sorting and processing waste materials for the recovery of valuable resources

3. Converting waste into energy through incinerator or other thermal processes

Municipal solid waste incinerator

4. Turning organic waste into compost for soil improvement

5. Promoting awareness about responsible waste disposal and the importance of recycling

Awareness Programme on Waste Management

Urban Waste

Urban waste often referred to as municipal solid waste (MSW) or urban solid waste, encompasses the discarded materials generated by residents, businesses, institution, and other entities within urban areas

The management of urban waste is a complex challenge as compare to the rural waste as urban areas produces more waste than rural one due to its high population density. Further a diversity of waste will be generated giving a serious headache to the municipality.

Source of Municipal Solid Waste	Type of Solid Waste
Residential	Food waste, food container and packer, can, bottles, papers and newspaper, clothes, garden waste, e-wastes, furniture waste
Commercial Centre (office lot, small shop, restaurant)	Vary type of papers and boxes, food waste, food container and packer, can, bottles,
Institutional (school, university, college, hospital)	Office waste, food waste, garden waste, furniture waste
Industry (factory)	Office waste, cafeteria waste, processing waste
City Centre (drainage and road)	Vary type of garden waste, construction waste, public waste

Source: Franklin Association (1999)

Needles, medical instrument, and pharmaceutical waste

Effects of Improper Urban Waste Management

1. Improper disposal can lead to air, soil and water pollution, impacting the local ecosystem

Open dumping and burning release harmful gases in the air

Disposal of waste in water leads to contamination of water

Seepage of the waste into the soil in landfills

2. Inadequate waste management can pose health risks

waste can attract and harbour disease-bearing insects and pests, which can lead to the spread of diseases like dengue fever, malaria, West Nile virus, and Zika.

3. Depletion of natural resources

If waste is not recycled, reused, or recovered, it leads to more extraction of natural resources, such as metals, wood, and fossil fuels, which depletes the earth's finite resources and causes environmental degradation.

Deforestation to meet the requirement

4. Improperly managed waste affects the aesthetics of urban areas

Improper waste disposal inside the city

Urban Waste Management

For waste management, we stress on ‘three R’s’

1. **Reduction in use of raw materials which will ultimately lead to less waste production**

Example

- Instead of disposable plates and cups use utensils made of steel, brass, aluminium etc. which can be used again and again.
- Only the necessary items should be purchased from the market. Try to reduce the amount of daily necessities
- Reduced demand of any metallic products will decrease the mining of their metal.

2. **Reuse of waste materials**

Example

- The refillable containers which are discarded after use can be reused
- Making rubber rings from the discarded cycle tubes will reduce the waste generated during manufacturing of rubber bands

3. Recycling of waste materials

Examples

- Old aluminum cans and glass bottles are melted and recast into new cans and bottles
- Preparation of automobiles and construction materials from steel cans
- By recycling waste paper can be turned into new paper products

Recycling of metal cans into different products

For discarding waste the following methods can be adopted

1. Sanitary landfill

In sanitary landfills, garbage is spread out in thin layers, compacted, and covered with clay or plastic foam. Care is taken so that leachate does not contaminate groundwater. Methane produced by anaerobic decomposition is collected and burnt to produce electricity or heat

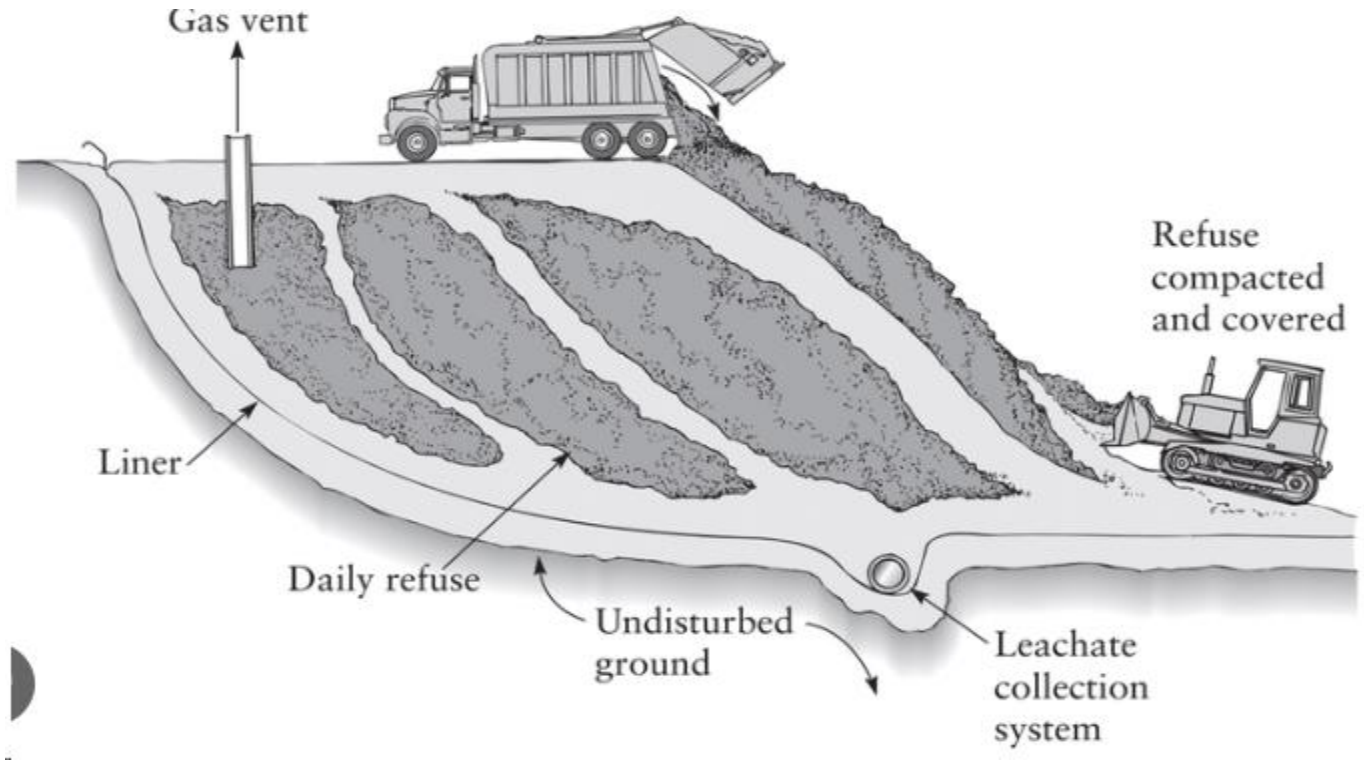


Diagram of a sanitary landfill

2. Composting

The biodegradable waste is allowed to decompose in an oxygen-rich medium. A good quality nutrient rich and environmental friendly manure is formed which improves the soil fertility

3. Incinerator

An incinerator involves the combustion of waste materials at high temperatures. The heat generated can be used for energy recovery

4. Regulations and policies

Enforcing and implementing regulations and policies to guarantee adherence to proper waste management practices

Industrial Waste

Industrial waste refers to the by-product generated during manufacturing, production, mining, or other industrial processes

Types of industrial waste

1.Hazardous Waste: This type of waste poses a significant threat to human health and the environment due to its toxic, reactive, flammable, or corrosive nature. Examples include heavy metals, solvents, pesticides, and certain chemicals used in manufacturing processes.
2.Non-Hazardous Waste: This includes waste that does not pose a significant threat to human health or the environment. Examples include paper, plastic, wood, and metal scraps generated during manufacturing processes.
3.Solid Waste: Solid waste includes any waste that is not liquid or gas. It can be either hazardous or non-hazardous and includes materials such as packaging, scrap metal, and construction debris.
4.Liquid Waste: Liquid waste includes any waste that is in liquid form, such as wastewater from industrial processes. It can contain pollutants and contaminants that require proper treatment before disposal.
5.Gaseous Waste: Gaseous waste includes emissions of gases such as carbon dioxide, sulfur dioxide, and nitrogen oxides from industrial processes. These gases can contribute to air pollution and climate change if not properly controlled.
6.Organic Waste: Organic waste includes biodegradable materials such as food scraps, paper, and yard waste. It can be composted to produce nutrient-rich soil for agriculture.
7.Infectious Waste: This type of waste includes materials contaminated with infectious agents, such as medical waste from hospitals and laboratories. It requires special handling and disposal procedures to prevent the spread of disease.
8.Radioactive Waste: Radioactive waste includes materials contaminated with radioactive substances, such as nuclear power plant waste and certain medical and research waste. It requires special handling and disposal procedures to prevent radiation exposure.

Source of industrial waste

1. **Manufacturing Processes**: Waste generated during the manufacturing of products. This includes scrap materials, off-spec products, and by-products.

2. **Chemical Processes**: Waste generated from chemical reactions, such as unused or expired chemicals, contaminated materials, and chemical spills.

3. **Mining and Extraction**: Waste generated from mining, quarrying, and extraction of minerals and metals. This includes waste rock, tailings, and wastewater from mining operations.

4. **Construction and Demolition**: Waste generated from construction and demolition activities, such as concrete, wood, metal, and other construction debris.

4**. Energy Production**: Waste generated from energy production processes, such as coal ash from coal-fired power plants, and radioactive waste from nuclear power plants.
5. **Food Processing**: Waste generated from food processing industries, such as food scraps, packaging materials, and wastewater.
6. **Textile and Apparel Industry**: Waste generated from textile and apparel manufacturing, such as fabric scraps, dyeing chemicals, and wastewater.
7. **Electronics and Electrical Equipment**: Waste generated from the manufacturing and disposal of electronic and electrical equipment, such as e-waste and electronic components.
8. **Agricultural Activities:** Waste generated from agricultural activities, such as crop residues, animal manure, and pesticide containers.

Effects of Improper Industrial waste management

1. Pollution: Improper disposal of industrial waste can lead to air, water, and soil pollution. This can harm ecosystems, wildlife, and human health. For example, the release of toxic chemicals into water bodies can contaminate drinking water sources and harm aquatic life.

2. Health Risks: Exposure to hazardous industrial waste can lead to serious health problems, including respiratory issues, neurological disorders, and cancer. Workers in industries that handle or dispose of hazardous waste are particularly at risk.

3. Soil Degradation: Improper disposal of industrial waste can lead to soil contamination, reducing soil fertility and affecting agricultural productivity. Contaminated soil can also pose health risks to humans and wildlife.

4. Water Contamination: Industrial waste can contaminate water sources, including rivers, lakes, and groundwater. This can have serious consequences for aquatic ecosystems and can also affect human health through the consumption of contaminated water or fish.

5. Climate Change: Improper disposal of industrial waste, especially greenhouse gas emissions, can contribute to climate change. For example, the burning of waste releases carbon dioxide and other greenhouse gases into the atmosphere, contributing to global warming.

6. Loss of Biodiversity: Pollution from industrial waste can lead to the loss of biodiversity, as it can harm and even kill plants, animals, and microorganisms. This can disrupt ecosystems and reduce their ability to provide important services, such as pollination and nutrient cycling.

Industrial Waste Management

1.Waste Minimization: This involves reducing the amount of waste generated at the source. Companies can achieve this by optimizing production processes, using materials more efficiently, and implementing recycling and reuse programs.
2.Segregation: Waste should be sorted into different categories (e.g., hazardous, non-hazardous) to facilitate proper handling and disposal.
3.Storage: Waste should be stored safely and securely to prevent leakage, spills, or contamination of the surrounding environment.
4.Treatment: Depending on the type of waste, treatment processes such as chemical, physical, or biological treatment may be necessary to reduce its hazardous properties or volume.
5.Transportation: Waste should be transported using appropriate vehicles and methods to prevent spills and ensure compliance with regulations.
6.Disposal: The final disposal of industrial waste should be carried out in accordance with regulations and best practices. This may involve landfilling, incineration, or other methods.
7.Monitoring and Reporting: Regular monitoring of waste management activities and reporting to regulatory authorities are important to ensure compliance with regulations and identify areas for improvement.