

## UNIT II

### SITE SELECTION AND SAFE DISPOSAL OF WASTE

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## **2.1 Safe disposal of waste**

### **2.1.1 What is Waste Disposal?**

**Waste disposal** means removing, discarding, recycling or destroying unwanted materials called waste that is produced from agriculture, domestic usage or industrial products. Following the correct methods for waste disposal will ensure lesser pollution and hazards for the environment. Proper waste management is necessary with steps involving the proper collection of waste and scientific treatments that may contribute less to water pollution, soil pollution and air pollution.

**Waste management** is an important term associated with waste disposal and both go hand in hand for maintaining a clean environment. Thus, the waste disposal definition should also include a waste management system. The 7 R's associated with waste management are Refuse, Repurpose, Reduce, Reuse, Rot, Recycle and Rethink.

### **2.1.2 Methods of Waste Disposal**

The various methods of waste disposal known are as follows:

1. Landfill
2. Incineration
3. Biogas Generation
4. Composting
5. Waste compaction
6. Vermicomposting

#### **Landfill**

In this process, the waste type involves non-reusable and non-recyclable substances which are spread in a thin layer in specific low-lying lands or areas. These areas are dug deep where waste is disposed inside then a layer of soil will be used to cover it back. These areas are declared unfit for activities like construction of buildings for the next 20 years. That site can be made use for building parks or playgrounds in the near future. It is one of the hugely adopted methods of waste disposal in a bulk manner.

#### **Incineration**

Incineration is the treatment of waste or waste disposal by the means of burning where the garbage turns into the incombustible matter like gases and ashes. Incinerators are believed to be environmentally very dangerous as the resultants are heavy metals, which are placed in landfills ultimately making air, water, and soil polluted. However, there are numerous benefits associated with this process including decreased waste quantity, production of power and heat, pollution reduction, no transportation of waste required, control over noise and odor, and elimination of chemical and harmful germs.

### **Generation of Biogas**

Food items, animal waste, municipal waste, vegetable/fruit peels and organic industrial wastes are biodegradable waste which means these can be decomposed by bacteria or other organisms. Using these wastes, biogas is produced at small as well as a large scale where bacteria, fungi, and other microbes easily degrade the substances. The organic biodegradable matter that is broken down or has to be decomposed serves as food for microorganisms. The biogas production process can happen anaerobically i.e. without oxygen as well as aerobically i.e. with oxygen. The outcome is biogas which is used as a fuel and the remains are used as manure in fields or plantations. Biogas is a mixture of gases, primarily methane and carbon dioxide. This kind of waste disposal method is beneficial as the wastes are utilized in production of something useful.

### **Waste Compaction**

Waste compaction involves a proper technique that includes shredding the waste into smaller pieces, pushing to mix properly and placing it in such a way to fill voids. Waste compaction results in reducing the amount and size of waste that ultimately results in less pollution of the environment. Recycling is also one of the best methods to reduce waste and it can be performed for cans, plastic bottles, cardboards, paper, metal, textiles, electronics, batteries, tires, etc. Reusing these kinds of wastes is possible through recycling.

### **Composting**

Composting is one of the waste disposal methods that begin from our kitchen. It

deals with all organic materials including food scraps, garden waste, fruits and vegetable peels. When these substances are buried and left under the soil for some days, those decay under the action of bacteria, fungi and other microorganisms. As a result, decomposition takes place and a humus-like substance called compost is formed. It is highly beneficial to be used as manure or fertilizer as it is nutrient-rich that can replenish the soil to grow crops or plants. It's also known to enhance the water retention capacity of the soil and is the best alternative to harmful chemical fertilizers.

### **Vermicomposting**

Also known as vermiculture, vermicomposting is one of the waste disposal methods and it is performed by the decomposition process using white worms, red wigglers, earthworms and other worms to break the organic matter like vegetable or food waste. Vermicast is the end product generated as a result of breakdown of organic waste by earthworms. Vermicompost or vermicast is highly water-soluble that acts as an excellent source of nutrients and thus used as fertilizer. It is often mixed with soil in a standard ratio or added as a liquid fertilizer.

### **2.1.3 Site selection for landfills**

#### **Criteria for Selection of Land Fill Site for Solid Waste Disposal**

##### **Proximity to population centers:**

Landfills should be located away from densely populated areas to minimize potential health risks associated with odors, air pollution, and water contamination.

##### **Geological and hydro-geological conditions:**

The site should be geologically stable and free from seismic activity, flood-prone areas, and areas with high water tables to prevent contamination of groundwater.

##### **Soil quality:**

The soil at the site should be suitable for waste disposal, with low permeability to minimize the migration of contaminants into the surrounding environment.

##### **Adequate land availability:**

Sufficient land area is required to accommodate waste disposal needs for an

extended period, taking into account projected population growth and waste generation rates.

**Accessibility and transportation infrastructure:**

The site should have convenient access to transportation routes, including roads, railways, and waterways, to facilitate waste transportation.

**Environmental and ecological considerations:**

Potential impacts on sensitive ecosystems, habitats, endangered species, wetlands, or protected areas should be assessed and minimized.

**Air quality considerations:**

Landfills should be situated away from areas with poor air quality to prevent additional pollution and minimize odors.

**Noise and visual impact:**

The site should be located away from residential areas and scenic landscapes to minimize noise pollution and visual blight.

**Buffer zones:**

Adequate buffer zones should be established to separate the landfill site from neighboring communities, water bodies, and environmentally sensitive areas.

**Land-use compatibility:**

Consideration should be given to existing and future land uses, such as agricultural, industrial, or residential areas, to minimize conflicts and potential land-use restrictions.

**Regulatory compliance:**

Compliance with local, regional, and national regulations, permits, and zoning requirements is crucial to ensure legal and environmentally sound waste disposal practices.

**Community engagement:**

Stakeholder involvement and public participation should be considered to address concerns, ensure transparency, and foster community acceptance.

## **Points to Consider in Selection of Solid Waste Landfill Site Location**

Other important points to consider in the selection of Landfill site location are as follows:

- Land area and volume should be sufficient enough to provide landfill capacity so that the projected need can be fulfilled for several years. In this way, the cost coming on all that procedure can be justified.
- The landfill site should not be at locations where suitable buffer zones between the landfill site and the population are not available.
- The landfill area having a steep gradient (where the stability of the slope could be problematic) should not be selected.
- The water level in the ground water table should be sufficient below the base of any excavation to enable landfill development.
- The land is significant environmentally (lands of biodiversity); the sensitive ecological area of such land should be present within the potential area of the landfill site.
- Public & private irrigation water supply wells should be well away from the boundaries of the landfill site because these supply wells will be at risk of contamination.
- Landfill areas should not be very close to significant water bodies (water courses or dams). There will be the risk of contamination of water bodies, which can be hazardous for aquatic life.
- No major power transmission or other infrastructure like sewers, or water supply lines should be crossing through landfill developmental areas.
- No residential development should be near the boundaries of a landfill site. The waste disposal site must be very away from residential or commercial areas and water resources.
- Groundwater quality should not be disturbed during the site developmental phase. There should be monitoring facilities at the site in order to ensure that groundwater quality is maintained.

- In areas under the laws of the concerned municipality, it should be the responsibility of the municipality to identify landfill sites and handover to operators for operations.
- The selection of landfill sites should be based on the examination of environmental issues.
- The landfill site should be near the waste recycling facility otherwise; the waste recycling facility should be planned as an integral part of the landfill site.

