

## **PUC 1st year - Semester – II**

### **Unit VII: Environmental issues: Causes, effects and control measures**

#### **Module No 40. Solid Waste Management**

#### **INTRODUCTION**

Addition of numerous kinds of solid wastes in the soil is called landscape pollution or third pollution. In India, Urban waste is growing at a phenomenal rate. Solid waste management is a planned system of effective control of the production, storage, collection, transportation, processing and disposal or utilization of solid wastes in a sanitary, aesthetically acceptable and economical manner. It requires mechanical, operational and management skills, all of which are not available in India.

##### **1. Causes**

The solid waste includes glass containers as bottles, crockeries, plastic containers, polythene and other packing materials that are used and then thrown away as garbage. Besides these there are also other used things like automobile spares, machines, and cycle parts etc. that are thrown as junk. The waste from building material (during construction and demolition), sludge, dead animals skeletons, heaps of crop residues also contribute to solid waste. All the urban solid wastes are commonly referred to as refuse. Solid waste and refuse, particularly in urban areas contribute to soil pollution.

## **CHARACTERISTICS OF REFUSE**

### **1. Garbage**

It consists of wastes resulting from the growing, handling, penetrating, cooking and consumption of food.

### **2. Rubbish**

It consists of both combustible and noncombustible substances such as metallic cans, paper, brushes, glasses, cardboard, wood scrap metals, and crockery. Plastics, fibers, rubbers, street sweepings, fuel residues, leaves, containers, abandoned vehicles and other discarded manufactured products.

### **3. Ashes**

Ashes result from the combustion of fuels like coal, wood or dung, used in houses or industries.

### **4. Dead animals**

Dead animals such as cows, horses, donkeys, pigs and dogs must be removed as easily as possible and finally disposed of by incineration.

### **5. Hospital Waste**

Hospitals generate hazardous waste that contains disinfectants and other harmful chemicals, and also pathogenic micro-organisms.

### **6. E-Wastes**

Discarded computer parts like monitor, keyboard, mouse, central processing units and other electronic goods are known as electronic waste (e-waste).

### A. Effects

In India several million tonnes of solid waste is dumped along high ways and other places. which spread several chronic diseases posing a serious threat to human health.

1. Urban domestic wastes though disposed off separately from the industrial waste, can still be dangerous. This is so because they cannot be easily degraded. Over population and increasing consumption have totally changed the very complexion of domestic wastes into complex mixture of food remains, paper, plastic and many notorious chemicals, other items like paints and varnishes which we use to add colour and glass to everyday life also add poison to the urban wastes posing soil pollution problems.
2. The waste including building materials, sludge, dead animal skeletons and thrown away garbage pile up at public places and cause obstruction in daily life.
3. Sewage is an excellent medium for the growth of pathogenic bacteria, viruses, and protozoa.
4. Solid wastes result in offensive odour and cause clogging of ground water filters. Suspended matter in sewage can blanket the soil, there by interfering with the soil moisture.
5. Industrial wastes consist of a variety of chemicals which are extremely toxic to living beings. Industries manufacturing paper, textile, steel, fertilizers, pesticides etc release metallic wastes, oils, greases, solvents, plastics, heavy metals, plasticizers, suspended solids etc. consequently these toxicants are

transferred to different organisms in their food chain causing a number of undesirable effects.

6. We have started packaging even our daily life use products like milk and water in polybags in cities, fruits and vegetables can be brought packed in beautiful polystyrene and plastic packaging – we pay so much and what do we do? Contribute heavily to environmental pollution.
7. E-wastes: Where metals like copper, iron, silicon, nickel and gold are recovered specifically built facilities for recycling of e-waste, recycling in developing countries often involves manual participation thus exposing workers to toxic substances present in e-wastes.

### **Management of solid wastes**

It involves following steps

1. Collection of municipal wastes
2. Applying scientific methods for the disposal of solid wastes
3. Sorting of waste materials
4. Dumping of non-combustible and harmless substances into dump sites
5. Composting organic substances which are biologically degradable
6. Burning of combustible substances in specially designed incinerators such as Multiple Hearth Furnaces (MHF) and Fluidized Bed Furnaces (FBF). Pyrolysis is the best way to treat solid wastes.

### **B. Control measures of urban and industrial wastes**

Disposal of solid waste is not an easy joke or cake walk, since the economy involved is quite expensive. To make the disposal of wastes more economical, recycling and reuse of material is essential.

### **Methods of safe disposal of solid wastes**

1. **Segregation:-** It involves separation of different types of waste materials e.g. biodegradable (e.g. refuse) from non-biodegradable wastes (e.g. scrap metal, glass, plastic, etc.) **for their separate reprocessing for reuse.**

Segregation can be done in **two ways**:

- (i) **On-site segregation** at the point of generation of wastes with the cooperation of the waste producer (e.g., houses, industries, commercial establishments, hospitals, etc).
- (ii) **Central processing facility.** It involves separation of different kinds of wastes by screening, air classifying and magnetic separators.

Biodegradable solid wastes are disposed by composting while non-biodegradable solid wastes are disposed by incineration, land filling, pyrolysis etc.

### **2. Dumping:**

In this, solid wastes are dumped into low lying areas and is also called **land filling**. The refuse is dumped in layers of about 1.5 metre and each layer is covered by good earth of about 20 cm thickness. Each layer is compacted by trucks to allow its settlement and then insecticides like DDT are sprayed on the top of each layer to prevent breeding of mosquitoes and flies. The refuse gets stabilised generally within a period of 2 to 12 months during which organic matter of the refuse undergoes decomposition under

anaerobic conditions into stable compounds. Such landfills can be used for developing parks or other recreational sites. So dumping is **simple and economical method to manage the urban solid wastes and reclaim the low-lying areas for better use.**

### 3. Composting:

In this, the **putrescible organic matter of solid wastes is digested anaerobically or aerobically by microbial action and converted into humus** and stable mineral compounds. Although aerobic composting is more attractive but it has drawback that most of the commercial plants have unacceptable odour. But is of much use that if its products are used as manures in soil then crop yield is improved and there is reduced need of fertilizers and pesticides. **Anaerobic composting** is more advantageous due to:

- No need of aeration
- Produces biogas (55% methane + 45% CO<sub>2</sub>) which can be used for heating or electric power generation.

Wastes also become free from most of the pathogenic organisms. This method is best suited to Indian conditions since it solves three problems simultaneously:

- (i) Disposal of solid wastes
- (ii) Disposal of night soil in the absence of proper sanitation.
- (iii) Production of valuable manure for crops.

### 4. Incineration:

It involves the **aerobic burning of the combustible constituents of solid wastes like garbage, rubbish and dead animals in the properly-constructed hearth of furnaces at high temperature ( $> 670^{\circ}\text{C}$ )**. It reduces the volume of waste by 20 to 30% of original volume and makes the product stable. The final products are ashes and clinkers out of which clinkers can be used as aggregate for low grade concrete. It can also be used **to generate steam power**. **Thermal incinerator** or **after burner** is the instrument used for **thermal combustion** of low amount of combustible gaseous pollutants. This is also the ideal method for medical waste management as eliminates the infectious organisms.

But incineration technique also has **certain drawbacks**:

- Incinerator ash is toxic and contains toxic chemicals like **Dioxin** (a chlorinated compound and adversely affecting humans and animals even in low doses) and **mercury** (damages the Kidneys and brain).
- Its leachate can **pollute ground water**.

## 5. Pyrolysis:

It involves **anaerobic destructive distillation of the combustible constituents of the solid wastes at high temperature ( $650^{\circ}$  to  $1000^{\circ}\text{C}$ )** in a pyrolysis chamber so as to recover the chemical constituents and chemical energy of organic wastes.

**E-waste:** e-waste are buried in landfills or incinerated. Over half of the e-waste generated in the developed world is exported to developing countries, mainly to China, India and Pakistan.

Where metals like copper, iron, silicon, nickel and gold are recovered specifically built facilities for recycling of e-waste, recycling in developing countries often involves manual participation thus exposing workers to toxic substances present in e-wastes.

## **Recycling**

1. Recycling of paper waste can be converted into useful products.
2. Glass is a perfect recyclable product that can be used in variety of ways
3. Recycling of metals from metallic wastes, disposed metallic cans, metallic scraps and wrecked automobiles is quite profitable and can be utilized in many other ways.

## **Check points**

- Solid waste management is a planned system of effective control of the production, storage, collection, transportation, processing and disposal or utilization of solid wastes.
- The solid waste includes glass containers as bottles, crockeries, plastic containers, polythene and other packing materials
- Garbage consists of wastes resulting from the growing, handling, penetrating, cooking and consumption of food.
- Hospitals generate hazardous waste that contains disinfectants and other harmful chemicals, and also pathogenic micro-organisms.
- Solid wastes result in offensive odour and cause clogging of ground water filters



- We can control solid waste pollution by Recycling, Burning of waste and utilizing heat to warm residential units, generation of electricity, Composting of organic waste for preparation of manures and biogas.
- The disposal of refuse can be done by Dumping into sea, by sanitary land filling and by Incineration, Composting, Pyrolysis etc.
- E-waste includes copper, iron, silicon, nickel and gold.
- Composed refuse is an excellent organic additive for agricultural soils.

### **Short answer questions**

1. What is solid waste management
2. What are solid waste
3. Write the characteristics of refuse
4. What are the effects of solid waste
5. Write the Control measures of urban and industrial wastes
6. Write short note on e-waste
7. Write different methods of disposal of refuse

### **Long answer questions**

1. Discuss the in detail the solid waste management.

**MCQ**

1. The urban solid waste are known as
  - a. **Refuse**
  - b. Garbage
  - c. Silt
  - d. None
2. Solid waste management is a planned system of effective control of
  - A. Production
  - B. Storage and collection
  - C. Transportation
  - D. All**
3. The solid waste includes
  - A. glass containers as bottles
  - B. crokeries
  - C. plastic containers and polythene
  - D. all**
4. Garbage consists of wastes resulting from
  - A. the growing food and handling the food,
  - B. cooking the food
  - C. consumption of food
  - D. all**
5. which of the following are the refuse
  - A. garbage
  - B. rubbish
  - C. ashes

**D. all**

6. Which of the following is e-waste

**A. copper**

B. garbage

C. paper

D. paint

7. One of the following is biodegradable waste material

**A. Refuse**

B. scrap metal

C. glass

D. plastic