# Chapter-13
# Waste and its Management

In the twenty first century, today we are proud of our scientific and industrial progress, because of this we are provided with many pleasures. Due to this progress the quality of life has improved on one hand, the problem of environmental degradation is born as a result. Because of this the whole world is worried today. One of the many dimensions of environmental degradation is the growth of waste materials and their adverse effects on environment and human health. Due to industrialization, urbanization and rapid population growth, the amount of waste is increasing continuously and the quality level is coming down as there are no proper disposal mechanism. Hence proper analysis and diagnosis of this problem is necessary.

## 13.1 Waste

The waste materials or products that are formed at the end of any process are called waste or it refers to those substances which are thrown away after use as useless items. On one hand it includes the materials used by human beings such as paper, cloth, plastic, glass, rubber etc. and on the other hand, there are liquid and solid waste disseminated from the industries. Apart from this the debris of mines and the dumping of agricultural waste etc. in open causes the environmental pollution as well as land pollution. This problem is more in cities than villages, because of the concentration of population and centralization of industries, the quantity of waste products are increasing regularly. In the developed country like the United States the amount of urban waste is 4.34 crore tons per year. In country like India, where there are no provisions for waste disposal, its quantity is multiplied.

## 13.2 Types of waste

Depending on its nature the waste can be classified as solid, liquid and gaseous waste, but the waste is classified into two classes based on decomposition- Bio-degradable and Non-bio degradable waste.

**1. Biodegradable waste**

Those waste materials that are decomposed by biological agents are called as biodegradable waste, such as, domestic organic waste, agricultural waste, bio-medical waste like cotton bran, blood, flesh pieces etc.

**2. Non-biodegradable waste**

Those waste materials that are not decomposed by biological agents are called as non-bio degradable waste, such as, plastic bottles, polythene, glass, syringe, metal pieces etc.

## 13.3 Sources of waste

Waste in the environment is discharged by various sources such as, domestic sources, municipal, industries and mining operations, agriculture and medical sectors.

**1. Household source**

Dirt is released every day after cleaning the houses, which include dust, paper, cardboard, clothes, plastic, wood, metal pieces, vegetables and fruits peels, rotten products, dried fruits leaves etc.

**Fig. 13.1 Household waste**

**Table 13.1 Industrial Waste**

| S. No. | Type of Industry | Waste | Symptoms |
|---|---|---|---|
| 1. | Pharmaceutical manufacturing industry | Microorganisms organic chemicals | Suspended and dissolved organic matter |
| 2. | Textile industry | Fibres and waste fabric | Alkaline and suspended substances |
| 3. | Chemical industry | Raw material, intermediate and end products | Poisonous, acidic, Alkaline inflammable (depending on the nature of industry) |
| 4. | Petroleum industry | Research chemicals | Oily and acidic |
| 5. | Fertilizer industry | Solid waste | Calcium and calcium sulphate |
| 6. | Thermal power plant | Flying ash. | Silicate, iron oxide, semi burnt carbon |
| 7. | Rubber industry | Rubber | High chloride, rubber powder |

Their quantity increases in occasional celebrations and parties. All these products are thrown out of the houses on roads or dumpedat fixed places. Their rotting creates many pathogens that causes pollution and also spread diseases.

**Municipal Source**

This means the total garbage and dirt collected from the city. In addition to domestic household wastes it includes faeces, urine, waste collected from markets, roads and from different institutions, materials thrown from dismantling of houses and products thrown from workshops. In fact the entire dirt of the town is included in it. Its volume is dependent on the population of the town and its expansion. According to an estimate, approximately 5000 tons of municipal waste per day is collected from 45 major cities of India.

**Fig. 13.2 Municipal waste**

**3. Industrial and mining waste**

Large amount of waste of used products are thrown in huge quantities from industries. It includes pieces of metals, chemical substances, many poisonous inflammable substances, oily substances, acidic and alkaline substances, bio degradable substances, ashes etc. All these substances harm the environment. Some waste from different industries are shown in table 13.1

Likewise the huge piles of waste substances from the mines in the mining sector cause environmental pollution.

**Fig. 13.3 Industrial waste**

**4. Agriculture**

After agriculture activities clusters of pasture, grass-straw, leaves, stalk etc are collected at one place or spread out. These agricultural waste start rotting with rain water and due to biological activity of decomposers becomes the cause of pollution.

**Fig. 13.4 Agricultural waste**

**5. Medical Sector**

Waste like glass, plastic bottles, tubes, syringes etc from the hospitals are non-biodegradable waste. Apart from this biodegradable waste such as blood, flesh pieces, infected tissues and organs provide the medium for infection of many diseases.

**Fig.13.5 Containers for collection of medical waste**

In the cities of India, 90 percent garbage is in the form of ash, mixed matter and different forms of carbon. In developed countries its nature varies, such as in United States of America, the waste constitutes 42 percent paper and cardboard items, 24 percent metallic matter and 12 percent food ingredients. It is clear that urban waste today is a major cause of environmental degradation, which is gradually increasing.

## 13.4 Losses due to Waste

Waste materials harm human beings as well as plants, animals and environment. Irregularly thrown garbage affects the natural beauty of any place. Biodegradable waste attracts many harmful micro-organisms and insects, which increases the likelihood of the spread of many infectious diseases. These waste emits bad odour on decomposition, thereby affecting the environment. During the decomposition process of these waste substances, harmful green house gases like methane, carbon dioxide etc. are emitted that pollute the environment.

Waste like contaminated cotton, bandages, blood, syringe, I V set, tube, glass and plastic bottles, which comes out of the hospitals is biomedical waste. The claim for the disposal of these wastes is greatly appreciated but proper arrangements are not there. In small private hospitals, clinics and in villages there are no arrangements for disposal of biomedical waste. Biomedical waste spread in and around like litter pile is dangerous in many ways. Hepatitis-B, tetanus, infection related diseases, AIDS due to infected needle, smoke emitted by burning of these waste, lead to many types of diseases. While exposed for long period of time in air, soil and water the artificial non-bio degradable waste like plastics starts to produce harmful toxic substances. Plastic is a petroleum based product. Its harmful toxic substance reaches the source of water, which increases the chance of having many types of diseases. Polythene waste is also proven to be fatal for humans, animals and birds. Various kinds of diseases are spreading in people, the fertility of the soil is decreasing and underground water sources are getting contaminated. Excessive exposure to plastic increases the amount of phthalates in blood due to that the growth of the foetus of pregnant women stops and reproductive organs are damaged. The chemical bisphenol which is used in plastic products causes diabetes and unbalances the liver enzymes.

The flow of water is blocked by throwing the polythene bags in the drains outside the houses, whereby many types of pathogenic microorganisms and their carrier insects flourish. The polythene bags that are thrown in the waste are several times eaten by animals, which gets trapped in their stomach and intestine that leads to the death of animals. Similarly burning of polythene waste emits toxic gases like carbon dioxide, carbon mono oxide and dioxines. It increases the risk of diseases related to respiratory tract, skin, eyes etc.

In the cities where waste materials are collected, poor people start living there. They are slum areas. People living here live a hellish life with poor hygine and sanitary conditions. These colonies are a blame on our urban development. There are many dirty settlements or slums in Delhi, Mumbai, Kolkata, Chennai and the capitals of the states and they are expanding. These slum settlements are expanding in many cities of Rajasthan like Jaipur, Jodhpur, Kota, Bikaner, Udaipur, Bhilwara, Shri Ganganagar, Alwar, Bharatpur etc. Also due to the limited resources and apathy of municipalities, today in all the cities the waste materials are spreading into the residential areas, which is a matter of extreme concern.

## 13.5 Waste management

Waste is not just n India problem but a global problem. Inadvertence towards garbage management has been taken seriously today and concerns have been raised at national and international levels about the side effects on the environment. There are total of 5161 cities in India, 35 of them get metropolitan status. In addition to 393 first class and 401 second class cities there are also small towns with 20000 to 50000 population. In India about one Lakh tones of waste are produced daily from these cities. The average amount of litter in small town is 0.1 Kg per person whereas 0.4-0.6 kg average garbage comes out in big cities. This garbage plays an important role in spoiling the beauty of the cities in India. The middle class villagers being attracted towards the urban culture are increasing the population of the cities. So these new cities are naturally careless towards waste management. Waste management is difficult in small towns due to the shortage or unavailability of funds, lack of contractors. It is easier to develop the cheaper and necessary management of waste by the people in the form of organic manure, vermi compost by using the litter of their own areas. Because of the unavailability of manure and increased side effects of chemical fertilizers, it will be more natural and beneficial to depend on organic manure. Management of litter is possible only with personal interest. It is not only a social duty but also the determinant biological duty of a human being for interdependence of life and environment.

Waste management is collection, transportation and disposal of garbage, sewage and other waste products. Waste management consists of solid, liquid, gas and radioactive substance. Different methods and expertise are used for each substance. Methods of waste management is different for developing and developed countries, villages and cities, residential and industrial producers. The aggregation and expansion of wastes is a serious problem in big cities today and will be in small towns tomorrow. Development is a natural process that cannot be stopped. It is necessary to give it a proper direction so that the imagination of waste free development can be done with the help of government machinery, NGO's and citizens.

In 1975 the Government of India constituted the Shivaraman committee for this work, which suggested the establishment of large dustbins, proper disposal of human excretory waste, proper arrangement of the waste collection in the cities, burning the piles of litter etc. Following methods are used for the control and management of wastes-

### 13.5.1 Methods of waste management

Waste management is different for different reasons, including the types of waste material, use of surrounding land and available area.

**1. Landfill -**

In this process waste is managed in this way- Landfills are often made in non-use mines, mining pits etc. This is a very clean and relatively low cost method of waste disposal and in most countries it is a common practice. But old and wrong method of landfill can have reverse effects on the environment like, waste flies with the air, attracts insects, produce liquid, etc. Apart from this, the decomposition of organic waste produces methane gas, which is a green house gas,

that produce bad odour and can destroy the vegetation. Waste is executed in a planned manner in modern landfill. Pits are filled with soil and landfills gas system can be established for collecting the landfill gas. Electricity can be produced by collecting this gas.

**Fig. 13.6 Landfill**

**2. Incineration**

In this method of execution of the waste, materials are burned at high temperature by which waste are converted into heat, gas, steam and ash.

**Fig. 13.7 Incineration reactor**

Incineration is performed on both scale. It is used by individuals on small scale, industries use it on large scale for the execution of liquid, solid and gaseous waste. It is recognized as a practical method for the execution of biological therapeutic waste. But because of emission of gaseous pollutants, incineration waste execution is a controversial method. Incineration is more prevalent in countries like Japan because it requires a small piece of land. It does not require large areas like land fill.

**3. Recycling methods**

Conversion of waste into new material is known as recycling, by which the waste material is renewed. Raw material can be removed and reprocessed or caloric content of waste can be converted into electricity. In most developed countries, popular means of recycling refers to the extensive collection and reuse of daily waste products.


**Pic. 13.8 Recycling process**

The most common consumer products for recycling are aluminum drink cans, steel, food and aerosol cans, plastic and glass bottles, card board boxes, magazines, plastic goods etc. Natural organic waste such as residual food, paper, wool, etc can be used to make compost, vermi compost and organic manure. Also by this process electricity can be produced by producing gas.

**4. Chemical reaction**

Many waste materials can also be destroyed by chemical action or they can be made useful again.

Apart from these, other remedies for waste disposal are as follows-

I. Waste can be disposed in deep oceans, but it is necessary to note that the ocean environment is not polluted.

II. Fat can be obtained by baking animal residues such as bones, feathers, blood etc which in turn can be used for making soap and its protein part can be used as a cattle feed.

III. Garbage can be changed to solid bricks by exerting heavy pressure.

IV. The urban sewage water should be stored in a

pit away from the city and after purification it can be used in irrigation.

V. Regarding the disposal of waste material and reuse requires extensive research at government and non- government level. Further the developed countries should provide all the technologies to the developing countries which are helpful in disposal of waste and for protection of environment.

VI. For solving the growing problem of waste products and environmental protection, it is necessary to form a long time master plan for a region, even for each city so that it can be resolved in a planned way.

VII. The most essential is the improvement in the behaviour of general citizens. If each of us stops to throw the house hold waste in front of own or others house or drainage and collect at a appropriate place then this problem will be automatically reduced. Similarly municipalities will have to renunciate their apathy and bring the skills and dutifulness in the work of the cleaning staff. There is a need of collective effort to avoid environmental pollution from waste materials and its adverse effects on our health because the environment is a common heritage that we have to keep safe.

## Important Points

1. In today's era of comfort and luxury where scientific and industrial progress has taken place, the whole world is worried due to the problem of environmental degradation.
2. Due to industrialization, urbanization and population growth the amount of waste is continuously increasing.
3. The waste materials or products produced at the end of the process are called waste, it can be of solid, liquid or gaseous nature.
4. Waste in the environment are emitted from many sources like - domestic household source, municipality, industry and mining work, agriculture and medical sector.
5. Waste materials harm the humans as well as plants and animals in the environment. They increase different types of pollution and cause many diseases.
6. Methods for waste management varies with different types of waste.
7. For the disposal and management of waste materials methods like landfills, incineration and recycling can be used.
8. By reusing, less using and recycling, the amount of waste can be reduced.

## Practice questions

### Objective type questions

1. Which technique is suitable for the disposal of bio medical waste -
   (a) Landfill (b) Incineration
   (c) Recycling (d) Disposal in water.
2. Recycling is the best treatment for what type of waste -
   (a) Metal waste (b) Medical waste
   (c) Agricultural waste (d) Domestic waste
3. Which of the following is the main green house gas -
   (a) Hydrogen (b) Carbon monoxide
   (c) Carbon dioxide (d) Sulphur dioxide
4. How much average waste per person gets in the big cities of India -
   (a) 1-2 kg (b) 1- .2 kg
   (c) 2-4 kg (d) 0.4 to 0.6 kg.
5. Organic manure can be made from -
   (a) Domestic waste (b) Agricultural waste
   (c) Both (d) None of the above

### Very short type questions

6. How biogas is made?

7. What is a waste?
8. Write the names of Green House Gases?
9. What is vermicompost?
10. Which diseases can be caused due to the stoppage of water in the drains?

## Short type questions

11. Explain waste management?
12. What is meant by solid waste?
13. Write difference between biodegradable and non biodegradable waste?
14. What do you understand by landfill?
15. What does the recycling mean?
16. Incineration method is used for what purpose?

## Essay type questions

17. Describe the types of wastes?
18. Write an article on waste management?
19. Write an essay on the sources of waste?
20. Make a list of different waste materials by classifying them around your surroundings?
21. What will you do for management of waste in your colony or village?

## Answer key

1. (b) 2. (a) 3. (c)
4. (d) 5. (c)