MODULE 1 – BASICS OF MUNICIPAL SOLID WASTE

OBJECTIVES

By the end of the session students will be able to:

1. Know about what is waste.
2. Types and main sources of Municipal Solid Waste (MSW)
3. Learn about the role of solid waste in creating environmental pollution
4. Know about the various components of MSW
5. Know about our role in solving the problem of solid waste.

SUMMARY

Any matter which is discharged, emitted or deposited in the environment & causes alteration in the environment is called waste. Waste is a form of either matter or energy. It can be in the solid, liquid or gaseous state. The urban solid waste is a major problem and environmental hazard in most of our cities. MSW can be characterized on the basis of percentage of various components present in it, such as paper, rubber & leather, metals, glass, ash and dust, and combustible matter. This module deals with municipal solid waste, its types and characteristics.

TRANSCRIPTION

INTRODUCTION

Waste is everyone's business. We all produce waste in everything we do. From ancient times, it has been human tendency that anything which is of no use is thrown out of the house on to the streets. In the same way, even today, whatever solid waste is generated in the house or in the city is dumped anywhere on the ground. About 20% of our population lives in cities and produces tons of solid waste every year. Besides, a large quantity of waste is generated in villages also.

In most of our cities this solid waste is dumped on the outskirts, in open pits or on uneven land. When this pit is full or the land becomes even, due to waste filling, another pit or uneven land is searched. This practice has been followed for years together. Occasionally this waste is burnt or compacted.

Until recently, the disposal of municipal solid waste (MSW) did not attract much public attention. With the increase in population the problem of generation and disposal of solid waste has become enormous. Most of the approach roads of our towns and cities are littered with multi-colored plastic bags and other garbage. Huge heaps of solid waste are burnt unscientifically. Such heaps receive visitors like rag pickers, dogs, cattle, pigs, birds, etc. They pose an environmental threat and are hazardous to health.

To address this problem modern methods of solid waste management are required. This includes planned/scientific collection, transportation, and safe disposal of solid

waste. Methods of disposal such as landfills, incineration and reduction at source can be adopted according to the volume and quality of solid waste.

WHAT IS WASTE?

"Any matter, whether solid, liquid, gaseous or radio active, which is discharged, emitted or deposited in the environment, in such a volume, consistency or manner as to cause an alteration of the environment is called waste".
In simple terms we can say – "unused, unwanted or discarded material in any form is waste".
In fact, it is very difficult to define 'waste' because it is a relative term. The concept of 'waste' is also changing with development in science and technology. The things which we consider as waste today may become a resource tomorrow.

TYPES OF WASTE

On the basis of *consistency*, waste can be classified into three major types:

(i) Solid waste
(ii) Liquid waste, &,
(iii) Gaseous waste.

On the basis of *source*, waste can be classified as:

(i) Industrial waste
(ii) Urban or Municipal waste
(iii) Rural & Agricultural waste.

MUNICIPAL SOLID WASTE

As defined by the World Health Organization, the term Municipal Solid Waste (MSW) is applied to unwanted and discarded materials from houses, street sweepings, commercial and agricultural operations arising out of mass activities. It is a mixture of vegetable and non-vegetable wastes in cooked and uncooked stages, leftovers, packaging of different kinds, paper, plastics, glass, metal, rags and other fabrics, dust, ash and a variety of combustible and non-combustible, bio-degradable and non-biodegradable matter. These materials are commonly called as *garbage*, *trash* or *refuse*. Solid waste also includes tree cuttings and garden refuse, but does not include construction debris.
In other words we cans say that MSW is "Product of City Metabolism".

CATEGORIES OF MUNICIPAL SOLID WASTE

On the basis of origin, source and class, MSW is categorized as:

(i) Domestic or Household refuse
(ii) Market refuse
(iii) Business area waste
(iv) Trade refuse
(v) Hospital waste

(vi) Road sweeping
(vii) Garden refuse
(viii) Cattle shed & stable refuse
(ix) Road construction rubbish
(x) Construction rubbish

(i) Domestic or household refuse: This includes kitchen waste, plastics, paper, rags and other solids discarded from household activities.
(ii) Market refuse: This includes vegetables, fruits, animal and fish matter, packaging materials, etc.
(iii) Business area waste: Paper, cigarette and bidi butts, matchsticks, fruit peelings, paper plates, tickets, carbon paper, etc, come in this category.
(iv) Trade Refuse: Cloth cuttings, refuse from car repairing, garages, etc. constitute trade refuse.
(v) Hospital waste: Hospital waste is considered a Hazardous Waste and dealt with separately under the modern management system, even though at times it is also included in MSW. Used needles, ampules, syringes, bottles, cotton, gauze, plaster, bandages, etc. constitute the hospital waste that tends to be considered as a part of MSW.
In developed countries hospital waste is segregated at source into plastic bags of different colors. Generally black bags contain non-infectious waste while yellow or red bags are used for infectious waste. Waste is then disposed separately according to the category. In most developing countries, including India, hospital waste is neither segregated nor disposed off properly. In almost all towns and cities of our country, hospital waste is collected in one corner of the hospital campus and then burnt without segregation. Many small hospitals dump their waste into municipal bins. This hazardous waste is a big source of infection, if not handled carefully, and often causes hazards to the people who are involved in collection and segregation of waste.
(vi) Road sweepings: Leaves, paper, plastic, dust, animal and human waste, etc. which need to be swept off the roads come under this category.
(vii) Garden Refuse: This includes leaves, branches, broken pots, stones, etc.
(viii) Cattle shed & stable refuse: Animal waste and litter comprise this category.
(ix) Road construction rubbish: Wood, stones, bitumen, ash, tar, etc, form road construction rubbish.
(x) Construction rubbish: bricks, plaster, concrete, iron pieces, plumbing waste, electric wires, sand, etc, are all constituents of construction rubbish.

Millions of tons of solid waste are generated every year in our towns and cities. The quantity of MSW produced in rural and urban areas of India ranges between 0.15kg-0.45 kg/person/day, depending on the standard of living, dietary habits, etc. In major metropolitan cities it may rise to approximately 0.4-0.5 kg/person/day. In developed countries such as the US, Canada, Europe and Japan between 1kg-2kgs of waste is produced per capita per day. According to EPA estimation, in 2003 USA alone had generated more than 236 million metric tons of MSW.

CHARACTERISTICS OF MSW

MSW especially from domestic and commercial areas contains recyclables like paper, plastics, rubber, metal & glass; toxic substances like paints, pesticides, aerosols, used batteries, medicines, etc; compostable organic matter like food leftovers, fruit and vegetable peels, spoilt food or fecal matter etc.; and soiled waste like blood stained cotton, sanitary napkins, disposable syringes, nappies, used drips, etc. In most Indian cities decomposable organic matter is the highest component of MSW. When left uncleared, this component of solid waste starts decomposing, emits bad odor and also causes the breeding and proliferation of undesirable and disease-causing micro-organisms. It makes MSW wet and has low calorific value of less than 2000 kcal/kg.
In developed countries major portion of MSW is dry and recyclable. As a result it is reduced through processes like recycling and incineration. In 1995 Japan recycled 50% of its MSW and incinerated 25% of it. On the other hand, in the same year the US dumped 60% waste in landfills, recycled only 25% and incinerated less than 20% waste.

MSW – A CAUSE OF ENVIRONMENTAL POLLUTION

In any ecosystem, bodies of dead organisms are broken down into less complex compounds which can be used again in nature's biogeochemical cycles. This is achieved through various chemical processes brought about by micro-organisms, which oxidize compounds of carbon. This biological decomposition of dead organisms produces carbon dioxide and releases various mineral salts into the environment. According to an estimate, between 2-3 thousand million tons of carbon is released into the atmosphere each year by decomposition on the surface of the earth. This natural cycle is disturbed due to human activites.
Our species has learnt to transform natural compounds and synthesize new substances that cannot exist in the environment. As a result of development and modernization we produce heaps of refuse, most of which cannot be reintroduced into nature's biogeochemical cycles. As a civilization becomes more and more advanced technologically and industrially, the quantity of refuse generated per person also keeps increasing. The greater proportion of this refuse is not biodegradable. Contamination occurs when decomposition and recycling fail to take place. The need is to understand that our role in the biosphere is to manage natural resources – that is, to use and construct according to the very laws or spirit of the biosphere.
The process of decomposition or degradation or the presence of many residual artificial products can affect the quality of our soil, water and air. Many of these compounds, such as solvents, paints, batteries, pesticides, etc. are highly toxic and cause damage to our body. For example, the presence of heavy metals or dioxin compounds is especially dangerous. These toxic elements and compounds build up in the soil and water, enter into various food chains and accumulate in the body of higher organisms, including humans, thus threatening our very existence.

SOLUTION TO THE PROBLEM: WASTE MANAGEMENT AT PERSONAL LEVEL

With increasing population, migration and the rising standard of living, the problem of solid waste is attaining larger and more complex dimensions. To solve this problem, we

need an integrated management system, proper policies, rules and regulations and technologies.

The first step towards solving this problem is to realize that we over-consume and get attracted to anything new. We must accept and look for concepts such as durability, mechanical resistance and easy maintenance and repair in instruments we use.

The rule of the "R's" should also be followed to get rid of solid waste – that is to 'recover', 'recycle', 'reuse', 'repair' and 'reduce'. This rule of "R's" begins the moment we choose a consumer article. Minimum packaging should be used. There should be more efficient use of raw material. The article should be more durable and easily repairable. The article should be recyclable after use. We must have the information about its recyclability. In this way we will be able to reduce waste at the source itself.

If all these precautions are taken care of in our day to day lives, they will be of great help in reducing and managing waste.

GLOSSARY

1. Outskirts: Parts of a town or city that are furthest from the centre

2. Compacted: To press firmly together, so as to use little space.

3. Disposal: Final disposal of MSW in terms of the specified measures to prevent contamination of ground water, surface water and ambient air quality.

4. Rag-pickers: People who collect the useful materials from discarded rubbish.

5. Scavengers: Animals or birds who live on decaying flesh or food; people who search through waste for items that can be used.

6. Hazard: A thing that can be dangerous or cause damage, a danger or risk.

7. Landfill: Disposal of residual solid waste on land in a facility designed with protective measures against pollution of ground water, surface water and ambient air.

8. Incineration: To separate completely by burning; to burn to ashes.

9. WHO: World Health Organization

10. Combustible: That can catch fire and burn easily

11. Biodegradable: That which can be degraded by micro-organisms

12. Infections: Being infected with a disease.

13. Segregation: To separate the MSW into groups of organic, inorganic, recyclable and hazardous wastes.

14. MSW: Municipal Solid Waste. Includes commercial and residential wastes generated in a municipal or notified area in wither solid or semi-solid form, excluding industrial hazardous wastes, but including treated bio-medical wastes.

15. Recover: to regain possession of, or get back the thing stolen or lost

16. Recycle: to treat things that have already been used so that they can be used again.

17. Recycling: The process by which solid wastes are transformed into new or recycled products.

18. Decomposition: Becoming bad or rotten or decaying.

19. Oxidize: To combine with oxygen.

20. Biogeochemical cycle: natural processes that recycle nutrients in various chemical forms from the nonliving environment to living organisms and then back to the nonliving environment. Examples are carbon, nitrogen, phosphorus, sulfur, and hydrological cycles.

21. Contamination: To make impure by adding substances that are dangerous or carry disease.

22. Recover: To regain useful substance from refuse material.

23. Reusable: that which can be used again

24. Repair: To mend what which is broken or damaged.

FAQs

Q1. What is waste?
Ans: Used, unwanted or discarded material in any form is waste.

Q2. On the basis of consistency, waste can be classified into how many types?
Ans: Three major types – (a) Solid waste
(b) Liquid waste
(c) Gaseous waste

Q3. What is the classification of waste on the basis of source?
Ans: Three classes – (a) Industrial waste
(b) Urban/municipal waste

(c) Rural/agricultural waste

Q4. What are the main components of Municipal Solid Waste (MSW)?
Ans: The main components of municipal solid waste are vegetables in cooked and uncooked form, leftovers, packaging of different kinds, paper, plastics, glass, metal, rags and other fabrics, dust, ash, etc.

Q5. What is the common name of MSW?
Ans: MSW is commonly called trash, garbage or refuse.

Q6. Name the different categories of waste.
Ans: MSW has ten different categories:
1. Domestic refuse
2. Market refuse
3. Business area waste
4. Trade refuse
5. Hospital waste
6. Road sweepings
7. Garden refuse
8. Road construction rubbish
9. Construction rubbish
10. Cattle shed & stable refuse

Q7. How much waste is generated by an India citizen per day?
Ans: An Indian citizen generated 0.15-0.45 kgs of solid waste every day.

Q8. How much solid waste is generated by a person in developed countries every day?
Ans: Waste generated by a person in developed countries per day ranges between 1-2 kgs.

Q9. Which component is highest in MSW in most Indian cities?
Ans: Decomposable organic matter is the highest component in MSW of Indian cities.

Q10. Why is hospital waste hazardous?
Ans: Hospital waste is hazardous because it is a big source of infection of various diseases.

Q11. What is the difference between MSW of developed and developing countries?

Ans: the MSW of developed countries is dry and has more quantities of recyclable waste, while the MSW of developing countries is wet with low calorific value and contains more amount of decomposable organic matter.

Q12. What kind of toxic substances can be present in MSW?
Ans: Paints, pesticides, aerosols, used batteries, medicines and other chemicals are the toxic substances generally found in MSW.

Q13. How do toxic substances enter the food chain?
Ans: Toxic elements such as heavy metals build up in the soil and water and then enter into the food chain.

Q14. What is the rule or the “R’s” to manage MSW?
Ans: The rule of “R’s” to manage MSW is to – Recover, Recycle, Reuse and Repair.