

## **9.0 WASTE DISPOSAL; EVALUATION AND MANAGEMENT OF CONTAMINATED SITES**

### **9.1 INTRODUCTION**

#### **What is waste?**

Waste is any plastics, paper, glass, metal, foods, chemicals, wood, oil, soil, effluents, liquids that have been discarded. How the waste gets generated is from commercial, household and industrial sources. Sewage sludge is another source. Domestic and municipal waste is generated by the consumption of goods, manufacturing, sewage treatment, agriculture, the production & disposal of hazardous substances and construction. They are essential parts of the process of production as the emission of carbon dioxide by human is part of breathing process. From time immemorial, waste disposal has been a problem, and after industrialization the problem has only compounded. In the past, trash was carried to the outskirts of cities and discarded in the open, but now that can no longer be done. Over time, various waste disposal methods have been devised, like compost, burning, landfill, biological reprocessing, etc. However, before going to these details, we need to understand the different kinds of wastes.

#### **Types of Wastes**

There are basically three types of wastes generated and they are classified based on their chemical, biological and physical characteristics viz:

a) **Solid wastes** include materials like mining wastes and industrial wastes besides household garbage.

b) **Liquid wastes** are those in which the composition of solids is less than 1% and there is a high concentration of metals and salts.

c) **Sludge** contains a mixture of solid and water.

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

**Waste Disposal** is the management of waste to prevent harm to the environment, injury or long term progressive damage to health. Disposal of wastes can be made to three locations namely surface water, atmosphere and land. The land represents not only the appropriate disposal medium for many wastes but also provides opportunity to manage wastes with a minimum of adverse environmental effects. Disposal of waste could be done through the following methods.

### **Methods of Waste disposal**

#### **1. Integrated waste management (IWM)**

Integrated waste management using LCA (life cycle analysis) attempts to offer the best option for waste management. IWM entails using a combination of techniques and programmes to manage the municipal/urban waste stream.

[http://en.wikipedia.org/wiki/File:Landfill\\_compactor.jpg](http://en.wikipedia.org/wiki/File:Landfill_compactor.jpg)

#### **2. Landfill**

Disposing of waste in a landfill involves burying the waste, and this remains a common practice in most countries. Landfills were often established in abandoned or unused quarries, mining voids or borrow pits. A properly designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials.

<p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>• volume can increase with little addition of people/equipment</li> <li>• filled land can be reused for other community purposes</li> </ul>	<p><b>Disadvantages:</b></p> <ul style="list-style-type: none"> <li>• completed landfill areas can settle and requires maintenance</li> <li>• requires proper planning, design, and operation</li> </ul>
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### 3. Incineration

Incineration is a disposal method in which solid organic wastes are subjected to combustion so as to convert them into residue and gaseous products. This method is useful for disposal of residue of both solid waste management and solid residue from waste water management.

<p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>• requires minimum land</li> <li>• can be operated in any weather</li> <li>• produces stable odor-free residue</li> <li>• refuse volume is reduced</li> </ul>	<p><b>Disadvantages:</b></p> <ul style="list-style-type: none"> <li>• expensive to build and operate</li> <li>• high energy requirement</li> <li>• requires skilled personnel and continuous maintenance</li> <li>• unsightly - smell, waste, vermin</li> </ul>
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#### 4. Recycling

Recycling refers to the collection and reuse of waste materials such as empty beverage containers. The materials from which the items are made can be reprocessed into new products. Material for recycling may be collected separately from general waste using dedicated bins and collection vehicles, or sorted directly from mixed waste streams.

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<b>Advantages:</b>	<b>Disadvantages:</b>
<ul style="list-style-type: none"><li>• key to providing a livable environment for the future</li></ul>	<ul style="list-style-type: none"><li>• expensive</li><li>• some wastes cannot be recycled</li><li>• technological push needed</li><li>• separation of useful material from waste may be difficult</li></ul>

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#### 5. Ocean Dumping

This is the deposition of waste into the water bodies, particularly the ocean. Controversy surrounds ocean dumping as a waste disposal method. Although the waste may provide nutrients for some sea life, it's widely believed that the harmful effects would outweigh any benefits.

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<b>Advantages:</b>	<b>Disadvantages:</b>
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<ul style="list-style-type: none"> <li>• convenient</li> <li>• inexpensive</li> <li>• source of nutrients, shelter and breeding</li> </ul>	<ul style="list-style-type: none"> <li>• ocean overburdened</li> <li>• destruction of food sources</li> <li>• killing of plankton</li> <li>• desalination</li> </ul>
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## 6. Open Dumping

This method involves disposing waste on an open land. As simple as this is, it is not without its own shortcoming.

<p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>• inexpensive</li> </ul>	<p><b>Disadvantages:</b></p> <ul style="list-style-type: none"> <li>• health - hazard - insects, rodents etc.</li> <li>• damage due to air pollution</li> <li>• ground water and run-off pollution</li> </ul>
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## 7. Biological reprocessing

Waste materials that are organic in nature, such as plant material, food scraps, and paper products, can be recycled using biological composting and digestion processes to decompose

the organic matter. The resulting organic material is then recycled as mulch or compost for agricultural or landscaping purposes

### **8. Energy recovery**

The energy content of waste products can be harnessed directly by using them as a direct combustion fuel, or indirectly by processing them into another type of fuel. Recycling through thermal treatment ranges from using waste as a fuel source for cooking or heating, to anaerobic digestion and the use of the gas fuel (see above), to fuel for boilers to generate steam and electricity in a turbine.

### **9. Avoidance and reduction methods**

An important method of waste management is the prevention of waste material being created, also known as waste reduction. Methods of avoidance include reuse of second-hand products, repairing broken items instead of buying new, designing products to be refillable or reusable (such as cotton instead of plastic shopping bags), encouraging consumers to avoid using disposable products (such as disposable cutlery), removing any food/liquid remains from cans, packaging, and designing products that use less material to achieve the same purpose (for example, light weighting of beverage cans).

### **Waste management**

Waste management is the collection, transport, processing, recycling or disposal, and monitoring of waste materials. The term usually relates to materials produced by human

activity, and is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management is also carried out to recover resources from it.

### **Waste management concepts**

There are a number of concepts about waste management which vary in their usage between countries or regions. Some of the most general, widely used concepts include:

- **Waste hierarchy** - The waste hierarchy refers to the "3 Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstone of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste.

- **Extended producer responsibility** - Extended Producer Responsibility (EPR) is a strategy designed to promote the integration of all costs associated with products throughout their life cycle (including end-of-life disposal costs) into the market price of the product.

Extended producer responsibility is meant to impose accountability over the entire lifecycle of products and packaging introduced to the market. This means that firms which manufacture, import and/or sell products are required to be responsible for the products after their useful life as well as during manufacture.

**Polluter pays principle** – This is a principle where the polluting party pays for the impact caused to the environment. With respect to waste management, this generally refers to the requirement for a waste generator to pay for appropriate disposal of the waste.