

REVIEW OF SOLID WASTE MANAGEMENT FOR SUSTAINABLE ENVIRONMENT

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ABSTRACT

The collection and treatment of municipal solid waste have become an intense problem due to speed up economic development, fast urbanization, cumulatively increased population and industrialization. Increased attention has been given by the government in recent years to handle this problem in a safe and hygienic manner. The objective of this paper is to study the current practices related to the various waste management initiatives available for better society. The other purpose is to provide some suggestions and recommendations to improve the waste management practices for the welfare of the society.

Keywords: Municipal Solid Waste, urbanization, treatment, welfare

1. INTRODUCTION

Currently, consumption driven world is generating about 1.3 billion tonnes of solid waste per year. This volume is expected to increase to 2.2 billion tonnes by 2025. Waste generation rates will more than double over the next twenty years in developing countries (World bank ,2012). By the middle of this century half of the worlds population lives in urban areas which will make it even bigger challenge (Neeraj Kumar et al.,2016).

Each of us has a right to clean air, water and food. This right can be fulfilled by maintaining a clear and healthy environment. Now for the first question, what is waste? Any material which is not needed by the owner, producer or processor is waste. Generally, waste is defined as “anything that does not create value” (BSR, 2010). In a common man’s eye anything that is unwanted or not useful is garbage or waste. However scientifically speaking there is no waste as such in the world. Almost all the components of solid waste have some potential if it is converted or treated in a scientific manner. Hence we can define solid waste as “Organic or inorganic waste materials produced out of household or commercial activities, that have lost their value in the eyes of the first owner but which may be of great value to somebody else.” (Robinson, W.D.1986). Generation of waste is inevitable in every habitation howsoever big or small. Since the dawn of civilization humanity has gradually deviated from nature & today there has been a drastic change in the lifestyle of human society. Direct reflection of this change is found in the

nature & quantity of garbage that a community generates. We can dispose the waste or reuse the waste and can earn money through proper management (Agarwal et al.,2015).

However, with increasing public and political awareness as well as new possibilities opened by economic growth and information technology, solid wastemanagement is starting to receive due attention throughout the developing world.

The various initiatives taken by government, NGOs, private companies, and local public drastically increased in the past few decades. Nonetheless, land filling is still the dominant solid waste management option around the world. It is well known that wastemanagement policies, as they exist now, are not sustainable in the long term.

Thus, waste management is undergoing drastic change to offer more options that are more sustainable. This paper outlines the general solid waste management principles.

2. CLASSIFICATION OF WASTE

There may be different types of waste such as Domestic waste, Factory waste, Waste from oil factory, E-waste, Construction waste, Agricultural waste, Food processing waste, Bio-medical waste, Nuclear waste, Slaughter house waste etc.

We can classify waste as follows:

- Solid waste- vegetable waste, kitchen waste, household waste etc.
- E-waste- discarded electronic devices such as computer, TV, music systems etc.
- Liquid waste- water used for different industries, tanneries, distilleries, thermal power plants
- Plastic waste- plastic bags, bottles, bucket, etc.
- Metal waste- unused metal sheet, metal scraps etc.
- Nuclear waste- unused materials from nuclear power plants

Further we can group all these types of waste into wet waste (Biodegradable) and dry waste (Non-Biodegradable).

2.1 Wet waste (Biodegradable) includes the following:

- Kitchen waste including food waste of all kinds, cooked and uncooked, including eggshells and bones
- Flower and fruit waste including juice peels and house-plant waste
- Garden sweeping or yard waste consisting of green/dry leaves
- Sanitary wastes
- Green waste from vegetable & fruit vendors/shops
- Waste from food & tea stalls/shops etc.

2.2 Dry waste (Non-biodegradable) includes the following:

- Paper and plastic, all kinds
- Cardboard and cartons
- Containers of all kinds excluding those containing hazardous material
- Packaging of all kinds
- Glass of all kinds
- Metals of all kinds
- Rags, rubber
- House sweeping (dust etc.)
- Ashes
- Foils, wrappings, pouches, sachets and tetra packs (rinsed)
- Discarded electronic items from offices, colonies viz. cassettes, computer diskettes, printer cartridges and electronic parts.
- Discarded clothing, furniture and equipment

In addition to the above wastes, another type of waste called “**Domestic Hazardous Waste**” may also be generated at the household level. These include used aerosol cans, batteries, and household kitchen and drain cleaning agents, car batteries and car care products, cosmetic items, chemical-based insecticides/pesticides, light bulbs, tube-lights and compact fluorescent lamps (CFL), paint, oil, lubricant and their empty containers (EPA Wastes Website, 2010).

3. DISPOSAL VS. MANAGEMENT

There are common practices to dispose waste from ordinary people. But disposal of waste is becoming a serious and vexing problem for any human habitation all over the world. Disposing solid waste out of sight does not solve the problem but indirectly increases the same manifold and at a certain point it goes beyond the control of everybody. The consequences of this practice such as health hazards, pollution of soil, water, air & food, unpleasant surroundings, loss of precious resources that could be obtained from the solid waste, etc. are well known. That's why it is essential to focus on proper management of waste all over the world. Waste management has become a subject of concern globally.

Management of solid waste which generally involves proper segregation and scientific recycling of all the components is in fact the ideal way of dealing with solid waste. Solid waste management (SWM) is a commonly used name and defined as the application of techniques to ensure an orderly execution of the various functions of collection, transport, processing, treatment and disposal of solid waste (Robinson, 1986). It aims at an overall waste management system which

is the best environmentally, economically sustainable for a particular region and socially acceptable (World Resource Foundation, 1996; McDougall et al., 2001).

4. BASIC PRINCIPLES OF SOLID WASTE MANAGEMENT

The basic principles of SWM include:

4.1. 4Rs: Refuse, Reduce, Reuse & Recycle

- Refuse: Do not buy anything which we do not really need.
- Reduce - Reduce the amount of garbage generated. Alter our lifestyles so that minimum garbage is generated.
- Reuse - Reuse everything to its maximum after properly cleaning it. Make secondary use of different articles.
- Recycle – Keep things which can be recycled to be given to ragpickers or waste pickers. Convert the recyclable garbage into manures or other useful products.

4.2. Segregation at source

Store organic or biodegradable and inorganic or non-biodegradable solid waste in different bins. Recycle of all the components with minimum labor and cost. Different treatments for different types of solid wastes: One must apply the techniques which are suitable to the given type of garbage. For example, the technique suitable for general market waste may not be suitable for slaughter house waste.

Treatment at nearest possible point: The solid waste should be treated in a decentralized manner as possible. The garbage generated should be treated preferably at the site of generation i.e. every house. Based on the above principles, an ideal Solid Waste Management system is given in fig.1

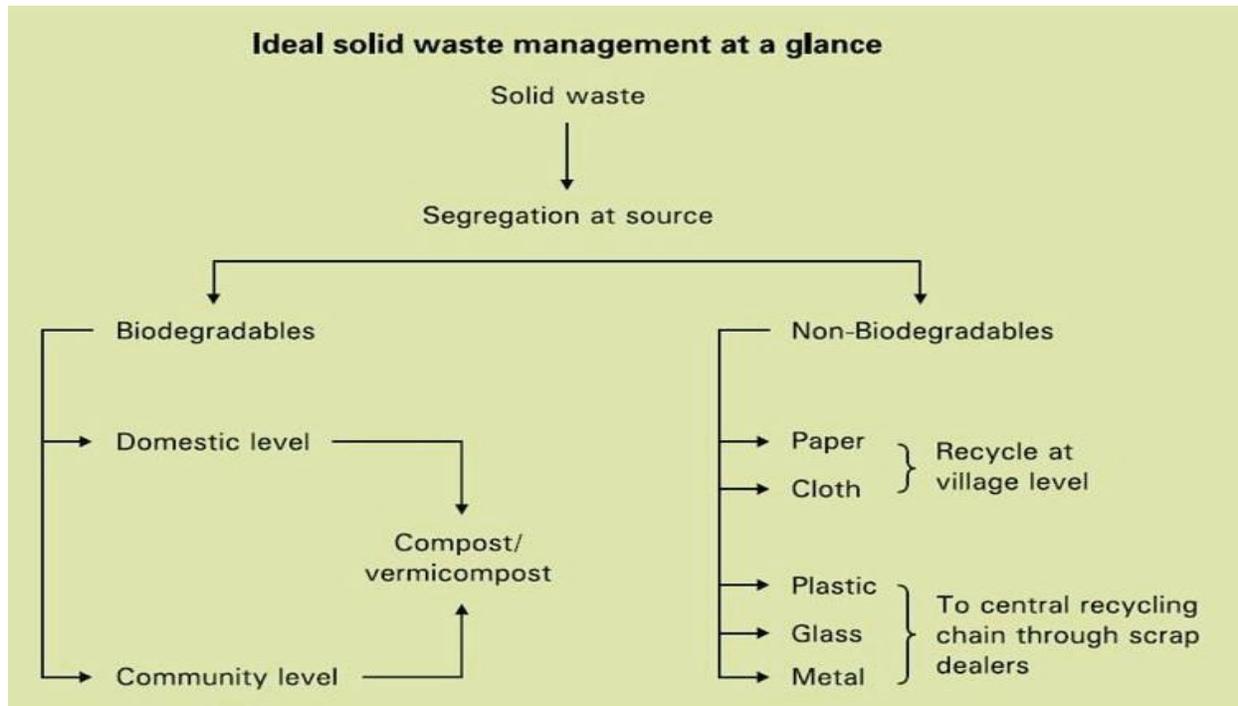


Figure 1: Ideal Solid waste management system.

Source- Shrikant M. Navrekar, "Sustainable Solid Waste Management: Need of the hour"

5. SOLID WASTE MANAGEMENT (SWM)

Solid waste management (SWM) is associated with the control of waste generation, its storage, collection, transfer and transport, processing and disposal in a manner that is in accordance with the best principles of public health, economics, engineering, conservation, aesthetics, public attitude and other environmental considerations. It should have the following considerations;

- Protection of environmental health.
- Promotion of environmental quality.
- Supporting the efficiency and productivity of the economy.
- Generation of employment and income.

6. APPROACHES FOR SOLID WASTE MANAGEMENT AT HOUSE HOLD LEVELS

The solid waste management is the collection, transport, processing, recycling or disposal of waste materials, usually ones produced by human activity, in an effort to reduce their effect on

humanhealth or local aesthetics or amenity. For effectivemanagement of solid waste in small town areas, focussould be on management at household level. That which cannot be managed at household level should be managed at the community level.

In general, the following approach should be followed:

- Segregation of solid waste at the household level (Biodegradable and non-biodegradable)
- Reuse of non-biodegradable waste at the household level to the extent possible
- Household level treatment of bio degradable waste
- Collection and transportation of segregated waste at the household level to a place identified at the community level (in cases where household level treatment is not possible)
- Community level treatment or recycling/ reuse of waste
- All the biodegradable waste should be composted at the community level
- Non-biodegradable waste may be further segregated and sold or recycled
- Waste which cannot be composted, reused or recycled may be disposed at the landfill sites following appropriate procedure, (such waste may usually be construction waste, debris etc) (Prakash Chandra, 2012).

7. TREATMENT AND DISPOSAL OF SOLID WASTE

In most developing countries, the use of appropriate treatment technologies is rare. Some commonly used disposal and treatment technologies (from all over the world) are listed hereafter:

7.1 Dumping is the disposal of waste at an uncontrolled, uncovered site of minimal or no structural design. Degrading waste in such dumps emits greenhouse gases (methane), toxic leachates pollute subsurface and surface waters and enhance the risk of disease transmission to nearby residents. In many African and Asian countries, open, uncontrolled disposal is the most common method of treating MSW.

7.2 Sanitary landfills are engineered disposal sites where waste is spread in layers, compacted and covered with soil or other materials to minimize air and water pollution. Modern sanitary landfills collect and treat leachate and methane gas.

7.3 Burning is unfortunately a widespread method used in developing countries to reduce the volume or odour of dumped or uncollected MSW. Open burning is the major source of toxic gas emission such as dioxins and furans. High-tech **incinerators**, as used in many European countries, are engineered to prevent toxic emissions and make use of the excess heat to generate steam for power production or for residential heating (Zaman, 2009; DEFRA, 2007).

7.4 Composting, which is a controlled aerobic degradation of organic material, can reduce waste volumes by about 50 to 80 %. The resulting soil-like product can be used in agriculture. Biodegradation of organic waste is commonly practiced in many Asian countries. (CPHEEO, 2000).

7.5 Bio-Methanation

The bio methanation is the procedure of alteration of organic matter in wastes to methane and manure by microbial act in the absence of air during the process known as anaerobic digestion. Solid wastes from agro -based system have high organic content and therefore its handling by the method of bio-methanation is the viable as it generates useful products similar to biogas and enriched manure. The bio methanation method is a two stage process consisting of acidification and methanation (CPCB, 2007).

7.6 Recycling is the separation and collection of secondary materials for remanufacturing. In many developing countries, recycling is an important economic factor providing income opportunities for poor, unemployed or disabled individuals. Recycling significantly reduces the amount of waste to be collected, transported and disposed of.

8. CONCLUSION:

1. Community participation is the key to the success of solid waste management.
2. Public should be educated to realize the importance of minimization and segregation of waste at the sources for proper waste management.
3. Manufacturing of non-recyclable polyethylene bags should be banned or research should be initiated to develop biodegradable polyethylene.

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