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Systamatic Review For Sustainable Solid Waste Management And Its Role In Development

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ABSTRACT

Solid waste is a problem that must be properly managed in order to protect the human health and environment and preserve the natural resources. Many do not realize that solid wastes also make a definite impact on the climatic change. The manufacturers, users, distributers of the products as well as the disposal of the resulting wastes all results in emission of the atmospheric gases-
" Green House gases" which has affected the earth's environment to a large extent. When the organic wastes decomposes on the landfills and uncontrolled it produces the methane gases one of the major green house gases contributing to a drastic change in the surrounding climate and the environment.

Keywords- Solid & Liquid Waste Management, Methods of Waste Management, Wastewater, Reuse, Recycle

INTRODUCTION:

In contemporary society, many of the items used daily are designed to be used and discarded.Single-use packaging and the disposable items defines many of our consumer's patterns.With increased availability of the disposals it has added to the Problem of how to get rid of all these wastes. Solid waste management Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorised according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc); or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc). Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal.

IMPACT OF SOLID WASTE ON CLIMATE CHANGE:

Even before a material or the product becomes solid waste, it goes through a long cycle that involves removing and processing the raw materials, manufacturing the product, transporting the materials and products to the market and using energy to operate the product. Each of these activities has the potential to generate greenhouse gas emissions through one or more of the following means:

1. **Energy consumption:** Extracting and processing raw materials, manufacturing products, and transporting materials and products to market all green house gas emission by consumption of energy.
2. **Methane Emissions:** When organic
wastes decompose in landfills it generates methane which is major component of green house gases.
3. **Carbon storage:** Trees absorb CO2 from air and store it in wood through carbon

sequestration. Waste prevention and recycling of wood and paper products allow more trees to remain standing in the forest where they can continue to remove CO2 from air which helps in minimizing the climatic changes. Now recycling reduces the methane emission by preventing the consumption of energy for extracting and processing the raw materials. Communities that are looking for ways to help prevent climatic changes should do it by implementing and integrated solid waste management program.

REDUCE, REUSE, RECYCLE

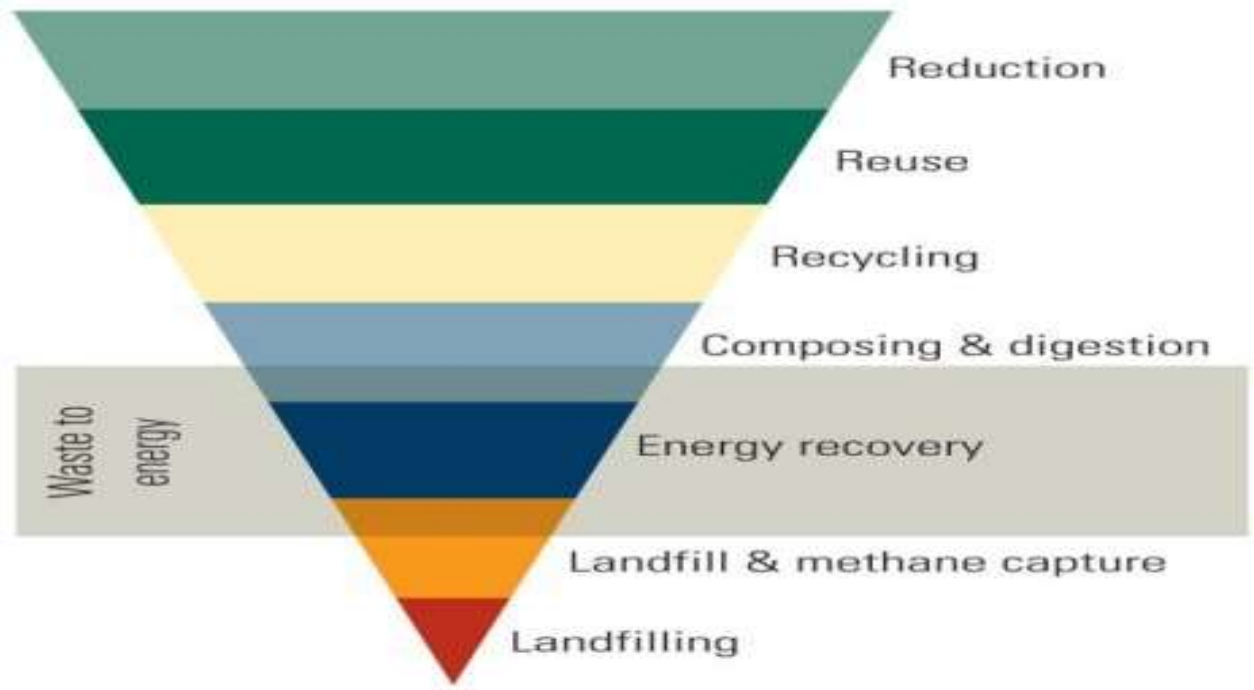
Methods of waste reduction, waste reuse and recycling are the preferred options when managing waste. There are many environmental benefits that can be derived from the use of these methods. They reduce or prevent green house gas emissions, reduce the release of pollutants, conserve resources, save energy and reduce the demand for waste treatment technology and landfill space. Therefore it is advisable that these methods be adopted and incorporated as part of the waste management plan.

WASTE REDUCTION AND REUSE

Waste reduction and reuse of products are both methods of waste prevention. They eliminate the production of waste at the source of usual generation and reduce the demands for large scale treatment and disposal facilities. Methods of waste reduction include manufacturing products with less packaging, encouraging customers to bring their own reusable bags for packaging, encouraging the public to choose reusable products such as cloth napkins and reusable plastic and glass containers, backyard composting and sharing and donating any unwanted items rather than discarding them. All of the methods of waste prevention mentioned require public participation.

INTEGRATED SOLID WASTE MANAGEMENT

Integrated Solid Waste Management (ISWM) takes an overall approach to creating sustainable systems that are economically affordable, socially acceptable and environmentally effective. An integrated solid waste management system involves the use of a range of different treatment methods, and key to the functioning of such a system is the collection and sorting of the waste. It is important to note that no one single treatment method can manage all the waste materials in an environmentally effective way. Thus all of the available treatment and disposal options must be evaluated equally and the best combination of the available options suited to the particular community chosen. Effective management schemes therefore need to operate in ways which best meet current social, economic,and environmental conditions of the municipality.



Environmental hierarchy for solid waste management

METHODS OF SOLID WASTES DISPOSAL:

i. Sanitary Land Filling:

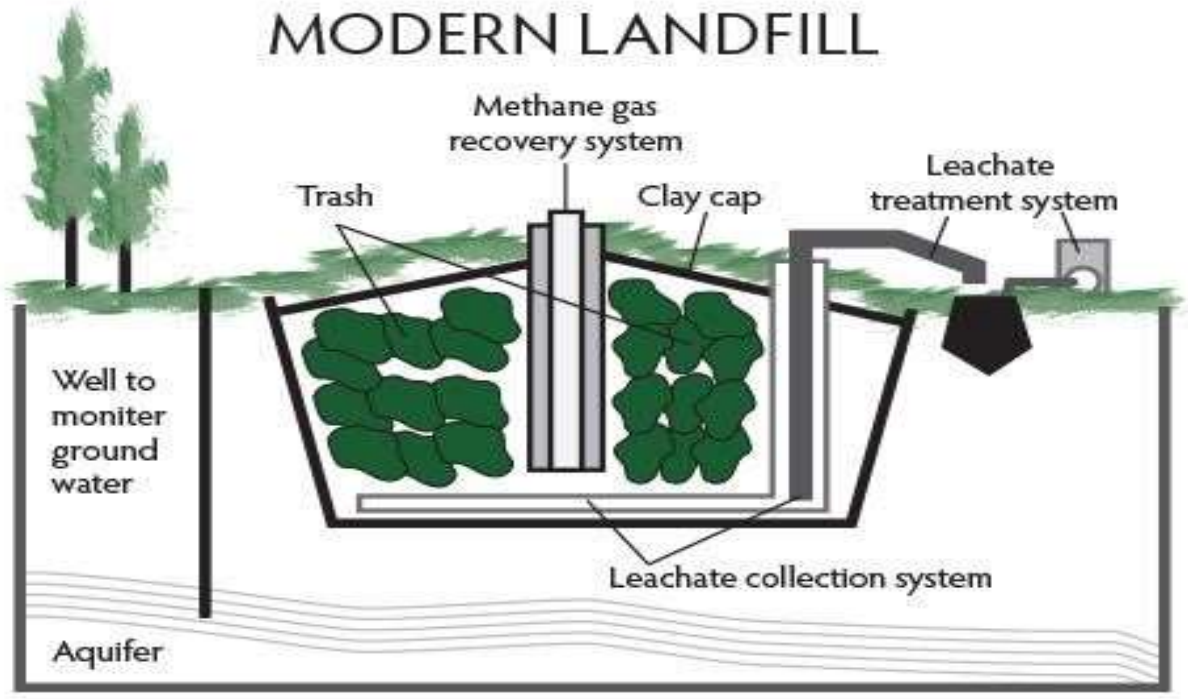
In a sanitary landfill, garbage is spread out in thin layers, compacted and covered with clay or plastic foam. In the modern landfills the bottom is covered with an impermeable liner, usually several layers of clay, thick plastic and sand. The liner protects the ground water from being contaminated due to percolation of leachate.

Leachate from bottom is pumped and sent for treatment. When landfill is full it is covered with clay, sand, gravel and top soil to prevent seepage of water. Several wells are drilled near the landfill site to monitor if any leakage is contaminating ground water.

Methane produced by anaerobic decomposition is collected and burnt to produce electricity or heat. Sanitary

Landfills Site Selection:

- Should be above the water table, to minimize interaction with groundwater.
- Preferably located in clay or silt.
- Do not want to place in a rock quarry, as water can leech through the cracks inherent in rocks into a water fracture system.
- Do not want to locate in sand or gravel pits, as these have high leeching. Unfortunately, most of Long Island is sand or gravel, and many landfills are located in gravel pits, after they were no longer being used.



ii. Incineration:

The term incinerates means to burn something until nothing is left but ashes. An incinerator is a unit or facility used to burn trash and other types of waste until it is reduced to ash. An incinerator is constructed of heavy, well-insulated materials, so that it does not give off extreme amounts of external heat.

The high levels of heat are kept inside the furnace or unit so that the waste is burned quickly and efficiently. If the heat were allowed to escape, the waste would not burn as completely or as rapidly. 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. This process reduces the volumes of solid waste to 20 to 30 per cent of the original volume.

Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". Incinerators convert waste materials into heat, gas, steam and ash. Incineration is carried out both on a small scale by individuals and on a large scale by industry. It is used to dispose of solid, liquid and gaseous waste. It is recognized as a practical method of disposing of certain hazardous waste materials. Incineration is a controversial method of waste disposal, due to issues such as emission of gaseous pollutants.

iii. Composting:

Due to shortage of space for landfill in bigger cities, the biodegradable yard waste (kept separate from the municipal waste) is allowed to degrade or decompose in a medium. A good quality nutrient rich and environmental friendly manure is formed which improves the soil conditions and fertility.

Organic matter constitutes 35%-40% of the municipal solid waste generated in India. This waste can be recycled by the method of composting, one of the oldest forms of disposal. It is the natural process of decomposition of organic waste that yields manure or compost, which is very rich in nutrients.

Composting is a biological process in which micro-organisms, mainly fungi and bacteria, convert degradable organic waste into humus like substance. This finished product, which looks like soil, is high in carbon and nitrogen and is an excellent medium for growing plants.

The process of composting ensures the waste that is produced in the kitchens is not carelessly thrown and left to rot. It recycles the nutrients and returns them to the soil as nutrients. Apart from being clean, cheap, and safe, composting can significantly reduce the amount of disposable garbage.

The organic fertilizer can be used instead of chemical fertilizers and is better specially when used for vegetables. It increases the soil's ability to hold water and makes the soil easier to cultivate. It helped the soil retain more of the plant nutrients.

Vermi-composting has become very popular in the last few years. In this method, worms are added to the compost. These help to break the waste and the added excreta of the worms makes the compost very rich in nutrients. In the activity section of this web site you can learn how to make a compost pit or a vermi-compost pit in your school or in the garden at home.

To make a compost pit, you have to select a cool, shaded corner of the garden or the school compound and dig a pit, which ideally should be 3 feet deep. This depth is convenient for aerobic composting as the compost has to be turned at regular intervals in this process.

Preferably the pit should be lined with granite or brick to prevent nitrite pollution of the subsoil water, which is known to be highly toxic. Each time organic matter is added to the pit it should be covered with a layer of dried leaves or a thin layer of soil which allows air to enter the pit thereby preventing bad odour. At the end of 45 days, the rich pure organic matter is ready to be used. Composting: some benefits

i. Compost allows the soil to retain more plant nutrients over a longer period.

ii. It supplies part of the 16 essential elements needed by the plants.

iii. It helps reduce the adverse effects of excessive alkalinity, acidity, or the excessive use of chemical fertilizer. iv. It makes soil easier to cultivate.

v. It helps keep the soil cool in summer and warm in winter.

vi. It aids in preventing soil erosion by keeping the soil covered.

vii. It helps in controlling the growth of weeds in the garden.

iv. Pyrolysis:

Pyrolysis is a form of incineration that chemically decomposes organic materials by heat in the absence of oxygen. Pyrolysis typically occurs under pressure and at operating temperatures above 430 °C (800 °F).

In practice, it is not possible to achieve a completely oxygen-free atmosphere. Because some oxygen is present in any pyrolysis system, a small amount of oxidation occurs. If volatile or semi-volatile materials are present in the waste, thermal desorption will also occur.

Organic materials are transformed into gases, small quantities of liquid, and a solid residue containing carbon and ash. The offgases may also be treated in a secondary thermal oxidation unit. Particulate removal equipment is also required. Several types of pyrolysis units are available, including the rotary kiln, rotary hearth furnace, and fluidized bed furnace. These units are similar to incinerators except that they operate at lower temperatures and with less air supply.

Limitations and Concerns:

i. The technology requires drying of soil prior to treatment.

ii. Limited performance data are available for systems treating hazardous wastes containing polychlorinated biphenyls (PCBs), dioxins, and other organics. There is concern that systems that destroy chlorinated organic molecules by heat have the potential to create products of incomplete combustion,

including dioxins and furans. These compounds are extremely toxic in the parts per trillion ranges. The MSO process reportedly does not produce dioxins and furans.

iii. The molten salt is usually recycled in the reactor chamber. However, depending on the waste treated (especially inorganics) and the amount of ash, spent molten salt may be hazardous and require special care in disposal.

iv. pyrolysis is not effective in either destroying or physically separating in organics from the contaminated medium. Volatile metals may be removed as a result of the higher temperatures associated with the process, but they are not destroyed. Byproducts containing heavy metals may require stabilization before final disposal.

v. When the off-gases are cooled, liquids condense, producing an oil/tar residue and contaminated water. These oils and tars may be hazardous wastes, requiring proper treatment, storage, and disposal.

CONCLUSION:

Urban solid waste management is an essential social service for protection of environment and health of the citizens. Therefore, a least cost most appropriate technological option for safe management should receive the needful funding. Industries, institutions, nongovernment agencies and individual citizen should all co-operate with the municipal authorities in ensuring safe management. As society moves waste to the forefront of public policy, it is more apparent that what we discard annually contains a multitude of valuable and recoverable materials. An intergraded waste management system entails a careful analysis of what is in the waste stream and offers ideas on practices to recover the various materials at the point of highest value. The best strategy for a community is to match its unique position with the mix of activities that will best serve it now and far into the future.

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