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Municipal Solid Waste in Developing countries

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Abstract -
RCRA §1004(27) defines a solid waste as, "any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material, resulting from industrial, commercial, mining, and agricultural operations and from community activities."
It is essentially any waste material generated by human activity, though even animal waste can sometimes be included in it. It is usually low in liquid content,hence being termed as Solid waste.

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I. Introduction

Solid Waste material can be divided into 5 broad types:

- Municipal Solid Waste:

This includes everyday items like packages, clothes, food etc which are collected from houses, schools and other businesses. It is the commercial and domestic wastewhich has been generated in municipal areas.

- Hazardous Waste:

It is the waste material which could be corrosive, reactive or explosive in natureand is generally collected from industries and some hospitals. As the name suggests, it is hazardous or toxic in nature.

- Industrial Waste:

It is any waste material produced during the manufacture of products in industrial plants. It is collected from large and small industries and can add up to be a lot ofwaste material when collated.

- Agricultural waste:

All the waste produced by various agricultural activities is known as agriculturalwaste. This includes, but is not limited to, manure,
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harvest waste, fertilizer run-off and salt and silt drain. A lot of waste fromfertilizers and pesticides enters into water bodies near the farms.

- Bio Medical waste:

Bio-medical waste means any solid and/or liquid waste including its container, which is generated during the diagnosis, treatment or immunization of human beings or animals or any medical research activities.
Biomedical waste poses a hazard due to two principal reasons – the first is infectivity and other toxicity. It is collected from hospitals, laboratories and testingplants.

Governance Aspects of Solid Waste Management - Management of solid waste has become a major issue affecting nations around the world. Rapid urbanization, increasing population and unplanned development clubbed with the problem of solid waste management in the country is worsening every day. In an effort to build a resource efficient India, it is important to improvewaste management practices.
After being neglected for long, SWM is slowly receiving momentum and towns across the country are demonstrating successful models of effective operating systems and infrastructure changes making it possible to monitor waste and makethe country waste free.

The government plays a huge role in waste management. The ministry of Environment, forests and climate change is now constantly coming up with new and more equipped rules and regulations required for better and more sustainablewaste management.

The municipalities collect all the waste material ranging from large industries to minor household waste and ensure that it is segregated and discarded appropriately.

Rules such as segregation at source and collect back scheme not only make wastediscarding easier, but also aim towards decreasing the amount of solid waste as awhole.
Although many effective changes are yet to be seen, it is believed that each newpolicy takes at least 4 to 6 years before any reduction of waste material can be seen.

Organic Waste Treatment -
Organic waste is any material that is biodegradable and comes from either a plantor an animal. Biodegradable waste is organic material that can be broken into carbon dioxide, methane or simple organic molecules. Examples of organic waste include green waste, food waste, food-soiled paper, non-hazardous wood waste, green waste, and landscape and pruning waste.

Compost from organic waste makes for an ideal organic fertilizer for agriculturalpurposes, and also promotes soil humus content stabilization or improvement.
However, to achieve this it is necessary for organic waste to be collected separately, as this is the only way that allows for the production of quality compost that is suitable for agricultural and horticultural use. They also make an excellent substitute for horticultural peat and in this way reduce greenhouse gas emissions, and protect plant and animal habitats. However, the treated organic waste must meet the relevant quality standards and the treatment process should be as eco friendly as possible.

Accelerated aerobic degradation through the introduction of cultured microorganisms offers a genuine breakthrough in terms of rapidly treating organicwastes at the point of production. Rapid thermophilic digestion solves the problemof dealing with otherwise intractable wastes by injecting new life and value into it,thereby achieving a phenomenal Return on Investment potential through its short processing time and quality end product.

"Biomax Technologies is a Singapore-based international company in the research and development of sustainable green technology, harnessing proprietary, breakthrough, environment-enhancing solutions while helping businesses use science and technology to achieve the greatest profitability for their investments. The Rapid Thermophilic Digestion Technology is the flagship product of Biomax." (source : Waste advantage magazine)

Special Waste Fractions -
Fraction of waste refers to the grouping of waste according to its properties. Eachwaste group or classification is called a fraction.

Waste from a business that requires additional or specific handling for proper disposal is considered special waste. WCSC defines special waste as garbage, refuse, or other discarded material or waste, including solid and semi-solid materials that require a special administrative assessment, additional processing, special transportation, special packaging, and/or additional disposal techniques dueto the quantity of material generated and/or its unique physical, chemical, or biological characteristics.

Special waste can be treated by chemical, thermal, biological, and physical methods. Chemical methods include ion exchange, precipitation, oxidation and reduction, and neutralization. Among thermal methods is high-temperature incineration, which not only can detoxify certain organic wastes but also can destroy them. Special types of thermal equipment are used for burning waste in either solid, liquid, or sludge form. However one of the main problems caused by this method is the major increase in air pollution. Biological treatment of certain organic wastes, such as those from the petroleum industry, is also an option. One method used to treat special waste biologically is called land farming. In this technique the waste is carefully mixed with surface soil on a suitable tract of land.Microbes that can metabolize the waste may be added, along with nutrients. In some cases a genetically engineered species of bacteria is used. Food or forage crops are not grown on the same site.

Strategic Issues and Planning in Solid Waste Management - "A computer model was developed and applied for studying integrated municipal solid waste management (MSWM) in the Helsinki Metropolitan Area. The modelis based on a method developed for analyzing on-site collection systems of waste
materials separated at the source for recovery. The aim of the Helsinki study was tofind and analyze separation strategies fulfilling the recovery rate targets adopted for municipal solid waste in Finland, i.e. 50wt.% by the end of 2000 and 70 wt.% by 2005. In the present situation (i.e. in 1995), the total recovery rate of 27wt.% was achieved in the region." ~ (source: researchNet.)

The ideal waste management alternative is to prevent waste generation in the first place. Hence, waste prevention is a basic goal of all the waste management strategies. Numerous technologies can be employed throughout the manufacturing,use, or post-use portions of product life cycles to eliminate waste and, in turn, reduce or prevent pollution. Some representative strategies include environmentally conscious manufacturing methods that incorporate less hazardous or harmful materials, the use of modern leakage detection systems for material storage, innovative chemical neutralization techniques to reduce reactivity, or water saving technologies that reduce the need for freshwater inputs.

Waste degradation not only produces useful solid end-products (such as compost), degradation by-products can also be used as a beneficial energy source. As discussed above, anaerobic digestion of waste can generate biogas, which can be captured and incorporated into electricity generation. Alternatively, waste can be directly incinerated to produce energy. Incineration consists of waste combustion at very high temperatures to produce electrical energy. The byproduct of incineration is ash, which requires proper characterisation prior to disposal, or in some cases, beneficial reuse. It is widely used in developed countries due to landfill space limitations. Further, incineration is often used to effectively mitigate hazardous wastes such as chlorinated hydrocarbons, oils, solvents, medical wastes, and pesticides.

Case Study -

In Chandigarh, the closest dumping ground is the Dadumajra landfill. The place was once completely empty. There was no filth, garbage or debris here. Eventuallywith time, a lot of people started throwing garbage due to the absence of dumpsters nearby. Which has accumulated to form a huge garbage dump affecting the qualityof air and sanitation of Chandigarh.

Animals often feed on the edible waste present in it and help scatter the wastefurther. This does not only increase the spread of the garbage, but can also be harmful for the animals feeding on it. The residents of the area are often found complaining about the massive uprise in the number of stray animals as well. An area earlier used by children as playgrounds, is today being used to collect garbage from around the city. Its foul smell and disgusting site is enough to inconvenience the residents of sector 38. It has also overall affected the air qualityof the city.

It is high time that effective measures are taken in order to remove and properly discard the waste collected at Dadumajra. However, this should also serve as a learning, how an empty ground can slowly turn into the largest landfill if garbage isnot periodically removed and treated.

II. Conclusion

Although the production of waste is inevitable, we can work towards limiting it and treating the produced waste properly. Some of it can be reused and recycled, composted or decomposed. It is clear that improper waste management practices have a significant impact on the natural environment and sustainable development in the study area. Thus, awareness about sustainable waste management impact on sound environmental development or/and sustainable development is seemingly low. Therefore, it is important that sustainable waste management should be developed from the primary level.

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