ISBN: 978-93-90847-02-0

4. Suggestive Eco-Friendly Approaches for Solid Waste Management

Dr. Utpal Goswami

Lecturer,
Govt. Banikanta College of Teacher Education,
Lachit Nagar, Guwahati, Assam.

Abstract:

With the rapid growth of population and industrialization, the production of waste is rising at an alarming rate in urban areas. Human activities generate considerable amount of solid waste. The indigenous practice in this regard is generally found to be open dumping and door-to-door collection by the municipal authorities. Environmental degradation is always accompanied by the commonly practiced ways of solid waste disposal. Hence, environmentally sound solid waste management strategies and techniques are required for the effectiveness of the urban solid waste management. The traditional methods used for solid waste management practices are associated with the environmental pollution problems such as air, water and soil pollution. It is possible to implement certain corrective measures during collection, storage, transport and disposal of urban solid waste so as to minimize the adverse impacts on the environment.

The problem of waste management can be mitigated through adoption of improved methods of collection, transportation and active community involvement. Moreover, scientific and environment friendly technologies for disposing should be encouraged. Technologies such as composting, vermicomposting, biomethanation, fuel pelletisation, landfill gas technology, energy recovery through processing can assist in proper tackling of solid wastes. Recycling activities and advanced technologies can ensure the reduction of the quantity of waste to be finally dumped besides generation of substantial amount of energy, electricity and manures. In this regard, municipalities, private entrepreneurs, NGOs and active participation of local residents is also necessary so as to achieve environmental sustainability in the long run.

Keywords: *Urban solid waste, Biomethanation, Composting, Fuel pelletisation, Landfill gas technology.*

4.1 Introduction:

The large quantity of solid waste generation has posed a serious threat to the ecology and environment of urban areas. Solid wastes include all the wastes in solid form arising from normal human and animal activities and which are discarded as useless or unwanted. Solid waste arising from human activity has become one of the major environmental problems in the present period of time causing extensive pollution and threat to human health. Piles of garbage and wastes of all kinds littered everywhere have become common sight in urban areas.

Solid waste generated by domestic, commercial and industrial activities are often indiscriminately disposed. It is common to find large heaps of garbage in disorganised manner at every nook and corner in most of the urban areas. The absence of adequate waste disposal system is a perpetual environmental hazard in cities and towns. The problem is further aggravated due to the non-biodegradable nature of plastic and polymeric materials. At present, solid waste pollution is regarded as third pollution after air and water pollution from the viewpoint of importance and significance.

There is a growing realization that the environment has limited assimilative and carrying capacity. This means that pollution control is essential in order to safeguard the environment and hence the quality of life. Waste, if not properly treated and handled, not only threatens human life in short term, but the environment as a whole in the long run. Therefore, it is necessary to implement suitable strategies for the management of solid wastes.

4.2 Common Indigenous Disposal Practices of Solid Wastes:

In urban areas, in most of the parts of India the open dumping is the common practice adopted by the people for the disposal of solid wastes, also known as garbage. However, the door-to-door collection and disposal at a common dumping site authorized by the municipal authorities is also seen in several urban areas. Open dumping observed at several streets of the cities is an eyesore destructing the natural beauty the city. Although sanitary landfilling method of disposal is not practiced for final disposal of solid waste in most cities and towns, however it can be regarded as better mode of non-recyclable waste disposal than the existing open dumping method. In order to combat garbage menace in cities, towns and some polluted rural areas of the country, several management practices can be adopted for the effective handling of solid wastes. These strategies are illuminated in the following heading.

4.3 Management Strategies:

The present and future ways to manage solid waste need consideration on the following points – upgradation of the waste collection, transportation and disposal practices, setting targets for waste reduction, technological intervention and recycling activity, institutional and regulatory reforms. Segregation and storage are the key factor for waste utilization and recycling. It is an essential part of the preliminary phase of waste management. To promote the practice of segregation the community awareness programmes have to be undertaken. A two-bin system of solid waste storage should be introduced for segregation at source. The bio-degradable and non-biodegradable waste can be separately placed in these two bins. The segregated waste so stored in these bins will have to be transferred to community collection point or to the municipal vehicle separately. Proper segregation of waste into different components and their separate collection can definitely lead to remarkable changes in the entire system. For primary collection, door-to-door collection is regarded as the best option all over the world. With the introduction of segregated waste storage, it can be possible to introduce a system in which different categories of wastes are collected on different days and at varying intervals from the point of generation. Collection of hazardous municipal waste such as infectious bio-medical solid waste should be strictly carried in covered container.

Proper segregation will lead to better opportunity for scientific disposal of waste. The recyclables should be straightway transported to recycling units. This will help in motivating and activating the recycling units and this in turn can lead to several advantages such as enabling technology upgradation, better quality products and saving of valuable raw material resources of country. The biodegradable matter can be disposed either by aerobic composting, anaerobic digestion or sanitary landfilling. Depending upon the land availability and financial resources either of these disposal methods can be adopted.

Source reduction is an effective way for solid waste menace. The less one has to deal with, the easier and convenient is the waste disposal. It includes both minimizing the amount of solid waste and reducing the waste toxicity. There are a number of ways by which waste generation can be minimized by its use or recycling. If it is not possible to reuse or recycle, the waste can be disposed of safely by methods like sanitary landfilling, incineration, pyrolysis etc. The appropriate technology for solid waste disposal reduces not only the quantity of waste but also improves the quality of waste to meet the required pollution standard. At the same time, substantial economy can be recovered in the form of energy and manures.

Various technological approaches that can be met for urban solid waste management are – (i) Composting (ii) Biomethanation (iii) Fuel pelletisation (iv) Energy recovery from refuse (v) Landfill gas technology etc.

Composting is the biological decomposition and stabilization of organic substrates. The processing of refuse may be done by composting and the end product is used as manure in agriculture. The key areas for consumption of compost made from city waste are – agriculture, land scaping, horticulture, bioremediation, aquaculture, afforestation, land restoration etc. As the required (Carbon : Nitrogen) ratio and organisms which are decomposing the organic matter are present in urban solid waste, composting is suitable for refuse management.

Vermicomposting is a process of using earthworms for conversion of biodegradable wastes into compost. This method of composting can be practiced widely at orchard, farm and small-scale decentralized community composting.

Biomethanation is one of the most innovative techniques in which resource recovery is in the form of biogas and organic manure. The biogas can be used for heating or power generation whereas the sludge from treatment plant is used as organic manure. Economic recovery in the form of biogas and organic manure provides good prospects for self-sustainability of the treatment plant.

Fuel pelletisation is the process of production of fuel pellets from solid waste. The pelletisation technology involves drying, removal of non- combustibles, grinding, mixing and production of pellets. Fuel pellets or refuse derived fuel (RDF) can be used as a fuel for heating plants, boilers, for generation of steam which can be used for generation of powers.

By adopting recent technologies energy recovery is possible from refuse as a by-product in waste treatment process.

These are various technologies like incineration, pelletisation, pyrolysis and sanitary landfilling etc. for energy recovery from the refuse. It is estimated that over 1000 MW power can be generated from the solid waste of India through adoption of waste recycling technologies.

The landfill gas technology can very effectively be utilized for disposing garbage that has relatively high organic contents. In this technology, landfill sites act as a bioreactor in which gas is generated by decomposition of organic matter. It has been estimated that over a period of 10 years, one ton of solid waste can produce more than 100 times its volume. The gas consists of mainly methane and carbon dioxide. It is worthwhile to recover energy when methane gas concentration is high.

The non-biodegradable plastic waste can be also recycled to produce various value-added products. Moreover, the plastic waste can be used for electricity generation, road construction etc. Scientists have also reported the possibility of applications of the plastic wastes to harness sunlight as well as conversion into petrol and probability of biodegradation of polluting plastics using carbohydrate and bacteria.

The municipalities are the primary institutions responsible for solid waste management in our country. However, it is also necessary to harness and integrate the role of private sector, NGOs and waste workers in this field so that the solid waste management practices become totally effective. In the context of solid waste management, private entrepreneurs are gaining entry into the waste collection, transport activities and treatment processes. Private companies can efficiently carry out secondary collection and transport of garbage including vehicle maintenance. The NGOs can help the rag pickers to form waste management associations / groups under the supervision of the local body and relevant residents or market associations. The Municipal Solid Waste (Management and Handling) rules, 2000 (revised in 2016) published by the Ministry of Environment and Forests, Govt. of India apply to every municipal authority responsible for collection, segregation, storage, transportation, disposal and processing of municipal solid wastes. Therefore, urgent implementation of the relevant agenda, regulatory reforms are essential for solid waste management system. The formulation of detailed technical and operational standards relating to handling and disposal of solid waste can show the pathway of proper and uniform planning for urban solid waste management. This can also ensure the environmental sustainability in the long run.

4.4 Conclusion:

The solid waste management has emerged as a major environmental issue in the urban areas. The unscientific and uncontrolled method of urban solid waste disposal can create severe pollution in terms of environmental degradation. The indigenous practices adopted by local people in the context of solid waste disposal is found to be unscientific and unhygienic at many regions of our country. The recycling activities, source reduction and adoption of suitable waste processing technologies should be encouraged to tackle the overwhelming menace. Moreover, the modern technological approaches such as Remote Sensing and GIS technique should be assisted so as to streamline the collection and transportation of solid waste with improved efficiency.

Active participation of local authorities, private sectors, NGOs are necessary, and a systematic approach needs to be adopted for optimizing the entire operation of solid waste management encompassing segregation at source, timely and properly collection, transportation routes, proper operation of sanitary landfill sites etc. Rather than considering the urban solid waste simply as a residue to be thrown away, it should be recognized as a resource material for the production of energy, compost and fuel depending upon the techno-economic viability, local conditions and achieving environmental sustainability for future period of time.

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