

# Challenges in Municipal Solid Waste Management in India

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## ABSTRACT

Due to population growth, industrialization, urbanization and economic growth, a trend of significant increase in municipal solid waste (MSW) generation has been recorded worldwide. Waste generation has been observed to increase annually in proportion to the rise in population and urbanization. As more land is needed for the ultimate disposal of these solid wastes, issues related to disposal have become highly challenging. India, with a population of over 1.21 billion account for 17.5% of the world population (Census of India 2011). According to the provisional figures of Census of India 2011, 377 million people live in the urban s of the country. This is 31.16 % of the Country's total population. The MSW amount is expected to increase significantly in the near future as the country strives to attain an industrialized nation status by the year 2020. This paper discusses methods of treatment of Municipal Solid Waste and the future challenges involved in MSW Management. Research methodology used is secondary sources like journals, text books, research papers and websites.

**Keywords:** Solid waste management (SWM), Municipal solid waste (MSW), disposal system, pollution, land filling.

## I. INTRODUCTION

**Municipal Solid Waste (MSW):** Waste is defined as any material that is not useful and does not represent any economic value to its owner, the owner being the waste generator. Depending on the physical state of waste, wastes are categorized into solid, liquid and gaseous. Solid Wastes are categorized into municipal wastes, hazardous wastes, medical wastes and radioactive wastes. Managing solid waste generally involves planning, financing, construction and operation of facilities for the collection, transportation, recycling and final disposition of the waste.

Sources and Types of Municipal Solid Waste	Typical waste generators	Components of solid waste
Residential	Single and multifamily dwellings	Food wastes, paper, cardboard, plastics, textiles, glass, metals, ashes, special wastes (bulky items, consumer electronics, batteries, oil, tires) and household hazardous wastes
Commercial	Stores, hotels, restaurants, markets, office buildings	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Institutional	Schools, government center, hospitals, prisons	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Municipal services	Street cleaning, landscaping, parks, beaches, recreational areas	Street sweepings, landscape and tree trimmings, general wastes from parks, beaches, and other recreational areas

### Objective of the Study

1. To study the methods of treatment of Municipal Solid Waste.
2. Future challenges involved in MSW Management.

## TREATMENTS AND COMPOSTING OF MSW

India is facing the lack of technical expertise necessary to deal with the disposal of MSW. The disposal methods adopted in India are:

### 1. Composting

Composting has a long tradition particularly in rural India. Composting is difficult process because the waste arrives in a mixed form and contains a lot of non-organic material. When mixed waste is composted, the end product is of poor quality. The presence of plastic objects in the waste stream is especially problematic, since these materials do not get recycled or have a secondary market. In the absence of segregation, even the best waste management system or plant will be rendered useless. The first large-scale aerobic composting plant in the country was set up in Mumbai in 1992 to handle 500 t/day of MSW by Excel Industries Ltd. However, only 300 t/day capacity is being utilized currently due to certain problems, but the plant is working very successfully and the compost produced is being sold at the rate of 2 Rs./kg. Another plant with 150 t/day capacity has been operated in the city of Vijayawada, and over the years a number of other plants have been implemented in the principal cities of the country such as Delhi, Bangalore, Ahmadabad, Hyderabad, Bhopal, Lucknow and Gwalior. Many other cities have either signed agreements or are in the process of doing so, to have composting facilities very soon. In India, composting is used around 10-12% because composting needs segregation of waste and sorting is not widely practiced.

### 2. Incineration

In India the incineration is a poor option as the waste consists mainly high organic material (40–60%) and high inert content (30–50%) also low calorific value content (800–1100 kcal/kg), high moisture content (40–60%) in MSW and the high costs of setting up and running the plants. The first large-scale MSW incineration plant was constructed at Timarpur, New Delhi in 1987 with a capacity of 300 t/day and a cost of Rs. 250 million (US\$5.7 million) by Miljotechnik volunteer, Denmark. The plant was out of operation after 6 month and the Municipal Corporation of Delhi was forced to shut down the plant due to its poor performance.

### 3. Gasification Technology

Gasification is the solid waste incineration under oxygen deficient conditions, to produce fuel gas. In India, there are very few gasifiers in operation, but they are mostly for burning of biomass such as agro-residues, sawmill dust, and forest wastes. Gasification can also be used for MSW treatment after drying, removing the inert and shredding for size reduction. In India one gasification unit installed at Gaul Pahari campus, New Delhi by Tata Energy Research Institute (TERI) and other is installed at Nohar, Hanungarh, Rajasthan by Narvreet Energy Research and Information (NERI) for the burning of agro-wastes, sawmill dust, and forest wastes.

### 4. Refuse Derived Fuel (RFD) Plants

It produces an improved solid fuel or pellets from MSW. The RDF plant reduces the pressure on landfills. Combustion of the RDF from MSW is technically sound and is capable of generating power. RDF may be fired along with the conventional fuels like coal without any ill effects for generating heat. Operation of the thermal treatment systems involves not only higher cost, but also a relatively higher degree of expertise. Many RDF plants are in operation in India, in Bangalore RDF plant was established and has had regular production of fuel pellets since October, 1989, compacting 50 t/day of garbage, converting into 5 t of fuel pellets, which can be designed both for industrial and domestic uses. The RDF plant at Deonar, Mumbai was set up in the early 1990s for processing garbage into fuel pellets. It is based on indigenous technology. However, the plant has not been in operation for the last few years and it is owned by Excel India at present. The Hyderabad RDF plant was commissioned in 1999 near the Golconda dumping ground with a 1000 t/day capacity (but receiving only 700t/day at present). The RDF production is about 210 t/day as fluff and pellets, and it is going to be used for producing power (about 6.6 MW).

### 5. Land filling

A landfill is an area of land onto or into which waste is deposited. The aim is to avoid any contact between the waste and the surrounding environment, particularly the groundwater. In India open, uncontrolled and poorly managed dumping is commonly practiced, giving rise to serious environmental degradation. 60%- 90% of MSW in cities and towns are directly disposed of on land in an unsatisfactory manner. These methods are not in accordance with the practices of sanitary land filling. The dumping is often done in low lying areas, which are prone to flooding, increasing the possibility of surface water contamination during the rainy season. The pollution of groundwater, though largely unassessed, is definitely a threat posed by the dumping of wastes. Such dumping activity in many coastal towns has led to heavy metals rapidly leaching into the coastal waters. The daily cover techniques are poor, which makes leakage easier. This is mainly because of a lack of knowledge and skill on the part of the local authorities. This forces local authorities

to curtail the implementation of even known precautions and practices. However, it appears that land filling would continue to be the most widely adopted practice in India in the coming few years, during which certain improvements will have to be made to ensure the sanitary land filling, even though the major cities like Delhi, Mumbai, Kolkata and Chennai are facing the problem of the limited availability of land for waste disposal.

## **6. Bioreactor Landfill**

A further development in landfill technology is the bioreactor landfill. Bioreactor landfills are designed, constructed and operated to optimise moisture content and increase the rate of anaerobic biodegradation. The principal function that distinguishes bioreactor landfills from conventional landfills is leachate recirculation. The goal is to increase the rate of bio-degradation to achieve maximum gas generation rate and output so as to optimise recovery for energy production. This approach also aims to minimise the landfill stabilisation time and reduce the period of monitoring and liability retention. The bioreactor option is a direct result of engineering and building a new generation of environmentally sound landfills; it provides environmental security while permitting and encouraging rapid stabilization of the readily and moderately decomposable organic waste components.

## **FUTURE CHALLENGES IN MSW MANAGEMENT**

A successful long term planning depends on the characteristics of the solid waste and estimation of future quantities. Decisions related to treatment choices and disposal options for solid waste management will get affected by the composition of solid waste in the future. Thus the future challenges in municipal solid waste management.

### **1. Increasing quantities and changing composition**

Due to growth in population, changing lifestyles and consumption patterns, not only the quantity of waste generated is further increasing but quality and composition of waste is also changing particularly more and more hazardous and toxic waste is being generated both because of industrialization as well as end-of-life products. A noticeable change in composition is observed that as the standards of living improve the proportion of paper and plastics increases – in many developing countries it has doubled in one decade.

### **2 Increasing severity of adverse impacts**

The negative impacts of wastes on the local environment (air, water, land, human health etc.) are becoming more acute often resulting in public outcries and demands for action. The impacts of inadequate waste management are not just limited to local level but are now crossing boundaries and due cases like methane emission are even affecting global environment. More and more water bodies (both surface waters as well as ground waters) are getting contaminated. The land under and around waste dumps are heavily polluted and will require tremendous efforts and resources for rejuvenation.

### **3. Increasing cost of waste management**

Cost of waste management is increasing on several accounts. Firstly, because of the increase in quantity of waste being generated. Secondly, the changing composition of waste with increasing content of non biodegradable and hazardous substances requires increasing complexity and sophistication in waste management techniques and technologies. Finally, with increasing environmental and health awareness the demands on safe and environmentally sound waste management require more careful and extensive waste management.

### **4. Limited policy framework**

As already mentioned, national and local policies on waste management are not yet comprehensive to, cover all types of waste, and all aspects of waste management in India. Policy framework to support resource recovery from waste is still inadequate in India.

### **5. Lack of political priority**

In India, waste management loses out to other political priorities of health, education, infrastructure development, job creation, poverty eradication etc. The realization that waste management could be supportive of these issues is often not there.

## **CONCLUSION**

The changing pattern of waste composition emphasises the importance of segregation for successful operation of waste management facilities. Municipal authorities should maintain the storage facilities in such a manner that they do not

create unhygienic and unsanitary conditions. This situation become havoc due to absence of proper regulation, laws for disposal & treatment of solid waste, lack of planning, lack of financial resources, old equipments & technology and societal dispiritedness. Hence to ensure sustainability in a holistic manner, Indian cities should adopt integrated solid waste management with proper laws and citizen participation.

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