



RESEARCH ARTICLE

SOLID WASTE MANAGEMENT -AN OVERVIEW OF MUNICIPAL SOLID
WASTE HANDLING IN INDIA

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ABSTRACT

Municipal solid waste disposal and handling has become a serious concern for both urban and rural localities as it tends to create nuisance and health hazard thereby deteriorating the environment and ecosystem. Prior recycling can be done in efficient and eco-friendly manner to utilize the usable material from the waste materials for various purposes that may reduce the over exploitation of available natural resources. The waste can be used for generating energy in the form of heat and electricity i.e. waste to energy conversion. It may reduce the consumption of traditional fuels that are used for generating electricity also it can be used serve as standalone plants where electrification has not been done, but before that a proper system of collection, composting processing, recycling and disposal has to be adopted for the efficient and effective handling of the municipal solid waste so that it do not create nuisance to the environment and can be managed in a sustainable manner.

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INTRODUCTION

Solid Waste Management in Indian cities has immensely emerged as a major concern over the past few years. The rise in urban as well as rural population and economic status of people has already increased exponentially from the past situation thereby increasing the number of commodities for daily use which is further disposed of in the form of wastes and further it can be categorized as industrial, commercial or residential solid waste. It is the by-product of Indian society. The waste generated from various locale i.e. residential, industrial as well as commercial has to be effectively collected, processed and disposed. The Poor collection and inadequate transportation are responsible for the accumulation of (MSW) municipal solid waste at every nook and corner. The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amount of MSW generated in class I, II, & III cities. Un-scientific methods of disposal cause an adverse impact on all components of the environment, ecosystem and human health. The waste-to-energy conversion and its conception has become one of the most popular topic in the energy field. It is to be noted that rapid industrialization and urbanization in India has led to the migration of people from villages to cities, which generate thousands of tons of MSW daily.

Status of solid waste and its management in India

Per capita waste generation ranges between 0.2 kg and 0.6 kg per day in the Indian cities amounting to about 1.15 lakh MT (metric tonne) of waste per day and 42 million MT annually. Also, as the city expands, average per capita waste generation increases.

Table 1 Waste generation per capita in Indian cities

Population range (in millions)	Average per capita waste generation grams/capita/day
0.1 to 0.5	210
0.5 to 1.0	250
1.0 to 2.0	270
2.0 to 5.0	350
5.0 plus	500

Source: NEERI (1995)

In countries with low income the waste generation is more as compared to India and waste generation in India is much lower as compared to fully developed countries. In larger cities, especially class I cities, the lifestyle, trend, living standards keep changing with passage of time and it leads to excessive use of more packaging material. Thus the packaging materials tend to increase the waste generation by about 1.3 percent per year.

For and urban population the overall quantity of solid waste in the city is more than 5 percent if the calculated annual growth in population is 2.7 percent to 3.5 percent per annum. India consist

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of 7 mega cities (the megacities are those whose population is above 4 million), 28 metro cities and total of 388 class I towns (whose population is in the range of 100,000 to 1 million range), MOUD2005. The mega and metro cities classified in JNNURM (table A1.1). The Energy and Resource Institute (TERI) has estimated that waste generation will exceed 260 million tonnes by 2047, which is more than five times than present.

Table 2 waste quantity and waste generation rate in cities having population more than one million

City	Waste generation rate (Kg/c/d)	Waste quantity generation (MT/d)
Vadodara	0.12	57.33
Kohima	0.16	12.48
Nashik	0.19	200
Lucknow	0.21	474.59
Guwahati	0.21	166.25
Gandhinagar	0.225	43.62
Jabalpur	0.23	216.19
Ranchi	0.246	208.27
Nagpur	0.25	503.85
Dehradun	0.29	131
Raipur	0.3	184.27
Indore	0.35	556.51
Bhubneshwar	0.36	234.46
Patna	0.37	510.94
Ahmedabad	0.37	1302
Faridabad	0.38	448.01
Dhanbad	0.387	77.12
Banglore	0.39	1669
Bhopal	0.4	574.07
Agartala	0.4	77.36
Ansansol	0.425	206.65
Daman	0.43	15.2
Meerut	0.46	490
Agra	0.49	653.57
Allahabad	0.51	509.24
Ludhiana	0.53	734.37
Jamshedpur	0.59	387.98
Visakhapatnam	0.62	600

Modern integrated solid waste management : Benefits and Concepts

The main aim of solid waste management is to reduce the amount of waste that has to be disposed off, and enhancing the overall efficiency and resource recovery.

Based on hierarchy of waste management a local assessment of appropriate technologies and processes are selected. The hierarchy of waste management include:

Reduction at source: The best and accepted method of controlling solid waste is to reduce or check it at the source of its production, also controlling it at various stages such as product design stage, packaging etc. Reduction of waste helps in reducing environmental constrains such as air emission and green house generation.

Waste Recycling: It is recovery of the materials that are recyclable through different processes such as segregation, collection and reprocessing it to create useful products.

Composting : The waste can be used for composting purpose, it is an agricultural and biological method of treating soil by increasing soil fertility by using the composting material as food for earthworms and other microbes which intake the food material and break them into simpler compounds.

Waste to Energy: The process of extracting energy in the form of heat and converting it to electrical energy by various processes and operations is called waste to energy generation. Various methods such as waste incineration, bio-methanation, refused derived fuels (RDF), and its production, co-generation and various technologies adopted in waste to energy conversion process.

Waste to disposal: The waste that is disposed of by various methods such as sanitary landfills, open dumping, layer by layer compaction, mechanical compaction etc.

Government support towards solid waste management in terms of subsidy

List of statutory clearances/ applicable Acts and non statutory approval required by all MSWM Treatment and /Processing and Disposal Facilities (Manual of MSW GOI 2005)

Statutory clearances

- Environmental clearances [The water (Prevention and Control of Pollution) Act 1947;

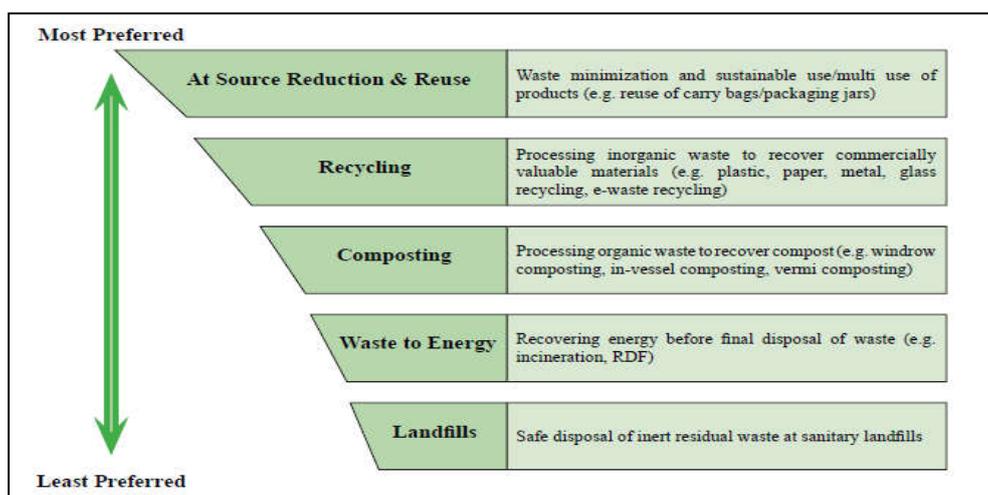


Figure 1 Hierarchy of solid waste management process and handling

- The water (Prevention and Control of Pollution) Cess Act 1977; The Air (Prevention and Control of Pollution) Act, 1981; The Environmental (Protection) Act, 1986, and rules; The EIA, 2006]
- Clearances from pollution control board of states
- Air authority of India clearances
- FCO clearance for compost based plants
- Land use from the Revenue Authority
- Clearance from state electricity control board for connecting through grid

Table 3 Government of India subsidy on solid waste management plant

Project for power generation from MSW involving Refused Derived Fuel (RDF)	Rs. 1.5 Crore per MW
Power based on high rate Bio-methanation technology	Rs 2 Crore per MW
Demonstration project for power generation from MSW based on gasification/ Pyrolysis and plasma arc technology	Rs 2 Crore per MW
Bio methanation technology for power generation from cattle dung, vegetable market and slaughterhouse waste above 250KW capacity	50 percent of project cost upto maximum of 3 Crore per MW
Bio-gas generation for thermal application	Upto Rs 1 Crore per MW equivalent
Project development assistance	Upto Rs 10 Lakh per project
Training course, seminar, workshop etc	Rs. 3 Lakh per event

Non Statutory Approvals

- Water supply agreement
- Power purchase agreements
- Bank loan agreement
- Proof of possession of site
- Bank appraisal note
- Municipal authority agreement with MSW Plant authority

CONCLUSION

The improvement of people and private sector through NGO, could improve the efficiency of solid waste management. The government should support and aware people about the benefits of proper solid waste management.

Public awareness should be created, especially at primary level. The municipal authorities should maintain the storage facilities to avoid un-hygienic and unsanitary conditions. It is advisable to move from open dumping to sanitary land filling in a phased manner. Littering of solid waste should be highly prohibited in cities, town and urban areas. Government should release subsidies to start pilot plant to setup small scale solid waste management treatment plant.

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