

# MUNICIPAL SOLID WASTE MANAGEMENT IN MEGACITIES IN INDIA: A MAJOR CHALLENGE

Paper presentation jointly by

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**INTRODUCTION:-** Megacities are a product of the continuous urbanization process. A megacity is usually defined as a metropolitan area with a total population in excess of 10 million people. Megacities can be distinguished from global cities by their rapid growth, new forms of spatial population density, and both formal and informal economy, as well as poverty, crime, and high levels of social fragmentation. A megacity can be a single metropolitan area or two or more metropolitan areas that converge.

Megacities population is estimated to increase by 280.000 people per day ! In the year 2015 the total population of megacities worldwide will be about 359 million and the future rate of growth will be high, as the development of Jakarta, Delhi, Dhaka and Karachi have shown. Their population tripled between 1975 and 2003. According UN estimation concerning the number of megacities in 2015, Tokyo (36.2 mill. inhabitants), Bombay (22.6), Delhi (20.9), Mexico City (20.4) and São Paulo (20.0) will be the worldwide five biggest megacities each with much more than 20 million inhabitants.

Although cities themselves occupy only two percent of the world's land, they have a major environmental impact on a much wider area. Mega-cities are likely to be a drain on the Earth's dwindling resources, while contributing mightily to environmental degradation themselves.

Megacities face tremendous environmental challenges and threats for human health. **In this framework the role of waste management is becoming more and more crucial both for the daily life as well as for the long to medium term sustainability of megacities.**

**SOLID WASTE :-** Solid waste may be defined as generation of undesirable substances which is left after they are used once. They cannot be reused directly by the society for its welfare because some of them may be hazardous for human health.

There are many definitions of waste in different legislations. The most recent definition can be found in the National Environmental Management Waste Act (DEAT. 2008). This definition states that waste is "...any substance, whether or not that substance can be reduced, reused, recycled and recovered—

- (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
- (b) where the generator has no further use of for the purposes of production, reprocessing or consumption;
- (c) that must be treated or disposed of; or
- (d) that is identified as a waste , but—

- (i) a by-product is not considered waste; and
- (ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste.”

**MUNICIPAL SOLID WASTE IN INDIA:-** A trend of significant increase in municipal solid waste generation has been recorded worldwide. This has been found due to over population growth rate, industrialization, urbanization and economic growth. Consumerism speed has been found very high covering around more than 50% of total population since last decade due to higher economic growth, which has ultimately resulted in increased solid waste generation. Municipal solid waste generation showed different trend and a positive correlation with economic development in term of kg/capita/day solid waste generation at world scale. Total Solid waste generated in Tons per day would be proportionate to the population of specific city in that specific mentioned year. Population growth and solid waste generation in India has varying trend and correlation between population and solid waste generation of specificity is not necessary to be applicable. Population increased from 8.2 to 12.3 million in Mumbai between 1981-97 at the rate of 49%. Similarly the population growth has been found to rise exponentially in other Indian cities; however, the growth rate may be varying. Trend of urbanization played significant role in enhancement of solid waste generation and in India it was 27.8% in 2001 and expected to reach 41% by 2021. In certain Indian cities, Solid waste generation has been found in 1995 was 0.64 kg in Kanpur, 0.52 kg in Lucknow, 0.4 kg in Varanasi, 0.59 kg in Ahmadabad and 0.44 kg in Mumbai. Currently total solid waste generated in India is around 42 million tons annually. Waste generation varies from 200-600 kg/capita/day and collection efficiency ranges from 50-90%.

#### **Objectives of the study:-**

On this backdrop ,the main objectives of the study are:-

1. To understand the quantity of waste disposed in different parts of megacities in India.
2. To examine the role played by government especially the local governments in effective solid waste management.
3. To study the various measures taken by Government towards waste management in big cities.
4. To analyse the problems and challenges faced by the municipals in proper waste management.
5. To find out an better alternative or to give suitable suggestions for effective disposal of wastes.

**Methodology:-** The study is based on secondary data. Various central and state governments survey reports were used for the statistical data collection. Various national and international journals, working papers and books were referred for the additional information. Other than this special articles and editorials of standard newspapers and experts opinions are considered for the study.

**MUNICIPAL SOLID WASTE MANAGEMENT IN INDIA :-**

Waste management is a problem in urban and rural areas. Many areas, particularly in developing countries, still have inadequate waste management; poorly controlled open dumps and illegal roadside dumping remain a problem. Such dumping spoils scenic resources, pollutes soil and water resources, and is a potential health hazard to plants, animals and people. According to the United Nation's Centre for Human Settlements, only between 25 and 55 per cent of all waste generated in large cities is collected by municipal authorities. At least 60 per cent of the countries that submitted national reports to the United Nations in advance of the 1992 Earth Summit said that solid waste disposal was among their biggest environmental concerns. The importance of proper solid waste management is one of the prime functions of the civic body, as improper management of solid wastes is a cause of much discomfort. Since waste management is the fundamental requirement for public health, Article 48-A of the Indian Constitution establishes the responsibility of the state to manage these wastes properly. CPCB with the assistance of NEERI has conducted a survey in 59 cities (35 metro cities and 24 state capitals) in year 2004-05 and reported that 39,031 tonnes of solid waste per day have been produced in India. On the basis of available data, it is estimated that the ten major metropolitan centers in India are presently producing 25,364 tones of solid waste per day as shown in table -1 below.

**Table - 1:- Urban waste situation in some major Indian cities.**

Major cities Waste Quantity	(Tonnes per day)
Surat	1000
Pune	1175
Kanpur	1100
Ahmedabad	1302
Hyderabad	2187
Bangalore	1669
Chennai	3036
Kolkata	2653
Delhi	5922
Mumbai	5320

Source: <http://cpcb.nic.in>

Total number of units engaged in hazardous waste generation in India are 12,584 which are located in different states and some important can be mentioned as in Maharashtra 3953, Gujarat 2984, Tamilnadu 1100 and Uttar Pradesh 1020. As the result of rapid increase in production and consumption, urban society rejects and generates solid material regularly which leads to considerable increase in the volume of waste generated from several sources such as, domestic wastes, commercial wastes, institutional wastes and industrial wastes. Wastes that arise from a typical urban society comprises of garbage, rubbish (package materials), construction and demolition wastes, leaf litter, hazardous wastes, etc. The type of litter we generate and the approximate time it takes to degenerate is shown in table 2

**Table-2:-Type of litter we generate and approximate time it takes to degenerate.**

Type of litter	Approximate time to degenerate
Organic waste (vegetable and fruit peels, foodstuff)	A week or two.
Paper	10-30 days
Cotton cloth	2-5 months
Wood	10-15 years
Woolen items	1 year
Tin, aluminum, and other metal items such as cans	100-500 year
Plastic bags	One million years?
Glass bottles	Undetermined

Source: <http://edugreen.teri.res.in>

. In India, the amount of waste generated per capita is estimated to increase at a rate of 1% - 1.33% annually. For example, the population of Mumbai grew from around 8.2 million in 1981 to 12.3 million in 1991, registering a growth of around 49%. On the other hand, municipal solid waste generated in the city increased from 3200 tonnes per day to 5355 tonnes per day in the same period registering a growth of around 67%.

From the above two tables it can be understood very clearly that how much waste is being generated and how it is increasing with the increase in population and number of years these wastes take to get degenerated.

**Table-3: COMPOSITION OF MUNICIPAL SOLID WASTE IN INDIAN TOWNS (%)**

Population (million)	Paper	Rubber, leather and synthetics	Glass	Metal	Total compostable materials	Inert materials
0.1 to 0.5	2.91%	0.78%	0.56%	0.33%	44.57%	43.59%
0.5 to 1	2.95%	0.73%	0.56%	0.32%	40.04%	48.38%
1 to 2	4.71%	0.71%	0.46%	0.49%	38.95%	44.73%
2 to 5	3.18%	0.48%	0.48%	0.59%	56.67%	40.07%
5 and over	6.43%	0.28%	0.94%	0.8%	30.84%	53.9%

(CPCB, 2000).

The conditions, issues and problems of urban waste management in the Industrialized and developing worlds are different. Though the developed countries generate larger amounts of wastes, they have developed adequate facilities, competent government institutions and bureaucracies to manage their wastes. Developing countries are still in the transition towards better waste management but they currently have insufficient collection and improper disposal of wastes. Generally, Solid waste is disposed off in low-lying areas without taking any precautions or operational controls. Therefore, Solid waste management is one of the major environmental problems of Indian megacities especially in a country like India where there is rapid population growth through urbanization into semi-urban areas on one hand and on the other hand the failure of governance in proper disposal of wastes. Clear government policies and competent bureaucracies for management of solid wastes are needed urgently especially in India .

## STEPS TAKEN BY GOVERNMENT FOR WASTE MANEGEMENT IN INDIA

Every year about 50 million tons of Municipal Solid Waste(MSW) is generated in India. Waste production is increasing by 5% per year due to urban growth, lifestyle and consumption changes. Current MSW management standards are far from satisfactory in India: large cities collect 70-90% of the MSW generated, whereas smaller cities collect less than 50%. Uncontrolled landfilling is practiced in most Indian cities, without any processing. More than 91% of collected MSW is landfilled on open lands and dumped, raising major environmental issues. Every year the open burning of MSW and landfill fires together release a lot of pollutants, requiring immediate intervention.

In response, the government of India framed the Municipal Solid Waste Rules 2000, introducing new obligations for municipal authorities throughout the country, irrespective of size and population. This program introduced objectives and obligations for the better collection, segregation, transportation and suitable disposal of municipal waste, and for the elaboration of awareness programs for segregating waste at source, to promote higher recycling rates. However, implementation remains slow, due to lack of communication with the general public, lack of financial resources, understaffing, lack of adequate training, lack of accountability and lack of support by the states. Consequently, India is now turning to more flexible instruments involving the private sector. With a MSW market for collection and disposal currently valued at approximately USD 570 million and a recycling market that could reach USD 2.5 to 3 billion in the near future, the private sector becomes more and more attracted to the MSW sector.

The Municipal Solid Wastes (Management and Handling) Rules, 2000 was notified by the Ministry of Environment and Forests for management of Municipal Solid Wastes (MSW). Except a few large cities, by-and-large, local bodies of medium and smaller towns have not undertaken regular exercise on quantification and characterization of municipal solid wastes. The Ministry of Urban Development (MoUD) assessed MSW generation in the country to be 1,00,000 Metric Tons or 0.1 million metric tonnes per day (MMT/d) in the year 2001-02. The Central Pollution Control Board (CPCB) made a survey of 59 cities in India during the year 2004-05 to assess the existing status of MSW management which included 35 metro cities and 24 State capitals. Based on this study and on census data of 2011, the MSW generation in the country has been estimated to be 0.673 (MMT/d) in the year 2011.

The average collection efficiency of municipal solid waste ranges from 22% to 60%. The highest per capita waste generation was in the city of Kochi (0.67 kg/capita/day) and the lowest was (0.17-0.19 kg/c/day) in Kohima, Imphal and Nashik. The waste characterization showed that municipal solid wastes typically contains 51 % of organic waste, 17% recyclables, 11% hazardous and 21% inert.. However, about 40% of all MSW is not collected at all and hence lies littered in the city and town and finds its way to nearby drains and water bodies, causing choking of drains and pollution of surface water. Unsegregated waste collection and transportation leads to dumping in open, which generates leachate and gaseous emissions besides causing nuisance in the surrounding environment. Leachate contaminates the groundwater as well as surface water in the vicinity: gaseous emissions contribute to global warming.



Municipalities have been mandated to implement the Municipal Solid Waste (Management & Handling) Rules, 2000 in all towns/cities of India to cover 100% collection, segregation and transportation of waste. However, hardly a few municipalities have taken initiatives for implementation of the Municipal Solid Waste (Management & Handling) Rules, 2000 to set up waste processing and waste disposal facilities. There are 86 mechanized compost plants, 20 Vermi-compost plants, 2 refuse Derived Fuel (RDF) plants, and two with energy recovery system established so far in India. Also Sanitary Landfill Facilities (SLF) have been constructed in the country for scientific disposal of MSW, many of which are in operation.

Given the limited additional funds available to finance the application of such new rules and the potential financial penalties incurred by the municipalities if they do not reach the new standards, this regulatory framework has also encouraged private sector participation to share their technical and managerial capabilities in the establishment of an integrated waste management system through profitable Public-Private Partnerships. About 36% of MSW processing contracts in India today are awarded to the private sector.

## **PROBLEMS OR CHALLENGES FACED IN WASTE MANAGEMENT IN INDIA**

Surface and manual disposal of wastes is the most widely practiced system of waste disposal in Indian cities.

1. Lack of an established system for collection, transportation, treatment, disposal and complete networking of the system is the major drawback in the proper management of waste in these cities.

2. The local bodies which are responsible for proper disposal of urban waste are over-burdened with other responsibilities of much higher priorities such as immunization, food sample testing, street cleaning etc. and waste disposal is relegated to the end of the list. Where it has been possible to establish a waste management system, these are not operated and maintained properly. The reasons for poor operation and maintenance include the following:

- a. Inadequate finances;
- b. Multiplicity of agencies for operation and maintenance;
- c. Inadequate training of personnel;
- d. Lack of performance monitoring;
- e. Inadequate emphasis on preventive maintenance;
- f. Lack of management; and
- g. Lack of appreciation for the facilities set up by the ULB for the use and safety of the community

### **Operational and Transportation Issues:**

The waste is transferred from the wheelbarrows into dustbins. After the waste is collected from the dustbins and streets, it is transported to the final treatment or disposal site. The trucks used for this purpose are generally of an open body type and are kept uncovered. During transfer to trucks and its transportation, the waste spills onto the road. To avoid this and to accommodate more waste on trucks, some corporations and municipalities engage compactor type vehicles. However, the compaction gear adds to the weight of the vehicle increasing fuel consumption and cost of maintenance.

Many cities lack transfer stations and legally notified landfill sites for dumping solid wastes thereby increasing their public health liabilities manifold. Furthermore, the organizational structure within the corporations or municipalities is such that SWM tasks are one of the many to be carried out by the Health Department resulting in insufficient human-power and resources for planning and execution in this area of work. This is compounded by the division of SWM tasks between the Health Department on one hand and the Engineering Department of the Municipality or Corporation, on the other, which results in multiple yet unclear responsibility and accountability in this sector.

### **FINDINGS:-**

1. Megacities have become a part of global network of waste trafficking.
2. Open dumping of waste presents a real threat to human health, constrained by budget pressures, struggling to deal with the proliferation of municipal solid waste management.
3. The land required for waste management is always difficult to be found which acts as a barrier to infrastructure delivery.
4. Today management of municipal solid waste is an important economic sector worth US \$ 390billion in both OECD and other emerging countries providing upto 5% of urban jobs in lower income countries.

### **SUGGESTIONS:-**

It is suggested that an overall national or regional waste policy should govern the multiple activities in the waste sector. A clear, concise and consistent policy is a necessary requirement for the waste industry to establish and set up waste management systems and make necessary investments. Policy should be backed by legislations for all kinds of waste spelling out clear penalty for violations. This is essential for guiding the management of waste in a manner that is environmentally responsible and which minimizes danger to public health.

The Municipal Solid Waste (Management and Handling) Rules, 2000 needs to be amended to incorporate waste reducing, reusing and recycling methods and strategies for achieving sustainable waste management while setting targets and timelines for achieving reduction in generation of waste.

### **Thus, it is recommended that:**

- A specific policy for the management of wastes in India, incorporating the internationally accepted hierarchy for management of wastes should be framed.
- Laws/rules for the management of all major kinds of waste like construction & demolition waste, end of life vehicles, packaging waste, mining waste, agriculture waste and e-waste should be framed. Penalty for violation should also be incorporated in the laws or rules for effective deterrence and achieving compliance.

- Bodies which would be responsible for the implementation and monitoring of the different waste management rules should also be identified, both at the central and state level. A nodal body to guide monitor and train personnel for managing all kinds of waste, should be set up at the Central level.
- A comprehensive assessment of the amount of waste being generated, according to the major waste types, should be carried out periodically. All the states in India should be involved in this exercise so that a comprehensive database on waste is generated for aiding policy-making and intervention.
- Implementation of MSWM Rules could be considered in time bound phases by prioritization and categorization of cities and towns based on population and quantum of waste generation with special emphasis on hilly, coastal and tourist towns and cities.
- National and State level Data Banks must be created with the purpose of disseminating information on characteristics of waste generated, potential for segregation, reuse, recycling and management of MSW. These would help local bodies as well as citizens to understand different aspects of MSW management and the benefits thereof.
- Safety of workers and rag pickers associated with waste handling should be given due attention with emphasis on education for using safety equipment and necessity for immunization.
- Collection of segregated waste must be done by local agencies through NGOs/ Association of rag pickers and Self Help Groups (SHG) groups for making arrangements for collection of waste from:
  - Households
  - Slums and squatter settlements
  - Commercial areas
  - Industrial areas
  - Horticultural nurseries and parks,
  - Sites generating construction and demolition waste
  - Office complexes
  - Slaughterhouses and vegetable markets
  - Healthcare establishments especially their non-infected waste
- Segregation of wastes must be at the level of residential/institutional/ Govt Departments so as to facilitate door - to - door collection of segregated waste. The inorganic/non-biodegradable waste should be channelized through the informal sector workers like door-to-door collection workers, SHGs, waste worker associations and others to registered recyclers for recycling and only the remaining waste, which cannot be recycled should be taken to sanitary landfills by the registered recyclers or the municipality. Awareness about segregation can be achieved through mass awareness campaigns, programmes at school and educational institutions, residential areas, market/commercial areas, healthcare establishments and zones of small manufacturing and service industries. This can be achieved through distribution of pamphlets, hoardings/newspaper/ local cable networks, etc.



- Safe and sustainable Waste management through segregation, collection and categorization of all types of recyclables and their processing/reprocessing should be made mandatory in each municipality. Central Pollution Control Board (CPCB) could help each municipality in identifying the waste segregation, collection, categorization and processing technology best suited to the needs of the municipality.

**Conclusion:-** Though the problem is definite to become more crucial day by day, an effective implementation of waste management strategies will contribute for its satisfactory management. Taking up more research in this sector certainly would help in tackling the growing demand. If the problem of municipal solid waste management is looked from another angle will grow to be one of the most important contributing sectors in the years to come.

### REFERENCES:-

1. S.M. Al-Salem, P. Lettieri, J. Baeyens October 2009 Recycling and recovery routes of plastic solid waste (PSW): A review Waste Management, Volume 29, Issue 10, October 2009, Pages 2625-2643
2. <http://edugreen.teri.res.in>
3. Central Pollution Control Board, 2000
4. <http://cpcb.nic.in>

