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## Review on Solid Waste Management Practice in India: A State of Art

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### **Abstract:**

*This paper deals with the review of Solid waste management practice in India. Since solid waste management consist of lots of waste such as industrial, agricultural, municipal, transport, etc. here in this paper, we focus on municipal waste generated across the country and there treatment in order to conserve environment. As municipal waste is one of the major environment problems of Indian cities. UN effective management leads to hazardous inhabitant. An attempt has been made to provide comprehensive review the characteristics, generation, collection and transportation, disposal and treatment technologies of MSW practiced in India is stated here and discussed.*

**Key words:** Municipal waste, waste management, environment conservation

### **1. Introduction**

India is the second fastest growing economy and the second most populated country in the world. The population of India is expected to increase from 1029 million to 1400 million during the period 2001–2028, an increase of 42% in 26 at the rate of 5.2% annually. About 852 million people live in rural areas and 325 million live in urban areas. The level of urbanization of the country has increased from 26.5% to 38% in the last 50-60 years and is expected to rise to 44% by the year 2026. An important feature of India's urbanization is the phenomenal concentration of the population in Class I cities<sup>1</sup> (metropolitan cities), urban agglomerations/cities having a population of more than 1 million, as depicted by the increase in the number of metropolitans from 23 to 35 in the last decade.[2]

Rapid industrialization and population explosion in India has led to the migration of people from villages to cities, which generate thousands of tons of MSW daily. 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[1]

Poor collection and inadequate transportation are responsible for the accumulation of MSW 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 daily in metropolitan cities. Unscientific disposal causes an adverse impact on all components of the environment and human health

Generally, MSW is disposed of in low-lying areas without taking any precautions or operational controls. Therefore, MSWM is one of the major environmental problems of Indian megacities. It involves activities associated with generation, storage, collection, transfer and transport, processing and disposal of solid wastes. But, in most cities, the MSWM system comprises only four activities, i.e., waste generation, collection, transportation, and disposal. The management of MSW requires proper infrastructure, maintenance and upgrade for all activities. This becomes increasingly expensive and complex due to the continuous and unplanned growth of urban centers. The difficulties in providing the desired level of public service in the urban centers are often attributed to the poor financial status of the managing municipal corporations.

### **2. Literature Survey**

In 2007 Sharholy and Ahmad gives a review report over Municipal solid waste management in Indian cities. In his report they discuss about the Qualitative and quantitative analysis, characteristics and composition, Storage and collection, Transfer and transport, disposals and treatment of Municipal Solid Waste. The study is concluded with a few fruitful suggestions, which may be beneficial to encourage the competent authorities/ researchers to work towards further improvement of the present system

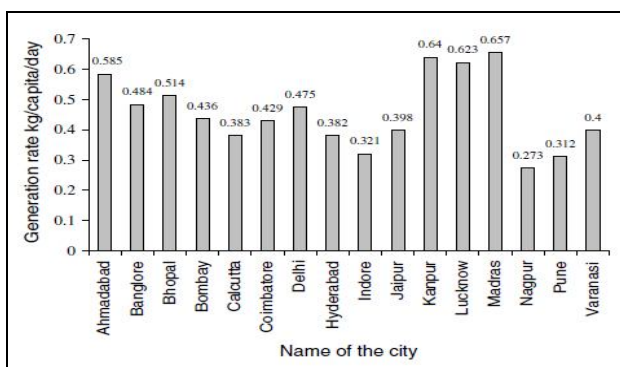


Figure 1: Per capita generation rate of MSW for Indian cities (CPCB, 2004). [3]

Vikash and Shreekrishnan 2008 evaluate the present state of municipal solid waste management in Delhi. Since Delhi is the most populated and urbanized city in India about 3.85% almost double the national average. Delhi is also a commercial hub, providing employment opportunities and accelerating the pace of urbanization, resulting in a corresponding increase in municipal solid waste (MSW) generation. Presently the inhabitants of Delhi generate about 7000 tonnes/day of MSW, which is projected to rise to 17,000–25,000 tonnes/day by the year 2021. MSW management has remained one of the most neglected areas of the municipal system in Delhi. About 70–80% of generated MSW is collected and the rest remains unattended on streets or in small open dumps. Only 9% of the collected MSW is treated through composting, the only treatment option, and rest is disposed in uncontrolled open landfills at the outskirts of the city. They also summarize the proposed policies and initiatives of the Government of Delhi and the Municipal Corporation of Delhi to improve the existing MSW management system.

Parameters	2002	1995	1982
Moisture	43.8	43.7	15–40
Organic carbon	20.5	20.5	22.8
Nitrogen as N	0.9	0.9	0.86
Phosphorus as P <sub>2</sub> O <sub>5</sub>	0.3	0.3	0.74
Potassium as K <sub>2</sub> O	0.7	0.7	0.52
C/N ratio	24.1	24.0	28.0
Calorific value (kCal/kg)	713.0	712.5	661–1200

Table 1: Chemical Composition (as wt. %) of MSW in Delhi. [4]

Hazra and goel 2009 gives an overview of current solid waste management (SWM) practices in Kolkata, India and suggests solutions to some of the major problems. More than around 2920ton/day of solid waste are generated in Kolkata Municipal Corporation, 60–70% are collected with the deficient in terms of manpower and vehicle availability. And conclude Lack of suitable facilities (equipment and infrastructure) and underestimates of waste generation rates, inadequate management and technical skills, improper bin collection, and route planning are responsible for poor collection and transportation of municipal solid wastes.



Figure 2: Road Sweeping (a), regular handcarts (b) and containerized handcarts (c). [5]

Kumar and goel analyzed Municipal solid waste (MSW) management practices in Kharagpur, a small city in West Bengal and propose integrated solid waste management plan. 45mt/d solid waste is collect by Municipal Corporation out of 95mt/d Most of this waste is dumped on open land and in natural and engineered drains, thus blocking the flow of storm water and contaminating groundwater. Other major problems include inappropriate bin locations and poorly designed community bins, collection vehicles that are in poor

condition, inadequate labor for collection and transport of waste, and lack of waste treatment and disposal facilities. 12 samples are collected and tested and various parameters such as moisture content, total solids, fixed solids, organic carbon, volatile solids and calorific value are analyzed and revealed that Kharagpur has high moisture content and low calorific value, making aerobic composting the best treatment strategy. Composting can help to divert more than 80% of the total waste and will lead to enormous savings in costs of waste collection, transport and disposal. The remaining waste can be disposed off in an engineered landfill. Augmentation in labor and vehicle inventory has been proposed along with better treatment and disposal facilities.



Figure 3: Example of a hauled container system used in Bhadreswar municipality, West Bengal. [6]

Narayan gives a comparative report on Landfills, Incineration, and Composting practices in India from Municipal solid waste management - From waste disposal to recovery of resources. Keeping in mind the costs that would be incurred by the respective governments, and identify the most economical and best option possible to combat the waste disposal problem [7]

Seema 2010 focus into the clean development mechanism (CDM) projects involving energy recovery from municipal solid waste (MSW). In her work comparing of Municipal problems, regulatory framework in place and the CDM opportunities in India, also explain RDF, composting and landfill gas recovery methods. Comparative Case study is also taken in consideration between Brazil and India and revealed that the India does not have well designed sanitary landfills where methane can be captured. India needs to make conscious effort towards developing more scientific landfills, capture methane and take carbon credits.[8]

Dimpal 2012 presents a report on Urbanization and solid waste management in India. In his report she describes how the urbanization High rate of population growth, declining opportunities in rural areas and shift from stagnant and low paying agriculture sector to more paying urban occupations, largely contribute to urbanization. The unexpected immigration has also caused the burgeoning of slums and the growth of squatters and informal housing all around the rapidly expanding cities of the developing world. Urbanization directly contributes to waste generation, and unscientific waste handling causes health hazards and urban environment degradation. Solid Waste Management which is already a mammoth task in India is going to be more complicated with the increase in urbanization, changing lifestyles and increase in consumerism. Financial constraints, institutional weaknesses, improper choice of technology and public apathy towards Municipal Solid Waste (MSW) have made this situation worse. At her report evaluates the current practices prevalent in India to deal with this solid waste and problems associated with it. It also provides the measures to deal with this waste in a healthy and environment friendly manner so that it may prove a resource instead of waste.

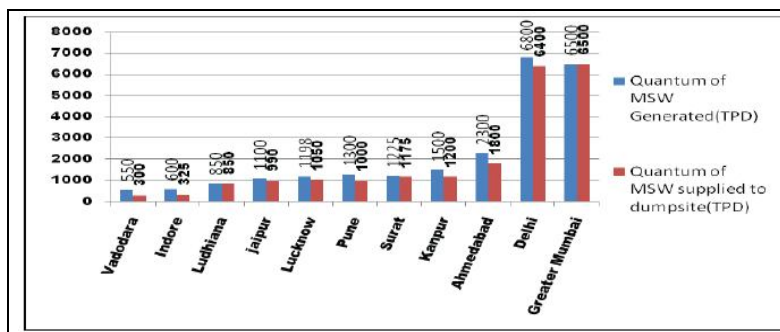


Figure 4: Bar graph representing the quantum of waste generated and the Quantum of waste supplied to the dumpsite for Cities generating more than 550 TPD. [9]

### 3. Conclusion

Since India is a developing country and has large resources of techniques and facilities but due to lack of awareness, political issues, lack of attention toward the duties which are assigned to the govt. officers, etc. are some of the hurdles due to which India is not able to cope up in waste management as compared to other countries. If some effective measure can be taken, lots of things should be done for the growth and development of the society such as proper recycling of waste, making goods from solid waste by proper treatment, which rises employment for unemployed people. A part from these stringent laws should be passed in this regard for proper disposal and

treatment of waste. No new plan of any residential, commercial area should be passed until and unless it has proper place for disposal and treatment of its waste. In India there is a strong case of private sector participation in this area and private sector can come with its expertise, technology, and capital, improved and efficiently managed service. Public participation is of paramount importance and can provide big results if seek properly.

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