



Solid Waste Management: Issues and Challenges in the Management of Municipal Solid Waste in India

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ABSTRACT: As per the Census of India report 2011 India with a population of over 1.21 billion accounts for nearly 17.5 percent of the world population. Rapid industrialization, urbanization, population growth, expansion of basic services and infrastructure, rising living standards of the people have all led to the increase in solid waste in the country. Proper Management of solid waste is a big challenge for the municipalities. These problems can be attributed to the habits and psychology of Indian masses, absence of proper waste collection and segregation system and also unavailability of proper infrastructure to treat and dispose the huge amounts of waste being generated. The high cost of waste management also adds to the problem. Swachh Bharat Mission launched in 2014 seeks to address this problem by creating awareness among masses and developing a system of collecting waste at source (door to door collection). This paper seeks to analyze the issues and challenges faced in Indian scenario and also suggest measures for effective management of solid waste in the country.

KEYWORDS: Solid Waste, Landfill, Waste segregation, Waste disposal

I. INTRODUCTION

Solid waste management problem is acute in most Indian cities. The January 2019 issue of "Swachhata Sandesh Newsletter" by the MoHUA mentions that about 147,613 metric tonnes (MT) of solid waste is generated per day. The 2014 report by the "Task Force on Waste to Energy" under Planning Commission, estimates that urban India will generate 2,76,342 tonnes per day (TPD) of waste by 2021; about 4,50,132 TPD by 2031; and 11,95,000 TPD by 2050. The quantity and composition of solid waste is changing continuously owing to the changing lifestyle, income and consumption patterns of the people. The share of wastes like paper, plastic, e-waste, rubber, glass and metals is constantly increasing. Planning Commission report 2014 suggests that per capita waste generation rate is 200-300 gms/capita for small towns, 300-400 gms/capita for medium towns and between 400-600 gms/capita for large cities. This data highlights the fact that waste generation per head is higher in large cities as compared to small towns. Rising living standards leads to increased waste generation. Further out of the total waste generated nearly 50 percent waste is organic, 31 percent inert waste and 18 percent is recyclable waste. Solid waste management is generally done in four steps which include collection, conveyance, treatment and disposal of the solid waste. The entire process of solid waste management is expensive and the urban or rural local bodies responsible for waste management generally run short of funds required for proper management of solid waste. Shortage of funds leads to poor waste collection facilities as verified by statistics (MoUD 2000) which portray that about 70 to 90 percent waste is collected in larger cities and less than 50 percent in small cities. Improper waste collection leads to overflowing garbage bins in public places with waste scattered all around; this is a common scenario prevailing in most cities. Lack of proper treatment and disposal facilities leads to indiscriminate dumping of waste in low lying areas treated as landfills which further leads to land, soil and air pollution. As per Planning Commission report 2014 more than 80 percent waste is dumped unhygienically leading to environmental degradation. Proper and scientific transportation facilities are also not available, open tractors and trucks are used for transportation of waste which spills on the roads creating unhygienic conditions. This paper attempts to discuss the major issues and challenges faced in India in the course of municipal solid waste management.

II. MATERIALS AND METHODS

This paper relies on collecting and analyzing the data available from existing literature. The data collected from existing literature was examined, analyzed and collated to enable one to understand the current situation of solid waste in India, the issues and challenges faced in solid waste management and also suggests ways to improve the current situation.



III. TYPES OF SOLID WASTE

1. **Municipal Solid Waste:** It includes household waste, commercial waste, street sweepings, etc. This waste roughly has 10.4% food waste, 5.9% glass, 5.2% wood, 9.4% plastics, 7.7% metals, 13.4% yard waste, 38.1% paper, paperboard and 9.9% other things.
2. **Biomedical Solid Waste:** It is the waste from hospitals, dispensaries, diagnostic centres, research laboratories and comprises of discarded medicines, wrappers of medicines, plasters, syringes, needles and other anatomical waste.
3. **Industrial Solid Waste:** It includes slags and sludges, coal ash, chemicals, waste from pharmaceutical industries, paints, waste from tanneries, waste from paper and pulp industries, metal scraps, waste from petrochemical industries, etc.
4. **Agricultural Solid Waste:** Waste like crop waste (rice husk, wheat straws, sugarcane bagasse, etc.) produced due to agricultural operations.
5. **Demolition and Construction Waste:** Includes concrete, bricks, tiles, metals, wood plastic etc generated due to demolition and construction activities.
6. **Hazardous Waste:** Comprises of toxic chemicals, flammable wastes, nuclear waste, explosives, corrosive waste, biological waste. This can be flammable, poisonous, explosive and even corrosive.
7. **E-Waste:** It comprises of both electronic waste like DVD, CD players, television, printers, mobile phones, computers, laptops, etc and electrical waste like refrigerators, washing machines, air conditioners, vacuum cleaners, toasters, irons, etc

IV. WASTE MANAGEMENT SYSTEM IN INDIA

The waste management system in India is mainly the responsibility of the municipal corporations along with the public health department. For the purpose of collection and transportation of solid waste the city is divided into different zones which are further subdivided into different sanitary wards. The municipal authorities pick up waste from their respective areas and then the waste is generally dumped into dumping grounds or landfills situated far away from the residential areas. The system of waste collection generally includes door to door collection where a collection vehicle moves around and the residents of the area put the waste of their household in it. Green colored big bins are also placed at different places in the colonies where the sweepers of the area after sweeping the streets put the waste. Even the residents of the area can put waste in these bins which are then emptied using big trucks generally manually for lack of proper engineered devices for waste collection. Ideally the waste after being collected by the transport vehicle from different wards or colonies should carry it to waste treatment centre where the waste should be segregated and treated. But as mentioned earlier due to paucity of proper treatment facilities, this waste is generally dumped in open areas called dumping grounds or trenching grounds away from residential areas.

In India the waste collection system is done in several ways:

- **Public sector :** This includes local authority and local public departments at the level of the city.
- **Private sector:** This comprises of waste pickers, local raddiwalas/ kabadiwalas (Ragpickers), waste buyers, traders and small scale enterprises which may be registered or unregistered.

| S.No | State | Solid Waste Generation Status | | | | Solid Waste Processing Facility |
|------|--------------------------|-------------------------------|-----------------------------|---------------------------|------------------------------|---|
| | | Total Waste Generated (TPD) | Total Waste Collected (TPD) | Total Waste Treated (TPD) | Total Waste Landfilled (TPD) | |
| 1 | Andaman & Nicobar Island | 120 | 117 | 65.1 | 37.9 | Composting facility at 05 sites and 01 landfill at Port Blair |
| 2 | Andhra Pradesh | 6440 | 6140 | 548 | 203 | 02 Waste to Energy Plants at Guntur & Vishakhapatnam |
| 3 | Arunachal Pradesh | 270.96 | 215 | nil | nil | |
| 4 | Assam | 1293.663 | 1119.37 | | | 02 composting facility |
| 5 | Bihar | 2272 | yes | | no | 156 dumpsites |



| | | | | | | |
|----|------------------|-----------|---------|----------|---------|--|
| 6 | Chandigarh | 470 | 458.52 | 15 | 361.28 | 01 RDF plant of 500 TPD capacity & 01 compost plant of 300TPD capacity |
| 7 | Chattisgarh | 1650 | 1386 | 1271 | 115 | 01 RDF plant |
| 8 | Daman Diu | 98 | 94.5 | 5 | 89.5 | Scientific landfill in process |
| 9 | Delhi | 10817 | 10614 | 5714 | 5225 | 01 landfill,03 waste to Energy plants with a combined capacity of 52 MW energy |
| 10 | Goa | 236.41 | 235.9 | 154.71 | 1.49 | 09 composting facilities |
| 11 | Gujarat | | 11119 | 1127 | 9992 | 95 Vermicompost plants, 06 biogas &05 RDF |
| 12 | Haryana | 4635.79 | 4430.25 | 815.93 | 3614.32 | 04 Waste to Energy & 10 Waste to compost/RDF |
| 13 | Himachal Pradesh | 389 | 340 | 150 | 190 | 01 Waste to Energy Plant |
| 14 | Jammu & Kashmir | 1530.53 | 1452.86 | | | Only open dumpsites |
| 15 | Jharkhand | 2205 | 2043.4 | 836.69 | 0 | Only open dumpsites |
| 16 | Karnataka | 11958 | 10011 | 4515 | | Dumped in landfill without processing |
| 17 | Kerala | 3903.023 | 772.23 | 437.74 | | 721 composting,16 Vermicomposting ,216 biogas facilities atcommunity level |
| 18 | Nagaland | 339.5 | 216.9 | 135.8 | 33.95 | open dumping |
| 19 | Madhya Pradesh | 8000 | 7500 | 6100 | 1400 | 01 RDF,01 Waste to Energy,several dumpsites available |
| 20 | Maharashtra | 23844.551 | 23675.7 | 12623.33 | | 307 composting,76 vermicomposting,52 biogas/ biomethanation,13 RDF |
| 21 | Manipur | 284.4 | 156.38 | 110.5 | 45.88 | |
| 22 | Mizoram | 251.42 | 213.07 | 29.22 | | open dumping |
| 23 | Meghalaya | 170.63 | 170.63 | 8.72 | 161.91 | 01 composting &01 landfill site |
| 24 | Orissa | 2564.43 | 2255.32 | 91.63 | 2163.69 | open dumping |
| 25 | Punjab | 4634.48 | 4574.93 | 917.56 | 3657.37 | 150 SW dumping sites |
| 26 | Pondicherry | 599.25 | 505 | 24 | 481 | 02 composting,01 vermicomposting & 5 biogs plants |
| 27 | Rajasthan | 6625.56 | 6475.39 | 780.18 | 4187.16 | material recovery facility available |
| 28 | Sikkim | 75.1 | 67.1 | 13.05 | 51.4 | 02 solid waste processing facilities |
| 29 | Tamil Nadu | 13968 | 12850 | 7196 | 5654 | Composting,Vermicomposting, Biomethanation ,lanfill facility available |
| 30 | Telangana | 8497 | 8360 | 5747 | 869 | 06 Waste to Energy Plants & 01 Incinerator |
| 31 | Tripura | 445.72 | 389.46 | 150.1 | 239.36 | open dumping |
| 32 | Uttarakhand | 1527.458 | 1437.4 | 524 | | |
| 33 | Uttar Pradesh | 17377.3 | 17329.4 | 4615 | 0 | 12 MSW processing facility |



| | | | | | | |
|----|-------------|-------|-------|-----|-----|---|
| 34 | West Bengal | 14613 | 13064 | 916 | 334 | 09 composting facilities, 13 sanitary landfills |
|----|-------------|-------|-------|-----|-----|---|

Compiled from Annual Report for the year 2018-19 on Implementation of Solid Waste Management Rules (As per provision 24(4) of SWM Rule, 16 published by Central Pollution Control Board, Ministry of environment, Forest and Climate Change, Government of India)

V. CHALLENGES IN INDIA

Analysis of the above table shows that MSW collection efficiency is 98.4% of the waste generation. However the key issues and challenges in India include almost zero segregation of waste at source, lack of public awareness where the masses dump all type of waste in one bin, scarcity of land, lack of technological knowhow and dearth of financial resources for applying the waste management technologies adopted by developed nations. Moreover proper waste treatment facilities are not available in most of the states so that maximum solid waste lands in landfills in mixed form. Waste management in India is still a linear system of waste collection and disposal which actually creates lot of health problems and causes environmental hazards. Although the new “Municipal Solid Waste management Rules 2000” came into effect from January 2004 but a cyclic system of waste management is a distant goal to be achieved. Waste if managed holistically can be wealth and has the potential to generate livelihood for the poor and can also enrich the earth by adopting sustainable techniques like composting and recycling rather than spreading pollution and making the earth a garbage bin. Recycling of waste is the most viable option for developing nation like India as it provides employment to the poor and does not require any specific skill. India being developing nation is adopting technologies which are being abandoned in developed nations. Waste incineration causing adverse environmental impacts is being adopted in India and due to its high cost and adverse effects of incineration emissions on environment is being done away with in developed nations.

VI. SUGGESTIONS FOR FURTHER IMPROVEMENT

The basic problem lies in the mindset of solving today’s problem without thinking about the future. A mindset with emphasis on sustainable technology is the key to a holistic waste management system. Efforts should be made to educate people to sort and segregate waste at source and dispose it in separate bins so that it can be recycled and wet organic waste can be used for composting, vermicomposting, for production of gas by methanation, etc. The aim of an effective solid waste management system should be on 100% waste collection and transportation. If waste segregation and sorting at source is effectively practiced then we can prevent the wealth in the waste from going into the landfills and creating environmental nuisance. General public plays a key roll in waste management and they should be made pioneers by giving incentives and awards to local areas, wards and municipalities which excel in sorting and segregation of waste at source. The private sector can also give commendable services in collection, recycling and treatment of solid waste. Another way is to promote formation of micro-enterprises among the waste recycling sector on the line of developing nations like Latin American countries. Formation of organized microenterprises will help to improve the living conditions of the presently unorganized waste pickers, the kabadiwallahs and the ragpickers. Such initiatives have been taken in few cities like Ahmedabad and are giving good results. The missing links and gaps can be filled by employing dedicated people with technical knowhow who can help in handling technologies in a cost effective manner and help in streamlining the process of handling waste during its journey from collection to treatment to disposal. A system should be adopted where the stakeholders get facility at their doorstep. A very common example is the burning of parali every year in the districts of Punjab which causes uncontrollable air pollution in neighbouring Delhi. Why can’t a system be developed where this agricultural waste is picked up directly from the fields and used to generate energy from this biomass. Wealth can be generated from waste by adopting number of technologies like recycling, composting, vermicomposting, pit composting, small scale anaerobic digestion (production of biogas), production of diesel from plastic waste, use of plastic waste for manufacture of better quality roads and so on. However for effective implementation their should be region specific planning as per the requirements of specific area, planning should be done at grassroot level by involving self help groups, youth, small entrepreneurs and by training the common masses for proper waste management.

VII. CONCLUSION

It can be said assertively that an integrated and strategic waste management system is the key to effectively address the solid waste problem in a country like India. While government efforts has remarkably increased the collection of municipal solid waste however lack of segregation at source prevents proper treatment of waste. Poor financial resources and technological knowhow is the major constraint in extracting the wealth from the waste. ‘Prevention is

better than cure' is a very popular adage; this should be abided by in case of waste management system so that waste generation can be reduced at source as prevention of waste generation will definitely prevent its adverse effects on environment and on the living system. Creating mass awareness, involving youth, common public ,political will go a long way in solving the solid waste management problem in India.

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