Status of Solid Waste Management in India: Problems and Perspectives

C. Annirvinna¹, Smita Sharma¹, Shipra Sharma² and Yashoda Saini³

¹Manipal University, Jaipur Campus, Jaipur, Rajasthan, India ^{2,3}Department of Environmental Science, SS Jain Subodh PG College, Jaipur, India

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ABSTRACT

There has been a tremendous increase in the amount of solid waste generated in India which may be attributed to the increasing population, urbanization and increased disposable income of the population. There persist various challenges for the stakeholders in terms of efficient and effective waste management practices. Many states still have a long way to travel on the waste management road. The present study analyzes the secondary data from various states in India and attempts to uncover the underlying reasons behind mismanagement of waste in these states. The study concludes that municipal solid waste strategies in these states need to be implemented at the ground level to bring about an effective change. Besides the emphasis should now be on waste diversion so that reduced amount of waste reaches the dump sites. Waste processing also offers a challenge which should be handled appropriately by the local government. At the individual level a mass movement is required to bring a behavioral change in the individual during the generation and disposal of waste.

Key words : Solid waste, Municipal solid waste, Mismanagement, Waste diversion, Mass movement, Behavioral change, India

Introduction

Blame it on urbanization and Industrialization, India now produces nearly 150,000 tons of municipal solid waste every day. India's financial capital, Mumbai is now adjudged to be the fifth among the most waste generating cities in the world. Still only 83% of waste that is produced is collected and even of this only 30% is treated. As per the World Bank Report the waste generated by India will reach a mammoth figure of 377,000 tons by the year 2025 which is a very disturbing development (Soyen Park, Raman and Raman Deepsingh, 2018). India would be staring at numerous social and environmental challenges on account of waste generation with respect to public health. Public health would get further jeopardized as there arethousands of informal rag pickers who eke out their livelihood through collection, sorting and selling of thewaste in the most pitiable process. Although the current government has given thetopmost priority to sanitation under the flagship of Swachh Abhyian Progamme, since the progrmame aims more at toilet construction and doing away with the practice of open defecation, it has shifted the attention from huge failure in the management of waste. In this respect India needs to take a leaf out of South Korea's books - a small developing country thatnow boasts of sophisticated waste managementandis now leagues ahead of India. It is crystal clear that it is only political will and a strong demand from the public for a pollution free environment that made this possible in the case of South Korea.

(²Assistant Professor, ³Head) **Corresponding author's email:** envirosmita@gmail.com, smita.sharma@jaipur.manipal.edu, anirvinnamuj@gmail.com

India has ranked among the world's 10 biggest producers of waste currently. It is now on the verge of becoming one of the top four countries producing waste within this decade. India caught up with developed countries in respect of consumption but suffers from deplorable practices of waste management by dumping 80% of waste in the open landfills without bothering about processing. It is high time we stopped giving excuses like paucity of municipal staff, lack of adequate funds and proper equipment etc. for the garbage piling up on the street. We should be questioning ourselves as to whether there are no better and scientific ways for disposing of garbage. Unfortunately, the citizens in the country are not able to appreciate the value of segregation of waste into different bins. Where waste management is concerned India faces difficult choices. We can either seek a new solution to waste management or emulate the technologies and experiences of countries like Germany, the Netherlands, Denmark and Australia etc. Whichever path we choose, the garbage disposal and sanitation do not mean merely the sweepers, andwaste collectors available at our doorstepsat regular intervals. India has been a late comer to the field of scientific management of wastethat involvesusing cost effective innovative technologies.

Today our world is witnessing degradation in the quality of environment through the solid waste being produced in urbancenters. It is believed that nearly 62 million tons of waste are being generated every year in India. But of this vast quantity, only 75-80% is collected. What is worrisome is that of this huge quantity only 22-28% is being processed and treated (Breathe Booklet and Niti Aayog, 2018). Balasubramanian (2018) and Sharma and Jain (2019) have also analyzed the status of municipal waste management in India since 1999-2016. The research suggests policy changes and its implications on the management practices in India. Mandal (2019) reviewed the evolution of waste management in India and explored its policy gaps. Further the blurring of the urban and semi urban boundaries is forcing a large portion of population to live around these dump sites. Lack of civic water supplies in these areas leads to the people utilizing the ground water in these areas as the prime source of drinking water. This enhances the risk of various health hazards arising because of these unorganized dump sites.

This study takes stock of the status of solid waste management in India. It seeks to examine the status

of waste management practices in states across India. The study elaborates on the worst performing states and their waste management cycles. It also proposes efficient practices which may be undertaken for managing the waste which can besuggested to the authorities concerned for implementation.

Review of Literature

The unsafe procedures and direct dumping of waste have led to a degradation in the quality of environment, increase in health related problems and decline in economic activity in the city of Aurangabdad The solid waste should first be segregated using the advanced Geographic Information system (GIS) and Remote Sensing (RS) technologies. This way wastemanagement can be achieved in a proper manner (Shaikh Moiz Ahmed et al., 2006). The rapid growth of Aurangabad has also coincided with the generation of more solid waste and is playing havoc with health of the people located in Naregaon. It is high time we identified the new ways of dumping such as use of GIS. This will help in saving money as well as precious time (Ajay D. Nagne *et al.*, 2014). Improper management of solid waste has often led to both aesthetic and environmental problems. The volatile organic compounds (VOCs), which are part of solid waste, pose huge problems because waste is dumped at the dumpsite in an unscientific manner. These VOCs pose a threat to human health. They are also identified as compounds that are potential carcinogens. The ozone formation at ground level and changes in climate are suspected to be the result of an increase in VOC levels. Two authors analyzed the VOCs being emitted from two municipal waste disposal sites in Mumbai both quantitatively and qualitatively. These sites are Malad and Deonar in Mumabi (Majumdar and Srivastava, 2012). The growing population and affluence have resulted in generation of solid waste thereby putting public health and environment in serious jeopardy. Municipal Solid Waste Management (MSW) is reaching the tipping point in almost allareas of the world and countries are desperately looking for strategies to sustain the environment (Sharma and Jain, 2020). The authors devised a framework in order to determine the socio economic factors that are related to the production of household waste. These factors are income, size, occupation of the family, the educational background etc. (Kaveri Kala *et al.*, 2020). The concept of circular economy provides a solution to the problem of solid waste management in economic, environmental and social feasibility terms. To reduce the consumption of coal in electricity generation, the authors propose a concept that plans to utilize the collected organic MSW for its conversion into biogas. Thus biogas generated is then proposed to be used as a fuel in thermal power plant thus reducing the use of coal. This in turn, will lead to less dependence on the coal mines by industries such as iron and steel (Rathore and Sarmah, 2020). It will also have the additional advantage of producing steel and iron in cleaner and more sustainable manner using solid waste effectively. The 21st century demandslow carbon cements for smart infrastructures (Krishna et al., 2020). The landfilling is extensively used method for disposing of solid waste across the globe and India is no exception to this. This study makes use of vector data and Remote Sensing. It proposes a rank algorithm to identify the landfill sites in places like Coimbatore in south India. In such places nearly 75% of MSW is dumped but it is not treated (Sneha Gautam *et al.*, 2020). The growingpopulation in developed countries has a bused the natural resources resulting in pollutants being released into the atmosphere. The authors consider the Greenhouse gases emitted near Faridabad city in India from MSW and analyzed the performance of land filling and method of converting waste energy based on the recommendations of intergovernmental panel on climatechange (IPCC) model. GHG emission and Linear Pinch Analysis (LPA) were performed (Mahendra Singh and Leena, 2019). The activities of human beings both at household level and by the industrial sectorgenerate huge quantities of waste. This waste is not bio-degradable. It pollutes the whole environment. Suitable methods in waste management and the corporate social responsibility framework can be used to bring in necessary changes in the environment and in the economy (Preethi Rajesh, 2019). To efficiently sell the waste generated involves apportioning the cost of waste processed. This must be done by including households at the primary disposal level. Then private entities can be involved in final disposal (Banerjee and Sarkhel, 2019). MSW had an enormous impact on the quality of ground water in village Ramna, Varanasi, India. The authors in their study evaluated Leachate Pollution Potential Index (LPI) of landfill leachate through physiochemical analysis. This analysis throws a light on the dangerous nature of MSW leachate and focuses on the overall leachate pollution potential (Mishra et al. (2019). The unscientific methods of Municipal Solid Waste disposal led to methane emissions. The authors estimated the level of methane being emitted through the landfill sites in Delhi. They used different models for this purpose (Pooja Ghosh, 2019). Organic waste is being disposed in an unscientific manner thereby causing the release of GHG methane, and CO₂ into the atmosphere. This is contributing to a higher pollution of the atmosphere that is already polluted through release of pollutants. Nearly 60% of the solid waste collected in municipalities is disposed by agencies at sites already identified. The remaining waste is dumped at unauthorized places. This causes environmental problems like emission of greenhouse gases (Ramachandra et al., 2018). Whether the waste management methods adopted are centralized or decentralized, depends upon their acceptance by the local governments (Prathibha Ganesan, 2017). The Alappad Panchayat in Kollam district of Kerala came up with a new system of waste management. It effectively implemented management systems for treating waste generated by the community. The system developed by this panchayat successfully uses colored waste bins having specific labels for easy sorting of waste by the users (Laura Michelle Goris et al., 2017). The proper management of waste is of the utmost importance in a modern city which faces problems like rapid rise in population, rise in the number of demands for improvement to the infrastructure and a constant increase in the number of migrants to the city. In addition to this, the waste administration procedure requires understanding the idea and setting of waste isolation (Kodali and Gorantla, 2017). The inadequate and inappropriate collection of waste leads to land, water and air pollution. Needless to say, it also leads to a lot of risks to human health. There is a serious need to find efficient management techniques forseparating and managing solid waste (Siddappaji et al., 2016). The authorsevaluate and review the major parameters of municipal solid waste management in India. There is a tremendous need for installation of decentralized processunits wherever solid waste management is required to be undertaken. The need to develop an industry specifically for recycling solid waste is of primary importance in a country like India (Rajkumar Joshi et al., 2016). The authors review the various solid waste managementprogrammes and policies undertaken by the government of India. This is to ensure adoption of checks and balances in the system of waste management in India.

Though earlier studies have attempted to capture the status of solid waste in India no study has explored the state wise pattern of waste generation and its disposal practices. The present study reflects light on the worst performing states in India and their waste management cycles in 2018-19. It also proposes efficient practices which may be undertaken for managing the waste which can further be suggested to the authorities concerned for implementation.

The research relies on recent government reports and questions put up in the Parliament discussions about the problems and perspectives of solid waste management in India.

Status of Solid Waste in Various States of India

The state wise solid waste generation clearly depicts Maharashtra leading the list with 8238050 metric tons of waste produced per annum. Maharashtra is followedby states like Uttar Pradesh, Tamil Nadu, Gujarat and Delhi. However,by comparing the population and area covered by these states important insights may be gainedabout the waste produced.The irony however lies in the fact that only a small percentage of this waste is being processed by the municipal and non-municipalbodies. In Maharashtra, the leading state, the waste processed is only 44%, in Uttar Pradesh the figure is around 57% and in Tamil Nadu it is55%. There however may be certain gaps in the actual amount of waste that is collected and finally processed since not all the waste generated is collected by local bodies.

The data suggests that the state of Maharashtra which is leading in terms of waste generation has a total of 7322 wards out of which the door to door collection facility is made available in only 5990 wards. With a per day waste generation of about 22570 MT the processing facility is only for almost half of the waste collected (57%). Similarly, in states like Uttar Pradesh the total number of wards are 12,007 with only 8381 having 100% door to door collection facility. On the other side there are states like Andhra Pradesh, Arunachal Pradesh, Chandigarh, Goa Gujarat and Sikkim which boast of a 100% door

Graph 2. State Wise Total Number of Wards, Collection and Waste Generated under Solid Waste Management in India (As on 31st Dec. 2018)







Graph 1. State-wise Solid Waste Generated and Processed in India *Source:* Lok Sabha Unstarred Question No. 2918, dated on 28.12.2018.

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to door collection process. The waste collection efficiency in India ranges between 70% and 90% in major Metro cities, whereas in several smaller cities it is below 50% (Ministry of Housing and Urban Affairs, 2018-19). However, if the current 62 million tones annual generation of MSW continues to be dumped without treatment, it will need 3.40 lakh cubic meters of landfill space every day.

The overall numeral for India is 84,229 wards with hundred percent door to door collection facility being available in 72,503 wards. The total waste generated is 145687 metric tonnes per day for the entire nation. The national average is 50.19% which suggests that there is still a long way to go further in waste management practices.

Graph 3. State-wise Waste Generation in Urban Areas under Municipal Solid Waste Management in India(As on 31.12.2018)



Source: Lok Sabha Unstarred Question No. 250, dated on 05.02.2019.

A comparative assessment of the urban waste generation in India provides an insight into the sprawling urban boundaries and increased waste generation. Maharashtra provides the lead and is followed by the states of Uttar Pradesh, Tamil Nadu, Gujarat, Delhi and Karnataka. The total waste processing of the urban waste in Maharashtra stands at

Graph 4. State-wise Quantity of Hazardous Waste Generation in India (2016-2017)



Source : Lok Sabha Unstarred Question No. 4553, dated on 19.07.2019

57%. It is followed by Tamil Nadu with 57%, Gujarat 69%, Delhi 55% and Karnataka 32%.

The states leading this list may however be different in the hazardous waste category. The list is headed by Gujarat (2811925.30 MTA) followed by Rajasthan (724663.20 MTA), Odisha (595697.80 MTA), Jharkhand(578788.60 MTA) and Tamil Nadu (383189.20 MTA). There has been a constant increase in the number of micro and medium industrial units in Gujarat as per the government data (Industries Commissionerate, Gujarat State, 2014).

The city wise waste generation in some of the important cities across India depicts a clear-cut increase in the amount of waste generated through various years. There has been a tremendous increase waste wise in all the major cities across India. The population growth rate can also be a contributing factorto the increase in the waste in these cities. However, the increase in the waste generated during the last decade has been substantial. The list being headed by Maharashtra requires an investigation of the various issues for a substantial increase in waste all through these years. However if we dig into the population share in India during the last decade, the increase is 9% overall as per the 2011 census with Uttar Pradesh leading the states with a population share of 16%. The percentage decadal growth rate has also been lower for all the populous states, the fall being the highest for Maharashtra at 6.7 % points (censusindia.gov). The population density however is 365 per square kilometre in 2017-18 as per the economic survey of Maharashtra and it may act as a contributor to the increasing waste generation.

Graph 5. City-wise Municipal Solid Waste Generation in Metro Cities/State Capitals in India



Source: Ministry of Statistics and Programme Implementation, Govt. of India. (ON1964)

Discussion

The study reveals that the present system of waste management in cities should be improved upon by the government through increased stakeholder interventions. The primary aspect which can influence the complete cycle of waste management is the source where the waste is produced. This requires increased community participation that should be initiated with the household being the primary unit. Segregation of waste at the source is a single step which can reduce the burden further down the line of the waste management cycle. If the waste is segregated properly at the source a lot of resources are saved further where segregation becomes a difficult task. Waste diversions in the form of handing suitable waste to the appropriate collector can also aid in the process. Further the next step of proper collection can also lessen the burden on the waste being dumped off at various places making it difficult to handle further. There is still a huge gap in the amount of waste generated and processed in India. The service provision is already informally private - but involves the deployment of informal workers and the transfer of their resources to the formal, corporate sector (Luthra, 2018). The rag pickers form an important link of this chain and should be included in the formal sector to bring about effectiveness in the process. Even the municipal waste collectors are not trained by these bodies to segregate the collected waste in a proper manner. Further the transportation of the waste to the dump sites also creates further havoc by consuming the maximum amount of resources spent on the waste management practices. The open dump sites are a huge menace in most of the cities with the government only thinking about their management rather than acting on the policies laid down. A huge difference was also found in the waste generated in the urban and rural areas. This difference may be attributed to the demographic and psychographic differences in both these areas. Income disparity may also be an important contributor. Further the policy changes brought about in the new Solid Waste Management and Handling Rules should be implemented. There are also some other major challenges related to effective waste policies such as availability of funds, appropriate technology selection and adequacy of trained people (Sharma and Jain, 2020).

Conclusion

Maharashtra is the only state streets a head of others in waste collection and generation due to rapid economic progress of the state. The municipal corporation invests a sizable portion of revenue in the collection of MSW and employs proper separation methods. The other states need to take a leaf out of Maharashtra's books by investing in technology and providing the training to manpower, etc. The several changes have been made in the existing solid waste management rules as per the new guidelines 2016, however the difference will only be visible if the implementation is carried at the ground level. The study also concludes that the recent practices of waste management should be standardized and decentralized in the cities. The uncontrolled open dump sites may further add to the menace. Hence the need of the hour is to work on decentralized systems of waste collection and segregation andthere should be an inclusion of the informal sector in its management cycle. An effective and efficient management of waste cycles and individual behavioral interventions can go a long way in bringing about the required transitions at the ground level.

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