

Municipal Solid Waste: Challenges and Management in India

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Abstract

Municipal Solid Waste (MSW) management is one of the major problems in India and it is a crucial component of sustainable urban development. It includes segregation, collection, recycle, transportation and disposal of solid waste in order to reduce its negative effects on both environmental and human health. Unmanaged MSW contributes to the spread of many diseases. According to my study, developing nations like India urgently need to establish localized solid waste processing facilities in urban areas and establish the recycling industrial sector.

Introduction

Residential garbage, yard waste, construction and demolition (C&D) waste are the most common types of MSW collected from homes, schools, hospitals and businesses locations. Incorrect MSW disposal pollutes streets, water bodies and other various sites, compounding the current problem. Certain MSW may be harmful to human health so it cannot be directly reused for social utility (Upadhyay *et al.*, 2012).





Addressing issues about inadequate waste disposal that relate to health, the environment, appearance, land usage, resources, and the economy is the main goal of Municipal Solid Waste Management (MSWM) plans (Ferronato *et al.*, 2018). The world's urban population is rising at a greater rate than the global population (1.5%) (Das *et al.* 2019). Global MSW production is expected to exceed 2,200 million tonnes per year by 2025, which is a disaster. India, the world's second most populous country, produces about 0.15 million tonnes of MSW every day, of which about 90% gets collected.

Municipal Solid Waste (MSW) management practices

Unfortunately, any city in India can't guarantee of completely sorting garbage at the dwelling unit. Only 12.45% of the total garbage collected was processed scientifically. The key components of a good solid waste management system are environmental friendly, cost effectiveness and community acceptance. Below is a critical analysis of essential MSWM practice criteria in relation to the Indian Scenario.

- A. Segregation:** - Either at the level of the home or the community bin, there is no regulated and scientifically designed for segregation of MSW. Garbage sorting is primarily carried out by the informal sector and seldom it is done by waste producers. The isolated elements have commonly remerged during transportation and disposal due to inappropriate management.
- B. Collection:** - Waste generated by homes is often dumped into public trash cans built of metal, concrete or a mix of both. Street sweepings also finish up in municipal trash cans.
- C. Recycle:** - This involves actions like recycling waste materials that may be profitably recovered and used to create new goods. The best recycling of the garbage is impossible since it is thrown into communal containers without being separated.
- D. Transportation:** - In India, MSWM is practiced using bullock carts, hand rickshaws, trucks, tractors, compactors and dumpers as modes of transportation. For best transportation of MSW, three types of vehicles are used: stationary compactors, mobile compactors/closed tempos and tarpaulin-covered vehicles. Approximately 65, 15, and 20 % of the garbage is carried through each of these compactors, respectively.
- E. Disposal:** - Nearly every city, town and village in India selected an improper method for disposing of MSW. Hierarchically, the following disposal techniques are used.

- Open dumping
- Land filling
- Landfill gas-to-energy plants - mainly CH₄ and CO₂ gases are produced
- Biological treatment of organic waste – vermicomposting

Some major steps taken by GOI for solid-waste management in India

- **National waste management committee:-** Constituted in 1990 and main objective is to identify the recyclable contents in solid waste picked up by rag-pickers.
- **Strategy Paper:-** A manual on SWM has been developed by the Ministry of Urban Development (MoUD) in collaboration with the National Environmental Engineering Research Institute (NEERI) in August, 1995.
- **Policy paper:-** A strategy document was developed by MoUD and the Central Public Health and Environmental Engineering Institute for the treatment of waste water, proper hygiene, SWM, and drainage system effectiveness.
- **Master plan of MSW:-** In March 1995, a plan was created by the joint efforts of the Ministry of Environment and Forests (MoEF), Central Pollution Control Board (CPCB), and Urban Local Bodies (ULBs) to create a master plan for SWM with a focus on biomedical waste.

Contribution of rag-pickers in MSWM

In India for MSWM, the function of rag-pickers in the Indian context is vital. they walk from one communal bin to open dump/land filling sites in search of recyclable materials (paper, plastic, tin, etc.) that may be sold to scrap dealers. Typically, middlemen make the majority of the profit when they buy recyclables from rag-pickers at pre-set prices. Despite the fact that rag-pickers yearly save up to 14% of the municipal budget, their contribution is widely underappreciated and they are typically denied the opportunity to work. According to estimates, rag-pickers lessen the load on transportation and landfill by up to 20%.

Challenges in MSWM

1. **Awareness to enhance segregation:-**The current situation in India shows that practically no rubbish is separated at the source, which causes a number of environmental issues and makes it exceedingly challenging to separate waste at collection points, landfills or treatment facilities. Environmental knowledge and

community involvement are essential for waste source separation, door-to-door collection, and disposal in the proper collecting bin.

2. Characterization of municipal solid waste

Since India is a large country with various climate regions, dietary preferences and living standards, it produces a wide variety of garbage. No significant studies have been carried out to classify the trash produced and deposited on landfills in practically all Indian cities and towns.

3. Urbanization and lack of appropriate level funding:- It is difficult to provide appropriate infrastructure in metropolitan areas due to population increase, therefore choosing a new landfill location is crucial. Due to a financial crisis, Urban Local Bodies (ULBs) lack the necessary infrastructure to offer effective solutions.

4. Implementation of rules at ground level

5. Financial auditing and work study

6. Resistance for notification of new landfill site

7. Lack of coordination among Centre and State

8. Appropriate technological solution, outsourcing and public-private partnerships

9. Failure of waste-to-energy projects

10. Involvement of organized sector

Municipal Solid Waste Management (MSWM) technologies and monitoring tools

To assess the condition of various MSWM technologies among them, 59 developed and developing nations have been classified according on their gross national income. To choose the best MSWM technology(s) for a city or town, 19 selection criteria have been explored (Sharma and Jain, 2020). These factors have an impact on the technologies' application, operational appropriateness and performance. Municipal Solid Waste (MSW) Management is also one of those problems that need to be resolved right away. Current technologies in the waste industry include ultrasonic sensors, metal detectors, and fragrance receptors, which enable for safe and low-cost trash monitoring for MSW Management.

I. Monitoring tool

Sensors	Domain of functionality	Target applications	References

Infrared light-emitting diode	Provides status of container filling every hour to aid in the apply of dynamic scheduling and routing	scheduling in real-time	(McLeod <i>et al.</i> , 2013)
Load cell sensor	Automatically capturing the weight & identity of trash bins.	Main aim to Monitoring of bin status	(Mamun <i>et al.</i> , 2016)
Photovoltaic & Optical sensors	Sorting for recyclable glass containers.	Sorting of glass containers	(Nivetha <i>et al.</i> , 2019)
Volumetric sensor	Framework for improving solid waste collection.	Optimizations of collection	(Wu <i>et al.</i> , 2019)

II. Hazard monitoring

High quantities of germs and endotoxins in the air have been connected to manual handling of solid waste products, which can cause health concerns. From the moment where workers collect or recycle garbage in their workplaces until the point of final disposal, there are risks at every stage of the process. Dust related diseases and symptoms are widespread, and they might endure decade.

Conclusion

The goal of this study is to present status of prevailing practices of MSWM, the rules pertaining to waste management in India, role of rag-pickers and challenges for MSWM. It is crucial to design and execute sustainable, low-cost MSWM techniques in underdeveloped nations like India. The failure of MSWM is mostly due to lack of awareness, improper technical knowledge, inadequate financing, lack of accountability, and execution of laws and regulations. With increased capability, improved processes, and training, problems including good site selection, enough financial support and improper human resource management may be resolved. Not only central government entities, but state governments also need to take a number of steps to enhance MSWM in the nation in order to address the issues related to the development and adoption of relevant technology and a lack of educated labour. In addition to lessening the burden on transportation and landfills, a well developed sector for rubbish reuse and recycling has to be established.

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