



# MUNICIPAL SOLID WASTE MANAGEMENT: A COMPREHENSIVE OVERVIEW OF INTEGRATED SOLID WASTE MANAGEMENT

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**Abstract:** In large cities around the world, municipal solid waste (MSW) has grown to be a serious environmental issue. India has a serious problem with inefficient solid waste management, especially in urban areas. The issues of managing solid waste in the megacities are getting worse as urbanization grows. In 2013, there were 1252 million people, up from 1028 million in 2001. A third of the population resides in cities. Over half of India's population is projected to live in urban areas by 2050, and garbage production would increase by 5% year. Waste generation is projected to reach 101 million metric tons (MMT), 164 MMT, and 436 MMT annually by 2021, 2031, and 2050, respectively. Therefore, the purpose of the current study was to identify the factors that contribute to the generation of solid waste as well as the possible problems.

**Key words -** Solid waste, Solid waste management, Municipal Solid Waste, Municipal Solid Waste management rules 2016, Integrated solid waste Management

## INTRODUCTION

The term "municipal solid waste" (MSW) is a condensation for the trash that cosmopolises collect and handle as a result of mortal-related marketable, domestic, and construction exertion waste. The amount of MSW creation has increased encyclopedically as a result of the exponential growth in population and urbanization, the development of the social sector, and an increase in living morals. On average, rich nations produce 521.9 – 759.2 kilograms (kpc) per person per time, while underdeveloped nations produce 109.5 – 525.6 kpc on average. According to recent estimates, further than 2 billion tons of MSW are generated worldwide each time, which poses a trouble to environmental declination. As a result, MSW operation (MSWM) appears to be one of the most important motifs for environmental protection moment and in the future. With this adding population in cooperative India, external solid waste operation in the country has surfaced as a challenge not only because of the environmental and aesthetic enterprises, but also because of the huge quantities of external solid waste generated every day. TPD of the total MSW, roughly TPD was collected, while only 32,871 TPD was reused or treated (2015 – 2016). It's estimated that Urban India generates between to metric tons of external solid waste every day – some 330- 550 gram per cooperative tenant a day. What is also fussing, is that not only is the volume adding, but the composition of Waste is changing from a high chance of biodegradable waste to non- biodegradable. (Karak, Tanmoy; Bhagat, R. M.; Bhattacharyya, Pradip. (2014). "Municipal Solid Waste Generation, Composition, and Management: The World Scenario)

## UNDERSTANDING THE CONCEPT

Solid wastes can be defined as unwanted materials in simplest term and it can also be nominated as waste in the wrong place inferring that a specific proprietor ceases to have use for it. Solid Waste management (SWM) is a systematized process of storage, collection, transportation, processing, treatment and safe disposal of solid garbage residuals in in an engineered sanitary landfill. It's an intertwined process compromising several collection styles, varied transportation outfit, storehouse, recovery mechanisms for recyclable material, treatment and reduction of waste volume and volume by styles similar as bio-methantion (waste- to- energy), composting, refuse deduced energy (RDF), waste- to- energy, and disposal in a designated in an engineered sanitary landfill. Integrate Solid Waste Management (ISWM) is a comprehensive waste prevention, recycling, composting, and disposal program.

In order to preserve human health and the environment, a successful ISWM system takes into account the best ways to reduce, recycle, and manage solid waste. ISWM entails assessing local requirements and conditions before choosing and combining the waste management practices that are best suited to those circumstances. The main ISWM activities include waste reduction, composting and recycling, waste combustion, and disposal in properly constructed and operated landfills. Careful planning, funding, collecting, and transportation are necessary for each of these tasks. (US EPA – 2002)

## HISTORY OF SOLID WASTE MANAGEMENT AROUND THE WORLD

In **Athens (500B.C.)**, it was the responsibility of each household to transport their scrap to a disposal point located at least 1.5 kilometers from the megacity walls. The Roman Empire brought the first scrap collection service. People threw their scrap into the thoroughfares, where it was transported by steed-drawn wagons to an open hole, which was frequently located within the community. Centuries of unorganized waste collection followed. Because there was a plenitude of land and many people, scrap was simply ditched in accessible locales and forgotten. By the 1700s, refuse had become a major issue; waste was still ditched in the thoroughfares, and open burning of scrap was common practice. And yet, it took another 150 years before scientific reports linking complaint to unprintable environmental conditions eventually helped launch the 'age of sanitation'.

In the **United States**, the ultramodern conception of solid waste operation first surfaced in the **1890s**. By the turn of the 20th century, a growing number of American cosmopolises handed at least a rudimentary position of solid waste collection and disposal, and around 1930 nearly all cosmopolises offered scrap collection services. The waste was taken from communal centers and then disposed of in a number of ways, including landfills, incinerators, water, and oceans. The ultimate was outlawed in 1933, still artificial and marketable wastes were exempted.

Consumption (overconsumption) and the advent of the chemical age, which together resulted in substantial changes in waste amounts, composition, and toxicity, were two factors that contributed to a significant escalation of the waste operation problem in the post-World War II period.

The term "sanitary landfill" was first used in the 1950s, and it refers to a system designed to dispose of solid waste on land. At the end of each working day, it is laid out in thin layers, compacted to the smallest practical volume, and then covered with soil.

It only changed until it became clear that landfills were seriously contaminating groundwater in the 1970s and 1980s. The issue was made worse by the fact that it is very challenging to clean up contaminated groundwater once it has happened. Some new features were consequently introduced. To prevent leachate from leaving the landfill, bottom liners consisting of clay or synthetic materials such as impermeable high-density polyethylene were introduced. To reduce precipitation infiltration, caps constructed of related materials were put on top of the waste. To absorb leachate and gas, engineered collecting systems were also erected. Groundwater, surface water, and gas emissions monitoring have all become commonplace in landfill operations. (Taras foundation. (October 10, 2020).

## KARNATAKA STATE POLICY ON INTEGRATED WASTE MANAGEMENT

### Objectives

The primary objectives of the Karnataka State policy on ISWM are to:

- Provide guidelines for MSWM conditioning in a way that is sustainable in terms of the environment, society, and finances;
- Create a connected and self-sufficient operating framework for MSWM;
- Improve ULBs' capacity to provide efficient waste management services to their residents.
- Enhancing the capability of ULBs to give effective waste operation services to their citizens. Some of the principles of the state policy on ISWM include:
- Promoting public mindfulness regarding minimizing and avoiding multiple running of waste;
- Defining the places and liabilities of colourful stakeholders in an operating frame;
- Developing systems for effective resource application and deployment;
- Promoting recovery of value from external solid waste (MSW); and
- Developing treatment and final disposal installations as per statutory conditions. Minimization of mortal contact with waste and increase in its mechanical running.

## EVALUATING THE CASE OF TELANGANA STATE IN SOLID WASTE MANAGEMENT

The Andhra Pradesh Reorganization Act 2014 established Telangana as the state's capital, with Hyderabad as its capital. The state is divided into 31 districts, with 13.72 million urban residents, or 38.89% of the total population. Telangana's 73 Urban Local Bodies (ULBs) produce 6628 tonnes of municipal solid waste daily, with 4000 tonnes collected, 3040 tonnes treated, and the rest disposed of. Many ULBs lack suitable facilities for treatment and disposal, with the exception of GHMC. The government has allocated Rs. 374 crores from the Twelfth Finance Commission Grant for Solid Waste Management to improve garbage collection, transportation equipment, and land acquisition for processing and disposal. The MA&UD department has divided 122 ULBs into 19 clusters to build WTE power projects under the Public-Private Partnership (PPP) model. Ten clusters, comprising 66 ULBs, have been sanctioned and approved by the state. However, the WTE plants have not yet started operating in full-fledged ways. Despite these measures, there are still significant problems in the solid waste management industry, including a lack of systems, capacity, resources, understanding of sound waste management procedures, lack of scientific landfills and processing technology, lack of significant capital and unrelated O&M costs to revenues, and a lack of institutional frameworks and technical know-how. Community and private sector involvement under PPP mode will greatly improve the processing and disposal activities in Telangana.

The Indian government has launched the Swachh Bharat Mission (SBM) to promote sanitation, waste management, and hygiene in the country. The Ministry of Urban Development and the Ministry of Drinking Water and Sanitation are responsible for implementing SBM in urban and rural areas. The primary goal is to improve cleanliness, hygiene, and quality of life in urban areas. The Government of Telangana (GoTS) proposes strengthening the Municipal Solid Waste Management (MSWM) system in all 72

ULBs in Telangana, including GHMC. This initiative aims to institutionalize a comprehensive, sustainable, and eco-friendly MSWM system in urban local bodies. (NGT 29-04-2019).

## MUNICIPAL SOLID WASTE MANAGEMENT RULES, 2016

### Salient Features of SOLID WASTE MANAGEMENT RULES, 2016

The Government has revamped the Municipal Solid Wastes (Management and Handling) Rules 2000 and notified the new Solid Waste Management Rules, 2016 on April 8, 2016. The salient features of the SWM Rules, 2016 are as under;

1. Areas Cover: These rules are applicable to; (i) Every urban local body (Mega city to Panchayat level), (ii) outgrowths in urban agglomerations, (iii) census towns as declared by the Registrar General and Census Commissioner of India, (iv) notified areas, (v) notified industrial townships, (vi) areas under the control of Indian Railways, (vii) airports/ airbases, (viii) Ports and harbours, (ix) defence establishments, (x) special economic zones, (xi) State and Central government organisations, (xii) places of pilgrims, (xiii) religious and historical importance as may be notified by respective State government from time to time and (xiv) every domestic, institutional, commercial and any other non-residential solid waste generator situated in the areas.
2. The Waste Generators: Every household, Event organizers, Street Vendors, RWAs & Market Associations, Gated Community having more than area 5000 sq.m., Hotels & restaurants, etc.
3. Duties of Waste generators and Authorities: (i) Every Waste Generators shall segregate waste and store separately and hand over to Municipal workers or authorized waste pickers. (ii) Ministry of Environment, Forest & Climate Change shall constitute 'Central Monitoring Committee' to monitor and review every year. (iii) MoUD shall frame National Policy on SWM and coordinate with States/UTs, provide technical guidelines, financial support, training to local bodies, etc. (iv) Departments of Fertilizers & Chemicals shall assist in market development for city compost and make available to companies (3/4 bags compost: 6/7 bags Fertilizers). (v) Ministry of Agriculture shall make flexible Fertilizer Control Order, promote utilization of compost, testing facility for compost and issue guidelines. (vi) Ministry of Power shall fix tariff of power generation from W-T-E project and ensure distribution through companies. (vii) MNRE shall facilitate infrastructure for waste-to-Energy plants and provide subsidy. (viii) Secy- In charge, UD (state/UT) shall prepare State Policy/Strategy, adopt 3- Rs, coordinate for state planning, identification of common/regional landfills, notify guidelines of buffer zones. (ix) District Collector/Magistrate shall facilitate identification of landfill site, quarterly review the performance of local bodies. (x) Secretary, Panchayats: same as Secy. UD at Panchayat level. (xi) CPCB shall coordinate with SPCBs/PCCs for monitoring and Annual Reports, formulation of standards, review new technologies, prepare guidelines for buffer zones restricting from residential, commercial and construction activities areas; and inter-state movement of waste. (xii) Local Authority/Panchayats shall prepare SWM plan with time line and its implementation, segregate, adopt 3-Rs, material recovery, processing/ disposal of Waste, user fee and levy spot fine. (xiii) SPCBs/PCCs shall monitor, issue authorization and regulate. (xiv) Manufacturers/Brand owners shall facilitate collect back wastes of their products and provide pouch for packaging sanitary wastes, etc. (xv) Industry (cement, power plant, etc.) shall use RDF within 100 km. (xvi) Operator of facilities shall follow guidelines/standards
4. Criteria for Hilly Region: Avoid landfill, make waste transfer stations, strict action for littering and construct landfill at plain areas.
5. Waste to Energy plant for waste with 1500 Kcal/kg and above for co-incineration in cement and power plants.
6. Time Frame for Implementation of SWM Rules: (a) Landfill Identification: 1 year (b) Procurement of waste processing facilities: 2 years (c) Ensure segregation of waste: 2 years (d) Cities up to 1 million population: 2 Years (e) Million plus cities: 3 years (f) Setting up sanitary landfills: 3 years (g) Bioremediation/capping of old landfills: 5 years
7. Review of implementation of rules at Various levels; (a) MoEF&CC, Central Monitoring Committee: Every year (b) District Collector review performance of Local authorities: Quarterly (c) SPCBs/PCCs review implementation of Rules with DMA: half yearly (d) Secretary Incharge, UD- State Level Advisory Committee: half yearly.

### A CASE STUDY OF ALAPPUZHA

Alappuzha, a city with a dense population, has initiated the 'Clean Home Clean City' project, which focuses on source segregation to prevent garbage from clogging up its water bodies. The Alappuzha Municipal Council (AMC) has distinguished itself by combining source-level segregation with decentralized waste management. The municipality has carried out 44 programs in educational institutions, 1,600 programs for SHG members, 12 programs for sanitation vehicle drivers, 16 programs for arts and sports clubs, 22 programs for student police cadets (SPC), and more than 50 programs as part of the Canal Rejuvenation Program (CANALY). A self-help group (SHG) led by women named Haritha Karma Sena performs door-to-door garbage pickup in all 52 wards. About 76% of homes participate in this project, with biodegradable garbage given to neighborhood aerobic bins by those without domestic bins, and the SHG solely collecting non-biodegradable waste. Waste is transported using fifty mechanized vehicles and seven non-mechanized vehicles. There are chambers for collecting different types of waste in six different vehicles. Awareness campaigns to promote source-level segregation led to remarkable changes in the attitude of citizens, making waste a problem of the entire community. Many people have been able to find jobs and improve their quality of life. Through scientific treatment of biodegradable waste, about 9,000 households have also been able to make fertilizer at home, which has led to improvements in agriculture. The most important step in waste management is source-level segregation, as that makes it easier to handle the waste in the later stages. Lessons learned include creating awareness about source segregation, involving the community, and the importance of leadership and organization. The new waste management system has been integrated with the waste-picking informal sector, with 93 SHG members. Multilayered plastics are disposed of through extended producer responsibility (EPR) programs, resulting in a significant decrease in garbage thrown in water bodies. The overall health of the community has improved due to control of water-borne illness transmission and the reduction of pollution. Farmers in the area are receiving free compost produced. In Jamshedpur, technology is being used to modernize the city's trash management system with the help of rag pickers and neighbourhood NGOs. The city has tried "Smart Bins" with infrared sensors, but some people still throw mixed-up trash close to the bins. The involvement of rag pickers at the Dry Waste Collection Centers has helped the city manage its non-biodegradable

waste optimally. (Atin Biswas, Subhasish Parida et al. 2021, *Waste-Wise Cities: Best practices in municipal solid waste management*, Centre for Science and Environment and NITI Aayog, New Delhi.)

## CONCLUSION

Municipal Solid waste management has become a serious issue as its disposal are not scientific and have major negative effects on the ecosystem. The improper disposal of waste poses a major threat to public health, especially during the rainy season. Health issues are more likely to occur in leathe and very humid environments. The combined impacts of uncollected wastes, improper management, and insufficient safeguards for disposal of municipal wastes have always had an impact on public health, increasing the likelihood of disease transmission, the spread of epidemics, and the loss of a healthy urban environment.

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