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Solid Waste Management, A Need For A Clean Environment

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Abstract

Major cities have been growing very fast due to good facilities for health and education. These also provide plenty of employment opportunities. The growing population also increases solid waste, which is the main cause of health hazards and pollution. So it needs an environment-friendly solution for its disposal. Only 31% of the Indian population resides in urban areas, this population generates a gigantic 1,43,449 metric tonnes per day of municipal solid waste, as per the Central Pollution Control Board, 2014-15. To further add to the problem, the total number of towns in the country has also increased from 5,161 in 2001 to 7,936 in 2011, thus increasing the number of municipal waste generation by 2,775 within a decade (GOI-manual, 2016). The three landfills in the national capital, Delhi i.e. Ghazipur, Bhalswa and Okhla landfills are examples of mismanagement of solid waste management. It can be possible by involving people at large and giving them good opportunities to earn from this garbage. This paper throws light on this grave concern and searches for people's awareness on a large scale to stimulate their participation and form a habit of solving this problem from its source of origin.

Keywords – Solid Waste, Garbage, pollution, people, environment.

Introduction-

Solid waste, commonly known as garbage, consists mainly of everyday items we consume at home and discard the rest. Solid waste also includes industrial and agricultural materials used in the process. This waste is collected and managed by local municipalities that are responsible for its removal and storage, so it is also termed municipal solid waste. The population in urban areas are expected to rise 40 per cent by the year 2030. Due to the rapid growth of urbanisation, the problem of municipal waste disposal and its proper management has been faced at large in most cities. Solid waste management has become one of the major threats to sustainable growth and development in the major cities. It directly influences the quality of

people's lives and has direct and indirect linkage to economic prosperity as well as linkages to social aspects of life of the people living there. It also affects the health of the people at large. Because of such concerns, it is important to put in place adequate measures to combat the growing source and extent of this type of pollution. Without these, our government efforts to maintain the healthy lives of citizens, to promote tourism, to develop new investments and a sustainable future for major cities may be severely undermined. The smart city mission included solid waste management as one of its objectives for the sustainable development of cities.

Solid waste management – issue at large

Waste is mainly solid substances that are generated by human activities, and that is no longer of value for the respective economic, social or technological process. It mostly includes food wastes, yard wastes, containers and product packaging, and other miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. Examples of organic wastes are office and classroom paper, disposable tableware, newspapers, clothing, food scrapes, boxes, furniture, wood pallets, rubber tires, and canteen or kitchen waste.

This solid waste has now become a major problem in most of the cities. the mountain of garbage, located at Ghazipur landfills is about 65 metres high and roughly as tall as the Qutub Minar, poses a major social as well as government embarrassment in New Delhi. The National Tribunal in 2019 mandated the biomining of the legacy waste and the three landfills in the national capital, Delhi i.e. Ghazipur, Bhalswa and Okhla landfills. But it will take not less than a decade to flatten the largest dumpsite of Delhi in Ghazipur as assessed in 2019 (Financial Express, 2022). The harmful effects of solid waste include water contamination due to improper disposal of solid waste causes diseases like diarrhoea, dysentery, typhoid, cholera, plague, etc. It also modifies the physiochemical and biological properties of plants and soil of nearby areas. It causes groundwater contamination and enhances air and water pollution. It also provides breeding sites for insects and infectious organisms that spread dangerous diseases like AIDS, hepatitis, tuberculosis, pneumonia, diarrhoeal diseases, tetanus and whooping cough (Altin et al, 2003. Mathur et al., 2012, Himabindu et al., 2015).

The management of municipal solid waste in India has surfaced or continued to be a severe problem not only because of environmental and aesthetic concerns but also because of the enormous quantities generated every day. Even though only 31% of the Indian population resides in urban areas, this population of 377 million (Census of India, 2011) generates a gigantic 1,43,449 metric tonnes per day of municipal solid waste, as per the Central Pollution Control Board (CPCB), 2014-15. These figures increase every day with an increase in population. To further add to the problem, the total number of towns (statutory and census) in the country has also increased from 5,161 in 2001 to 7,936 in 2011, thus increasing the number of municipal waste generation by 2,775 within a decade (GOI-manual, 2016).

The component of solid waste management includes prevention of waste, reuse of waste and recycling, separation of recyclable materials from the waste and the use waste as an energy resource development processes and methods of waste disposal, remediation of unregulated dumps, and developing awareness of waste management in-volves waste management. The concept of waste management refers to the activities of collecting, transporting, sorting, recycling, disposal, tracking and monitoring of waste. The biggest problem is the collection of waste for recycling, ie, waste sorting, because some parts of the process must be performed manually, which increases the cost of recycling (Skenderovic et al., 2015).

The common challenges

Solid waste management is a local issue with global implications. As the world's population continues to grow, so does the amount of waste being produced. In 2015, the world generated 2 billion metric tons of solid waste. This number is expected to grow to 3.4 billion metric tons by 2050. In low-income countries, the amount of waste is expected to increase by more than three times by 2050 (Kaza et al. 2018). As waste generation increases, so does the importance of having an effective solid waste management system in place. However, cities and local governments face many challenges when it comes to properly managing their solid waste. As a result, it is estimated that at least 2 billion people live in areas that lack waste collection and rely on uncontrolled dumpsites (UNEP and ISWA 2015)

Cities recognize the many health, environmental, and other concerns associated with inadequate solid waste management; however, they face many challenges in properly managing this waste. Common challenges include limited financial resources and capacity, limited access to and technical knowledge of equipment, limited technical expertise and awareness of best practices, limited staff capacity, political willpower, Lack of planning and evaluation at both national and municipal levels, limited or lack of vertical and horizontal government coordination, difficult working conditions, limited or lack of communications with relevant stakeholders, including residents, Limited available land, climatologic, geographic, and topographic conditions, Cultural norms (U.S. EPA. 2020).

Sustainable and environment-friendly solution

The Indian Government launched the 'Smart City Mission' on 25 June 2015 to promote cities that have core infrastructure, clean and sustainable environments and give a decent quality of life to their citizens. Under this mission, the Government of India completed 5002 projects out of a total of 7742 projects that targeted to make cities clean and sustainable for future growth. This mission emphasized solid waste management among others for making cities better (MoUD, 2015).

Solid Waste Management Rules 2016 mandate local authorities to frame by-laws to levy user charges and also impose fines for littering and non-compliance. This would be a useful source of financial empowerment for the cities assuming that the state governments would approve the user charge levy and local authorities would succeed in collecting the same. Under the Swachh Bharat Mission, the Government of India has committed to spend Rs 14,620 crore out of a total Mission cost of Rs 62,000 crore over 5 years for all of the existing 4,041 statutory towns in the country. The Mission is largely expected to be financed through the

budgets of state/urban local governments, amplified by user charges, unlocking land value, and private sector contributions (Ahluwalia et al., 2018, MoEF, 2016, Mohanty 2016).

No single solid waste management approach is suitable for managing waste in all places. Local governments could work to create a plan that meets the specific needs and conditions of their locality. However, the important steps involved in solid waste management are to reduce, reuse and recycle of raw materials and also include discarding of wastes. Waste may be discarded to landfills, incineration and composting sites.

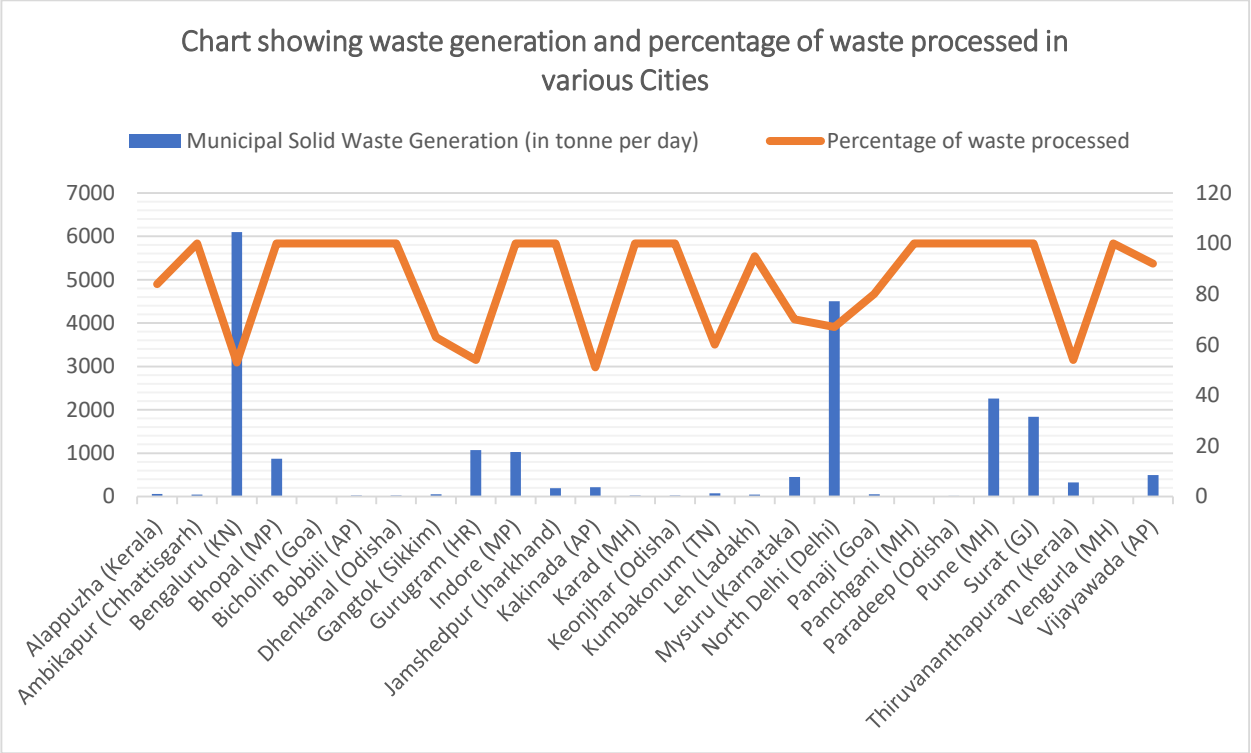
For a healthy environment, proper integrated solid waste management (ISWM) is essential and focuses on the reduction of waste at source, reuse of recovered resource and recycle of residue. With economic efficacy, reduction of environmental impact and ensuring multi-stakeholder participation the ISWM are more advantageous to conventional waste management. The complete cycle of Solid Waste Management contains waste collection, separation, storage, transportation, treatment and disposal. Lack of awareness and modern facilities of proper waste management can cause serious health issues and environmental impact. Rag pickers are responsible for recycling and reuse of this waste with their bare hands. After that, it goes for disposal in open land (dumping yard), incineration, and combustion which liberates hazardous material that has various chronic effects on the ecosystem (Annepu, 2012). Some of the treatment technology and disposal methodologies are very usual and some are too specific for classified wastes (like hospital solid waste, and municipal solid waste) (Sharholy, 2008). With limitations and advantages, the main technologies in the solid waste disposal and treatments are landfilling, composting, vermicomposting, and biomethanation are the Mechanical Biological Treatment (MBT) methods and some thermal treatments like incineration, gasification and pyrolysis, plasma pyrolysis, production of Refuse-Derived Fuel (RDF) are the main technologies in solid waste disposal and treatment (Banerjee et al., 2019).

Comparative Analysis of Solid Waste Management in Some Indian Cities-

Table- Comparative analysis of solid waste management in some Indian cities

S. No.	City	Population (in Million)	Area (Sq. Km.)	No. of Households (2021)	Municipal Solid Waste Generation (in tonne per day)	No. of Sanitation Workers	Percentage of waste processed
1.	Alappuzha (Kerala)	0.17	46.77	48000	56	214	84
2.	Ambikapur (Chhattisgarh)	0.12	41	27247	47.91	470	100
3.	Bengaluru (KN)	13.09	713	3700000	6100	18500	53
4.	Bhopal (MP)	1.8	413	420000	873	7839	100
5.	Bicholim (Goa)	0.017	14.47	4376	6.5	43	100
6.	Bobbili (AP)	0.056	25.6	16271	21.5	167	100
7.	Dhenkanal (Odisha)	0.067	35.5	16649	23	225	100
8.	Gangtok (Sikkim)	0.1	19.05	22255	50	226	63
9.	Gurugram (HR)	0.88	314	420000	1068	1310	54
10.	Indore (MP)	1.9	276	490000	1029	2854	100
11.	Jamshedpur (Jharkhand)	0.63	64	150000	194	1400	100
12.	Kakinada (AP)	0.31	31	120000	213	1206	51
13.	Karad (MH)	0.053	1.5	13900	26	249	100
14.	Keonjhar (Odisha)	0.06	21.93	13627	24	182	100
15.	Kumbakonum (TN)	0.14	12.58	36105	72	390	60
16.	Leh (Ladakh)	0.03	9.1	6820	45	50	95
17.	Mysuru (Karnataka)	0.89	128.42	230000	450	870	70
18.	North Delhi (Delhi)	7.67	636	1470000	4500	26324	67
19.	Panaji (Goa)	0.04	8.12	16000	50	474	80
20.	Panchgani (MH)	0.014	6.2	2697	7.2	35	100
21.	Paradeep (Odisha)	0.068	32.4	17411	16.2	369	100
22.	Pune (MH)	3.12	516	930000	2258	14087	100
23.	Surat (GJ)	4.46	461.6	1430000	1838	10000	100
24.	Thiruvananthapuram (Kerala)	0.95	214.86	380000	325.3	1195	54
25.	Vengurla (MH)	0.012	13	4826	3.3	55	100
26.	Vijayawada (AP)	1.04	61.88	270000	496.7	3779	92

Source- Atin et al. (2021), Waste-Wise Cities: Best practices in municipal solid waste management.



The cities, that performed well in waste management, included the following components to the entire management process- the involvement of the local community in the door-to-door collection, creating awareness campaigns, processing of waste, timely monitoring, generating revenue from waste, and involvement of poor (rag-pickers) were important steps that played an impactful role in their excellent performance in solid waste management (Atin et al. 2021; Paul and Paul 2021).

Successful Stories-

There are many successful stories in different countries following best practices to solve this problem in an environment-friendly manner. Some successful stories (U.S. EPA. 2020) from India are-

1. **The City of Bangalore** - In recent years the City of Bangalore has focused on micro-level planning for waste collection and treatment to reduce their costs and improve efficiency. Currently, more than 15,000 informal sector workers handle waste in the city. These workers provide skilled labour that significantly reduces the city's solid waste management costs. One added benefit of working with the informal sector is that the city has reduced their dependence on traditional contractors, who sometimes overcharge for services and can be difficult to manage. Workers at some of these centers provide door-to-door collection, and then receive financial support from the city. Informal sector workers in Bangalore have found innovative ways to integrate technological solutions into their work. Some have developed phone applications to monitor when their customers' waste bins have been emptied, how much waste was collected, and how well it is segregated (a requirement in India). This review allows informal sector workers to rate their customers' performance; higher ratings can lead to lower collection service fees.

2. **The city of Trichy**- The City of Trichy piloted the use of Quick Response (QR) codes™ by providing them to residents for door-to-door collection and commercial establishments in one ward. Information is entered online instantly as waste collectors scan the QR code™ at each collection point, which ensures that no collection points are missed.
3. **The city of Gangtok**- Following the Swachh Bharat Mission, Municipal Solid Waste (MSW) Management Manual, 2016, GMC has partly outsourced the collection of MSW to local NGOs and SHGs, under the PPP model. As per the agreement, the party is responsible for door-to-door collection of waste using their resources, contacts, and advocacy and deposition of MSW to collection points from where the municipal vehicle picks the waste up to be taken to landfill (Indira, 2021). Sikkim has been at the forefront of a unique green revolution through its waste management system. Residents of Sikkim are increasingly choosing dishes made of paper, leaves, bagasse, and even areca nuts. For activities and meetings, government offices have converted to alternatives such as filtered water, huge reusable dispensers, and reusable water bottles instead of plastic bottles (TFIPOST, 2021).
4. **The city of Indore** - Indore has become the cleanest city in India by mastering segregation at source and subsequent steps in the waste management chain. The Indore Municipal Corporation has taken various steps to improve its waste management process. It spreads awareness and involves the people in segregation and door-to-door collection of waste. It carries out nukkad-natak, and wall paintings, and uses the radio and social media extensively to promote cleanliness among people (Atin *et al*. 2021).

Conclusion-

Municipal solid waste management has become an arduous task for government bodies. The Smart City mission also aims to make cities clean and green with sustainable development. Many successful stories of solid waste management showed that people's participation and awareness are the keys to its environment-friendly solution. The main steps- reduction, reuse and recycling may be helpful when stakeholders are aware to cooperate and willing to help in this effort. Levying some charges at the collection point of the garbage may give them a source of income, which paves the way for people's involvement on a large scale. This is also revealed in the successful stories, how they managed it and changed the entire scenario.

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