



# The Zero Waste Strategy: Opportunities and Challenges in Indore city.

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**Abstract-** Waste is created in every street, town, city, state, country and municipal jurisdiction in the world. And if not managed properly causes threat to the environment, spreading disease among the human and animal population. Even till the 20<sup>th</sup> century, improper waste management (both liquid and solid waste) has created major health epidemics and resulted in an alarming situation. Its impact is visible on the environmental change and the other arising problems that can be noticed now a days. It is very necessary to manage waste timely so that it may not be threat to society. This paper presents a systematic framework for zero waste management in the study area and the practices which are done by IMC and the challenges which are faced by for the implementation of zero waste strategy. The objective of the paper is –To study the opportunities for zero solid waste management in the study area. And to study the challenges for solid waste management in the study area. The study is based on both primary and secondary data. This study is analytical in nature and so the factors are identified on which discussions are done. Also challenges faced for zero waste strategy worldwide are discussed.

**Keywords-** sustainable waste management, Zero waste, opportunities, challenges.

**Introduction-** The urban life is based on pre-planned conditions and programs where life is easy to live in while in rural areas there is no adequate planning for easy lifestyle. So, people easily migrate to planned cities and avail all the facilities of urban life. With the increase in population, improvement in standard of living and the rising demand for food and other essentials has been a rise in the quantity of waste generated per day. Its impact is visible on the environmental change. In India rapid urbanization, industrialization, modernization

has led towards economic development, growth high standard of living . In India there is approx. 17% of the world population which survives only on 2.4% land which has moderate living conditions in the area. human being are some how exploiting the resources and this exploitation, over utilization of resources has led to disastrous problems .one of the major issue is waste generated in the country. India is facing a serious issue of waste which is generated in bulk and heaps of garbage are dumped in the city , on open land ,in water bodies ,on the outskirts of the city ,heaps of garbage (mountain) are found in the area .the waste causes disastrous problem when thrown on road –side ,on open land , in water bodies causes environmental pollution effecting land , water, air. What is waste to the society? Does it harms the health and hygiene of the society? How this waste effects our living standard? The heaps of garbage located at every part of the city is leading over society towards hazardous disaster. can this waste be disposed off safely, what are the measures taken by the society/government to control this issue to sustain a healthy life. can we reduce and recycle the waste so that the community may survive a healthy and hygienic living.

In India, rapid urbanization and uncontrolled growth rate of population are main reasons for MSW to become an acute problem. According to population size per capita waste generation rate and its growth during a decade are growing at a very fast rate. It is anticipated that population of India would be about 1,823 million by 2051 and about 300 million tons per annum of MSW will be generated that will require around 1,450 km<sup>2</sup> of land to dispose it in a systematic manner. Therefore, with 5% annual growth in per capita generation landfill area required for disposal of waste could be many times more.. Effective SWM is a major challenge in cities with high population density .India is at 10<sup>th</sup> position for waste generation in the world due to growing urbanization and high consumption.. The cities of India -Mumbai, Nagpur, Chandigarh, Delhi, Surat, Ahmedabad and Indore are best at managing their municipal waste, and are trying to manage the waste sustainably.

In Madhya Pradesh Indore is marked at no. 1 position with its urban population 2,424,312 (12.1%)in the year 1951 ,census of Indore city was 310,859 then slowly and gradually the population of indore district increased and in year 2011 the population was recorded as 2,167,447 which was increased by 47% from the last census of 2001. due to this rapid increase in population ,waste is generated at higher rates. A survey is conducted by central pollution control board for the assessment and quantification of plastic waste generation in the country for 60 major cities of the country. Indore is marked at 1<sup>st</sup> position in the M.P. and 14<sup>th</sup> position across the country for the plastic generation.

Local governments like corporations, municipalities, towns and village panchayats are unable to deliver services effectively and illegal dumping of domestic residential and industrial waste is a common practice. Local governments have found it increasingly difficult to play major role in managing the solid waste, because of inadequate (funds) budget provision and resulting to poor service delivery and inability to provide the cost-effective services more efficiently. The problems that are faced by local bodies are - low collection coverage, irregular collection services, crude open dumping and burning without air and water pollution control, the

breading of flies and pests, and the handling and control of informal waste picking or scavenging activities (Bartone,1995). Big cities collect about 70 - 90% of MSW generated, whereas smaller cities and towns collect less than 50% of waste generated. More than 91% of the MSW collected formally is landfilled on open lands and dumping zone. It is estimated that about 2% of the uncollected wastes are burnt openly on the streets. About 10% of the collected MSW is openly burnt or is caught in landfill fires. Many a times the gas that is released causes fire in the dumping zones.

Several states and ULBs have developed their own digital solutions to manage the virus's spread and track the situation, including smartphone apps, online health checks, GIS, and electronic passes. The Jalandhar District Administration has introduced an app via Alluzo and a WhatsApp-based service for ordering critical services at government rates. Drones are being used to sanitise crowded areas in Indore, Madhya Pradesh's cleanest zone. The Indore Municipal Corporation has hired two private drones to spray chemicals in the affected areas. Facing limited resources, Dungarpur (Rajasthan) has done exceptionally well in controlling the spread of COVID-19. The national lockdown has resulted in significant improvements in the waste-management industry, including a rise in infectious and biomedical waste, as well as a reduction in the percentage of MSW that reaches landfills or dumpsites. While the volume of SWM has decreased as a result of the closing of restaurants, stores, malls, and other businesses, waste collection quality has been harmed as a result of the reduction of municipal employees. "Following the imposition of the lockout, many waste-pickers were unable to collect waste due to restrictions imposed by the police or apartment societies, which hampered waste collection." The health and livelihoods of informal-sector workers have also been affected by the combined effect of the health crisis and the economic downturn.

In the year 2001 the population of Indore city was 10,86,673 and the waste generated in the area was 600 metric ton per day, in year 2011 the population of Indore city was 19,94,398 and waste generated was approx 800 metric ton per day and in the year 2021 the expected population of Indore city is 34 lakhs approximately and waste generated in the city is 1200 metric ton per day which is segregated as dry waste-550 metric ton per day, wet waste -650 metric ton per day. Indore City is divided into 85 wards. These wards have been clubbed under 19 zones for waste transportation. Waste after collection and segregation is dumped on the transfer zone , compressed and then filled into capsules ( big packed trucks) and then transported to waste disposal site presently at Devguradiya. IMC is keen on substantially improving the quality of service delivery of Municipal waste management activities in the IMC area and wishes to seek private sector participation for collection and transportation of MSW.

**Objectives of study-** There were following objective of the study –

- To study the opportunities for zero solid waste management in the study area.
- To study the challenges for solid waste management in the study area.

**Research Methodology of study-** The study is based on both primary and secondary data. This study is analytical in nature. Therefore, primary data is collected through direct observation, group discussions, and visiting the ward free area, trenching ground in the study area. Secondary data is used from various sources such as Research Papers, Annual Reports, Websites, Journals, Government Websites, Newspapers and an observation of the study area is made to interpret about the various problem and major causes and effect of the waste management.

**Discussion-** Waste management must be accomplished by both waste diversion and commodity reuse. They reduce the need for large-scale treatment and disposal facilities by eliminating waste output at the root of normal generation. Waste minimization is the remedy for management. Recovery of goods and energy from waste, as well as remanufacturing and processing waste into useful items, can be the second solution in cases where pollution cannot be stopped.

**Segregated collection:** In Indore, the waste is produced in a segregated structure. The waste generators are divided into three categories: household, semi-bulk, and bulk. Local generators are those who produce less than 25 kg of waste per day. Semi-bulk generators have been arranged for generators that produce 25-100 kg of waste per day. Bulk generators are waste generators that produce more than 50 kg of waste. Domestic generators produce waste in four separate structures: wet waste, dry waste, biomedical(diapers, sanitary pads, PPE kits, mask, hand gloves) and domestic hazardous waste. The waste is separated into wet and dry waste by the semi-bulk/bulk generators.

**Waste collection and transportation:** Partitioned tippers collect waste in a segregated structure for domestic generators. These tippers have been divided into 50:50, 60:40, or 85:15 proportions. These vehicles collect both wet and dry waste in separate chambers. Domestic hazardous waste and biomedical waste is collected in a separate container attached to the back of the tipper.

**Processing and Disposal-** Dry waste from both exchange stations and bulk collection vehicles is offloaded at MRF locations, where it is further separated and prepared. The wet waste from the exchange stations and the bulk collection framework is trucked to the central composting plant for processing. Individual generators process the wet waste from the bulk generators on site. Residential hazardous waste is treated in a separate facility and transported in biomedical vans directly from the exchange station. At the Central Biomedical Waste Treatment Facility, hazardous waste is burned.

**Dry Waste:** In an automated Material recovery facility, dry waste, which accounts for around half of all waste, is sorted. Separation and sorting of waste materials, as well as preparation of these materials for reuse or reprocessing, are all done at the MRF plant. In the waste disposal process, recycling is critical. IMC had previously built Material Recovery Facility- II at Devguradiya Trenching Ground to manage and process such

large quantities of dry waste. Pre-sorting is performed by 100 mm using a trommel system at this material recovery plant. The waste that passes through is classified as inert material, which cannot be recycled and must be disposed of in a landfill.

**Wet waste:** The separated wet waste is offloaded directly onto the compost plant's windrows by hook-loaders from GTS or bulk collection vehicles. It is assumed that waste will be fitted into one windrow one day. The waste leachate is stored in two Leachate storage ponds that are connected to the windrows. The wet waste that is offloaded is then processed according to normal procedures. As a result, the city's centralised processing plant processes and disposes of 600 MT of organic waste. The wet waste in the study area is disposed in decentralized manner. Decentralized wet waste processing has been established at Nandlalpura vegetable and fruit market, Rajkumar mill vegetable market, and Khajrana Ganesh Mandir using the aerobic pit composting method and the Organic Waste Converter System to turn flower waste into compost.

**Biomethanation:** Indore Municipal Corporation has taken a one-of-a-kind initiative to manufacture and use Bio CNG derived from the processing of municipal solid waste. Indore has built a 20-tonne-per-day (TPD) biomethanation plant in Choithram Mandi, which is essentially a whole-sale fruit and vegetable market that generates a large amount of wet waste.

### **Implementation of 3R Model in Indore City**

**Reduce, reuse, and recycle (3R)** are three words that come to mind when thinking about how to save money. When it comes to waste management, waste prevention, waste recovery, and recycling are the chosen methods. The usage of these approaches will result in a plethora of environmental advantages. They mitigate or avoid greenhouse gas emissions, pollutant emissions, resource conservation, energy conservation, and the need for waste management technology and landfill capacity. As a result, it is recommended that these approaches be implemented and integrated into the waste management strategy.

The MoHUA is committed to encouraging scientific SWM, especially in quarantined households. Because of the nature of their jobs, sanitation workers on the front lines are among the most vulnerable. In light of this, the MoHUA has issued a number of guidelines and advisories for states, local governments, and contractors who hire sanitation and faecal waste management staff to obey. There are three types of boards in the Central Advisory.

1. Standard Operating Procedure
2. Specific measures for sanitation workers
3. Availability of PPE kits/safety gears and disinfectants for sanitation workers

In addition to the broad categories, the MoHUA has issued advisories to help ULBs in the following areas:

1. Special cleaning of public places
2. Safe disposal of waste from quarantined households
3. Safe disposal of masks and other related waste from quarantined households, and transportation without mixing with other household wastes
4. Welfare and protection of sanitary workers engaged in collection and transportation of COVID-19 waste.

This central garbage processing plant was constructed on the site of Indore's former major dumping ground. The city government rented machines in 2018 to separate the legacy garbage and clean up the facility. A portion of the cleaned-up dumping ground has been turned into a park by planting trees. The Indore Municipal Corporation has chosen to make 5 of its wards Zero Waste Wards, which would be expanded to all 85 wards in the future. Ward No. 32 has been designated as a "zero waste" ward by the Feedback Foundation (Adarsh Ward). Team Feedback Foundation has begun mobilising the ward's citizen groups. They are being educated on trash minimization, garbage separation at the source, and keeping the environment clean. They have been instructed to sort rubbish into four categories and keep separate bins for each: blue bin for recyclables/dry waste, green bin for biodegradable/wet trash, red bin for household biomedical waste, and black bin for household hazardous trash. Citizens are also being visited at their homes to encourage them to modify their behaviour by instilling more responsible waste disposal behaviours, properly categorising waste, and guaranteeing correct disposal. They are also encouraged to begin composting at home. Citizens are also enthusiastic about making their ward a "zero waste ward" and setting an example for other Indore wards.

**Challenges for Zero Waste strategy** - Finance for Solid waste management is a major obstacle, much more so for recurring operating costs than for capital projects, and operational costs must be factored. Operating costs for advanced waste management, which include collection, transportation, treatment, and disposal, typically surpass \$100 per tonne in high-income countries. In actual terms, lower-income nations pay less on waste activities, with prices averaging \$35 a tonne and even higher, but they have a much harder time recovering costs. Waste treatment requires a lot of manpower, and shipping costs alone will vary between \$20 to \$50 per tonne. The cost recovery for waste services varies dramatically depending on one's income status. User payments vary from \$35 a year in low-income countries to \$170 a year in high-income countries, with high-income countries having the best chance of recovering all or almost all of their costs. Depending on the form of customer being billed, user rate structures may be set or variable.

## **Emerging Challenges in Solid Waste Management around world.**

After China and the United States, India is the world's third-largest producer of solid waste. It faces major waste generation, storage, treatment, and disposal problems. ULBs are ill-equipped to manage the growing volume of waste, which is a direct result of India's growing urban population and average income, which has resulted in significant changes in city consumption patterns. The lack of waste segregation and doorstep processing, the use of ineffective treatment systems, and the indiscriminate disposal of waste are all major problems for the SWM system. The problem is made worse by the public's callous attitude toward waste. The following are the key challenges in the sense of SWM in India:

- ❖ Data on the amount of waste generated in India is inconclusive because there is no mechanism in place to collect data on waste generation on a regular basis. As a result, solid waste estimates and forecasts differ greatly from one agency to the next.
- ❖ SWM Rules 2016 require waste to be separated at the household level, which means waste generators must separate waste into three categories: biodegradable, non-biodegradable, and hazardous waste. Following that, the segregated waste must be given to approved waste collectors. ULBs, on the other hand, have failed to establish the systems and technologies needed for waste segregation, collection, and processing. Furthermore, there is a general lack of understanding of the segregation mechanism.
- ❖ According to research, India's waste collection efficiency is poor due to non-uniformity in the collection system. Only in areas where private contractors and non-governmental organisations are actively involved can waste management efficiency reach 100%.
- ❖ In India, most cities and towns dispose of their waste by depositing it in low-lying areas outside of the city, with no appropriate safeguards in place. According to research, there is no land suitable for landfill. Seeking new land becomes a big obstacle for ULBs because they lack the financial means to do so.
- ❖ There have been no systematic studies covering all of the country's cities and towns to characterise the waste produced and disposed of in landfills. As a result, it is difficult for policymakers to provide appropriate solutions for waste generated in a specific area.

### **Challenges for waste management in the Study Area.**

- ❖ Local governments lack sufficient resources and infrastructure. As a result, they are unable to implement advanced and effective waste management and disposal technologies.
- ❖ In Indore, waste to energy (WtE) is a commonly used technology, but it has a number of drawbacks, including unsegregated waste and seasonal variations in waste composition. Due to operational and design problems, most Waste to energy plants cannot work effectively, according to various research documents.
- ❖ The COVID-19 pandemic has presented a new set of challenges in Indore SWM system, including maintaining social distances at treatment plants and among collection workers, as well as a shortage of personal protective equipment (PPE) and safety gear for conservancy staff. These issues jeopardise SWM employees' protection, waste management requirements, and other procedures.
- ❖ There is a lack of adequate preparation and indigenization of sophisticated waste processing facilities, as well as routine waste-collector training.

**Conclusion-** It is obvious that sustainability cannot be considered as an afterthought in the solid waste management process. It must be incorporated into the system's various components and their interactions. Promoting the 3R concept, which reduces consumption and eliminates excessive GHG emissions. Recycling of waste, help minimize GHG pollution because manufacturing a product with virgin materials needs more energy than manufacturing a product with recycled materials. Composting organic waste used to increase soil carbon content and help agriculture replace chemical fertilizers. Compost aids in carbon sequestration by reintroducing carbon into the soil. Other advantages of compost includes increased soil moisture retaining ability and porousness, which reduces the need for tillage. To maintain the segregation, collection, transportation, disposal of waste timely are very important for zero waste to landfill site.

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