SOLID WASTE MANAGEMENT IN INDIA: CURRENT SCENARIO

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***Abstract*- The issues of solid waste management in India today are discussed in this research article. The most serious environmental problem is waste management and disposal. Municipal solid trash is rapidly increasing as a result of urbanisation and population growth.The composition of garbage changes depending on a number of variables, including socioeconomic status, meteorological circumstances, and living standards.**

I. INTRODUCTION

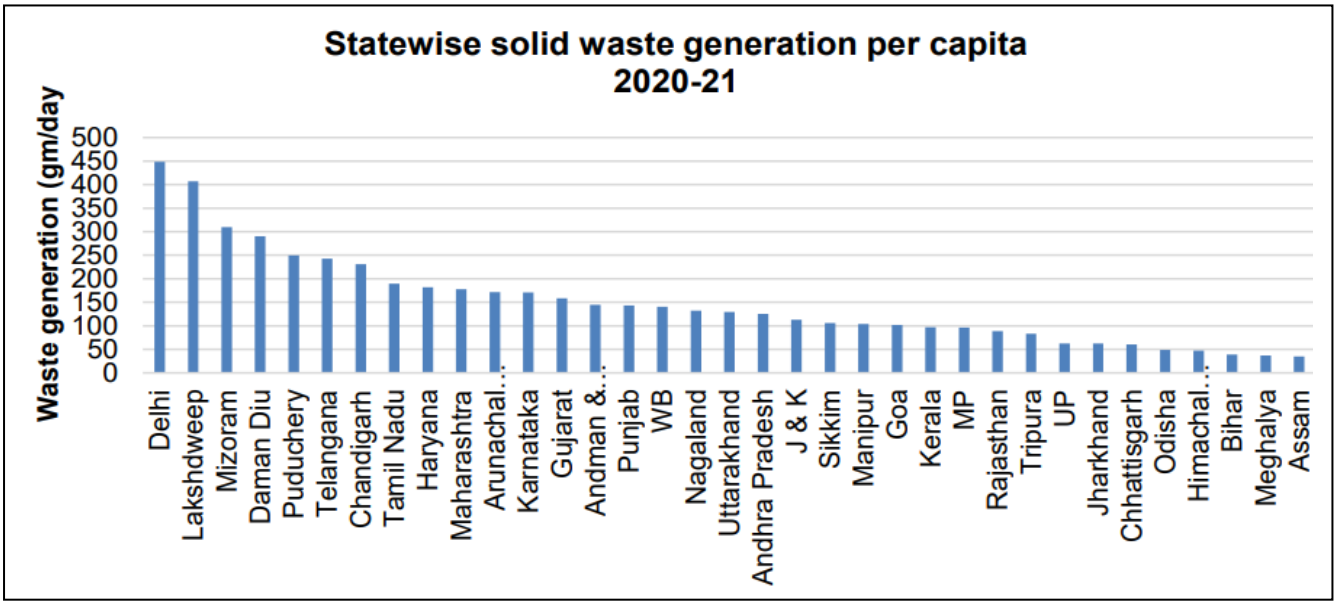
In developing countries, over 90% of solid waste is usually burned outdoors or deposited in unregulated dumps. Poor waste management has a detrimental effect on infrastructure, public health, the environment, and the quality of life for citizens. It significantly affects climate change as well.

The organic component of rubbish has substantially dropped while the inorganic component has increased. Additionally, rubbish from establishments like shops, hospitals, residences, and many other places has a detrimental effect on the environment and public health. Additionally, the chemicals created by unlawfully disposing of these wastes infiltrate the air, land, and water resources, having hazardous and toxic effects in countries that were unable to strictly apply the agreed regulatory framework.

The collection and transportation of mixed, unsorted garbage are the main concerns of the current system. Both resource recovery from trash and the secure disposal of residual garbage in landfills with solid engineering are sadly underappreciated. Although there are already legislation for sustainable solid waste management, it will be challenging to create the system, manage operations, and ensure that the rules are followed.

II. INDIA'S ANNUAL SCENARIO FOR SOLID WASTE GENERATION

A total of 160038.9 TPD of solid waste are produced in the nation, of which 152749.5 TPD are collected with a 95.4% efficiency rate, 79956.3 TPD are treated, and 29427.2 TPD are landfilled. 31.7% of the entire garbage produced, or 50655.4 TPD, is still unaccounted for.



Year	Solid Waste Generation Per Capita(gm/day)
2015-16	118.68
2016-17	132.78
2017-18	98.79
2018-19	121.54
2019-20	119.26
2020-21	119.07

III. .FUNCTIONAL ELEMENTS

Segregation, collection, transportation, processing, and disposal are only a few of the various functional components involved in managing solid wastes.

Waste Production

Wastes are produced at the beginning of every process as well as at every stage after that as raw materials are transformed into products for consumption. Quantity, content, and other waste characteristics are determined by the source of trash formation.

Waste Management

After collecting and before being transported to the site for processing or disposal, waste must be stored. The type of garbage will determine how long it will be stored. For instance, because biodegradable waste is putrescible, it cannot be kept in a storage container for an extended period of time.

Waste collection

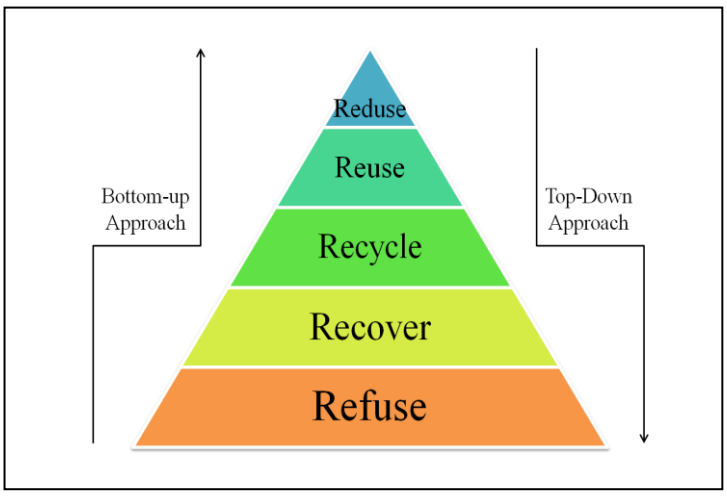
The two primary components of collection are the transfer of waste from the place of generation to the next collecting point, the transfer of waste from that point to the big trucks needed for transportation or to the transfer stations, and ultimately the transfer of waste to the processing facility or disposal location.

IV. SOLID WASTE MANAGEMENT FRAME WORK

At the federal and state levels of government, the Central Pollution Control Board and the State Pollution Control Boards/Committees disseminate environ -mental policy, pollution monitoring, and reporting. Locally, plans and regulations are put into effect by municipal authorities and cantonment boards in the territories under their control. They create infrastructure for solid waste disposal as well as for collection, segregation, transportation, storage, treatment, and processing.

Waste hierarchy[4Rs]

The "4 Rs" approach (reduce, reuse, recycle, and recover) is referred to as the "waste hierarchy," and it categorises waste management techniques according to how desirable they are for minimising waste.



Principle of Polluter pays

According to this theory, the polluter is responsible for the damage they do to the environment. Here, it alludes to the demand that a waste creator cover the cost of proper trash disposal.

Extended producer responsibility

EPR is a marketing tactic intended to encourage the inclusion of all expenses related to products throughout their life cycle, including end-of-life disposal costs, in the product's market price. Its goal is to establish accountability across the whole lifecycle of newly released goods and packaging.

V. AN ACTIVITY SENSITIVE STRATEGY

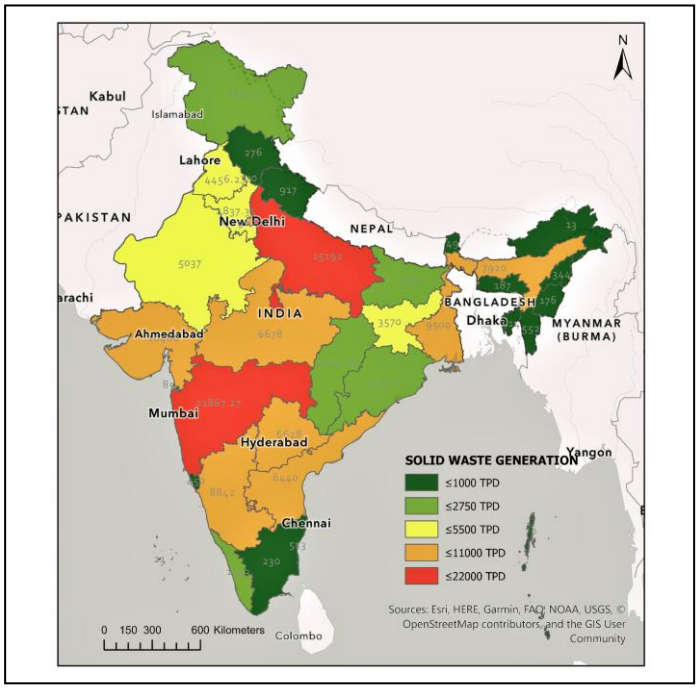
- Enhance Source-Based Waste Segregation and Storage.
- The Main Collection. Direct Waste Collection in Bulk.
- Leaf Blowing.
- Establish Transfer Stations and Secondary Waste Storage Depots.
- Boost Waste Transport.
- Decide on options for recycling and treatment.
- Complete Disposal through the Development of Sanitary Engineered Landfills.

VI. SOLID WASTE TYPES AND GENERATION

Household waste, municipal garbage, or domestic waste

According to the Municipal Solid Wastes (Management and Handling) Rules 2000, which the Government of India prescribed under the Environment Protection Act 1986, municipal waste is defined as "commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form, excluding industrial hazardous wastes but including treated bio-medical wastes."

From 6 million tonnes in 1947 and 48 million tonnes in 1997, it is predicted that 300 million tonnes of solid waste will be produced yearly in Indian cities by 2047 (CPCB, 2000a). More than 25% of municipal solid trash is not collected at all, there are no hygienic landfills to dispose of the waste, and 70% of Indian municipalities lack the transportation infrastructure. The current landfills need to improve in terms of both their administration and equipment. Additionally, they did not take any measures to prevent soil and groundwater contamination.



Hospital waste or Biomedical waste

Medical labs and healthcare facilities produce pathological, anatomical, infectious, and poisonous wastes, which are also found in hospital garbage. It is created when people or animals are examined, treated, or immunised, as well as when relevant research is being conducted. Wastes such biological fluids, human excreta, unused pharmaceuticals, chemical wastes, single-use syringes, glucose bottles, cultures, cotton swabs, bandages, and anatomical debris could be present. This waste is extremely contagious and poses a serious threat to human health if handled improperly.

According to estimates, India generates 600 grammes of waste per day per bed in general practitioner clinics and 1-2 kilogramme per bed per day in hospitals. A hospital with 100 beds, for example, would generate 100–200 kilogrammes of hospital waste per day. It is estimated that only 5–10% of this, or 5–10 kg daily, is hazardous or infectious waste. It has been roughly predicted that at least 1 kilogramme of the 4 kg of trash generated in a hospital will be contaminated.

Waste from agriculture

Organic waste includes things like contaminated water, silage effluent, spent mushroom compost, and animal excrement in the form of slurries and farmyard manures. Debris including plastic, scrap metal, fences, pesticides, used oils, and veterinary drugs are also considered to be agricultural waste. Fertiliser overflow into surface waters, which can overrich the water body, is one of several potential environmental repercussions of improper handling of agricultural waste. Leakage and improper storage of agricultural waste could pose a severe threat to surface waters. Ammonia and methane emissions from farming operations could also contribute to acidification and greenhouse gas emissions.

Radioactive producing garbage

These primarily come from industrial facilities, nuclear testing facilities, and nuclear power plants. The World Watch Institute estimates that the commercial use of nuclear energy has resulted in the accumulation of more than 80,000 tonnes of radioactive fuel and hundreds of thousands of tonnes of additional radioactive waste. It may take hundreds of thousands of years for radioactive fuel to decompose into a safe material. It must be kept well away from any potential human interaction because it is exceedingly harmful till then.

VII. MANAGEMENT OF HAZARDOUS WASTES

National Inventory of Hazardous Wastes

Approximately 41,523 industries produce about 7.90 million tonnes of hazardous waste annually in the country, of which 3.32 million tonnes (42.02%), 0.60 million tonnes (7.60%), and 3.98 million tonnes (50.38%) are recyclable hazardous waste, according to data from the Central Pollution Control Board (CPCB). The NHWIS has surveyed 33,000 hazardous waste enterprises, and about 27,500 of these industries have had their MIS data entered.

Facilities for the treatment, storage, and disposal of hazardous waste

38 TSDFs, including 17 Integrated TSDF, 13 Exclusive Common Secure Landfills, and 8 Exclusive Common Incinerators, are currently available in 10, 9, and 4 States/UT. Approximately 97.8% of the nation's total hazardous wastes that can be disposed of in landfills and 88.19% of the total hazardous wastes that may be burned are produced in these States and UT, respectively. Two new or existing TSDF initiatives for hazardous wastes across the country received financing in 2013–14.

Management of E-Waste

The E-Waste Rules were released by the Ministry of Environment and Forest in May 2011, and they became effective on May 1, 2012. These regulations give Extended Producer Responsibility (EPR) official legitimacy. According to these Regulations, producers must set up collection centres or take-back programmes to collect the e-waste produced when their devices reach the end of their useful lives. Only facilities that have acquired state pollution control board permission and are registered with pollution control committees (PCCs) are allowed to recycle e-waste.128 Producers located across 11 states have received EPR authorizations as a consequence of these criteria. 134 collection points have been established in 19 States.

Management of Batteries

In order to control the entry of used lead acid batteries into the nation as well as their collection, characterisation, and recycling, the Batteries (Management & Handling) Rules, 2001 were published in May 2001. Consumers must return used batteries in accordance with these regulations, among other things.

VIII. SOLID WASTE MANAGEMENT

- Municipal solid waste management, which includes the management of plastic garbage.
- Managing biomedical waste.
- The use of fly ash.

IX. INTERNATIONAL PROTOCOLS AND CONVENTIONS

- The Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and the Disposal of Such Wastes is the first such convention.
- The Rotterdam Convention on Prior Informed Consent for Particular Hazardous Chemicals and Pesticides in International Trade.
- the Persistent Organic Pollutants Convention of Stockholm.
- A Strategic Management Approach to International Chemicals

X. INDORE [WASTE MANAGEMENT] CASE STUDY

Today, Indore produces approximately 1,115 MT of waste per day, all of which is collected at the source, be it a residential or business building. In two of the city's 84 wards, the door-to-door service was launched in January 2016 as a pilot initiative.

To accomplish 100% door-to-door rubbish pickup, it took over a year. Through outstanding teamwork, Indore has managed to segregate waste at the source in all of its residential and business buildings.

Collection from doors to doors

There are 85 wards and 19 zones in Indore. An average of 6,000 residents and 600 businesses (part of 88 registered commercial areas) are found in each ward. Waste is produced in Indore from a variety of places, including homes, businesses, and other institutions like RWAs, hospitals, and hotels. The door-to-door collection system is used for homes or apartment buildings, and the bulk collection system is used for semi-bulk and bulk generators. Through its door-to-door collection method, Indore makes sure that all wards are completely covered.

Primary collection

Municipal employees collected household rubbish in some areas, while housing colonies gathered it in other areas under private contracts.

Secondary collection

Developed Infrastructure Limited, a private contractor, transferred waste from the central trash cans to an open dump in Devguradia.

Weighbridge

All trucks entering the processing plant to unload their garbage must first interact with the computerised weighbridge facility, which is located there.

Waste Processing

The bulk collection trucks and transfer stations both discharge their dry waste at the MRF facilities, where it is further separated and processed.

Transfer station for garbage

One of Madhya Pradesh's more economically developed cities, Indore serves as the state's financial hub. India's ninth-largest city, Indore, with a population of about 25 lakh people. The operational region for Solid Waste Management (SWM) has been divided into 85 Wards and 19 Zones. In Indore, trash is collected separately, i.e., the generators separate the waste at the source. The city of Indore produces 1115 MTPD of trash in total. Wet or organic trash makes up 58.25% of the total waste, dry waste makes up 41.75%, and domestic hazardous and sanitary garbage makes up 5%. The approximate total wet waste generation is 650 MTPD, and the approximate total dry trash generation is 465 MTPD.

Centre for the collection of plastic waste

When IMC took over the waste collection, rag pickers lost their jobs. With the assistance of the NGOs Sarthak and Basix, the rag pickers have been reoriented and are now working at a centre for collecting plastic garbage.

Two distinct strategies are used to dispose of plastic garbage collected at collection centres:

- selling it to the cement mill in Neemuch
- Offered and utilised for road development by the M.P. Rural Road Development Board.

XI. GOVERNMENT INITIATIVES

- Swachh Bharat Mission.
- GOBAR-dhan[Galvanizing Organic Bio-Aggro Resources Scheme].
- Waste to Energy.

XII. SOLUTIONS TO SOLID WASTEMA- NAGEMENT IN INDIA

Conversion of Waste to Energy

Different WTE potential exists in the solid, liquid, and gaseous emissions from industrial operations. In Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, and Telangana, biogas generation projects have been established, producing a total installed capacity of 37900 m3/day. States like Punjab, Karnataka, and Maharashtra have developed 4 MW power installations based on WTE. There is now a cumulative installed capacity of 25731 kg/day for the production of bio-CNG. Additionally, 114.93 MW of off-grid electricity and 139.80 MW of grid-interactive power plants are in use. Currently, industrial facilities in Madhya Pradesh and Maharashtra produce 57426 m3 of biogas per day through the processing of maize and starch. Through the use of vegetable waste, hotel trash, cow manure, and sewage treatment facilities, Ahmedabad and Surat produce 8600 kg of Bio-CNG every day. Aggressively used for WTE are wastes from gardens, poultry, animal husbandry, slaughterhouses, distilleries, sugar manufacturing, dairy, oil refining, leather processing, food, and food grain processing.

Emission of Greenhouse Gas

India is a developing country that is enhancing its waste-to-energy generation infrastructure and technology. By utilising gases produced by landfills, such as methane, the area's energy potential can be increased. It may be utilised as biogas for producing heat and power rapidly and efficiently. Contrarily, landfills are the primary source of methane emissions. Gas from landfills has not yet been used as a source of energy. According to IPCC, landfills are responsible for 30% of all greenhouse gas emissions to the environment. Delhi is responsible for 10% of all MSW methane emissions.

XIII. The conclusion

(DEVELOPMENT, CENTRE OF EXCELLENCE IN URBAN DEVELOPMENT IN THE AREA SOLID WASTE AND WASTE WATER MANAGEMENT, 2011)SWM. Despite numerous studies on various aspects of solid waste management, including investigating and implementing scientific monitoring, treatment, and disposal techniques; overhauling organisational structures; seeking out best practises for recycling and recovery from solid waste; fully utilising the waste-to-energy potential of

landfill-gas to energy and waste-to-energy; and looking for low-cost, location-based strategies to achieve zero waste disposal at all sources,

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