
Solid Waste Management And It's Impact On Environment

Surbhi Chahar¹ & Dr. Bhanwar Pal Singh²

¹Research scholar, Geography, Shri Varshney College, Aligarh

²Associate Professor Geography, Shri Varshney College, Aligarh (Dr. Bhim Rao Ambedkar University, Agra)

Received: 24 Oct 2024 Accepted & Reviewed: 25 Nov 2024, Published : 30 November 2024

Abstract

Solid Waste Management (SWM) is one of the key responsibilities of city administration and one of the effective substitute of good governance. Effective SWM diminish the adverse health and environmental impact, conserves resources and improves the inhabitability of the city. Sanitation and Waste Management has become one of the most important phenomenon for urban growth culture. Improper waste management and sanitation problem are accurate indicators of Urban poverty and health problem. Waste generation increases as a result of rapid urbanisation and economic growth, placing tremendous pressure on the current management systems. Effective waste management has remained difficult despite the rapid economic expansion, indicating a gap in development strategies.

It further emphasises that immediate sustainable waste management solutions are needed to solve environmental issues and achieve economic potential. Constructive approaches that involve public engagement and take geographical differences into account are essential. Through the implementation of sustainable practices such as waste disposal, reduction, reuse, and waste recovery, communities can turn waste from an issue into an asset that benefits the environment, the economy, and public health in urban areas. A shift towards responsible practices, along with investment in infrastructure, finance, technology, and awareness, are necessary to alleviate the challenges and achieves effective waste management. This paper deals with the problem of waste generation and to keep the waste discard management in a proper way so that aim of clean India can be achieved.

Keywords: Solid waste, decentralisation, municipal finance, waste to energy plant, sustainable waste management practices.

Introduction

As question arises what is solid waste?

As we all know that solid waste is an unwanted waste which is generated on a daily basis from various sources of waste generation like residential, industrial, agricultural, commercial, institutional, municipal areas. It is very difficult to explain “solid waste” in one sentence.

Waste can be refer to products that are no longer to utilised and won't be used soon. They are outmoded. The term municipal solid waste refers to wastes that are either solid or semi- solid that are produced in municipal and notified areas. These waste do not include industrial hazardous waste but do include biomedical waste that have been treated.

When we talk about solid waste management, we are referring to the process of exercising control over generation, storage, collection, transport, processing and disposal of solid waste to meet the requirements of public health , conservation, economics, aesthetic, engineering and other environmental aspects in the most optimal manner .

Sources of Solid Waste Generation Are As Follows:

Source of waste generation	Waste generator level	Types of solid waste generated
Residential	Household waste	Food waste , electronic waste, plastic, paper, wood , steel ,textile waste and bulky residential waste such as household appliances
Industrial	Heavy and light manufacturing, fabrication ,construction sites ,power plants and chemical plants.	Packaging waste , manufacturers wastes, food wastes, waste generated from transportation. Metal and steel wastes.
Agricultural	Remains of farm wastes, animal manure, orchards and fertilizers wastage.	Agricultural wastes including food waste and animal manure waste.
Commercial	Waste collected from offices, buildings, hotels, markets	Plastic cans , food wrappers, retail packaging, food and paper waste.
Institutional	Waste generated from schools, colleges, educational institutions, government offices and non-cooperative organizations	Paper wastes, stationary wastes , food wastes , waste generated from construction operations in institutions.
Municipal	Performing maintenance on streets, parks, beaches ,housing areas and recreational areas.	Street garbage, waste from public places , plastic wastes, sanitary and other wastes.
Construction	Waste generated during the process of building, renovation and demolition.	Brick and cement waste ,scrapped waste , residual waste , construction waste etc.

Solid Waste Management in India:- In India, it is a frequent practice to get rid of municipal solid waste in low lying regions, however this is done without taking the appropriate safety measures putting in place proper operational controls. This is a problem since India has a high rate of pollution caused by municipal solid waste. As a result, one of the most significant environmental challenges that Indian megacities are presently facing is the management of municipal solid waste.

The activities that are involved in the formation of solid wastes, as well as their storage and collection, transfer and transport, treatment and disposal are referred to as solid waste management. Indian cities consist of four major activities: the production of trash, the collection of rubbish , transportation of garbage and disposal of garbage . The management of solid waste is going through a difficult period since there are not enough facilities available to adequately process and disposal of the MSW that are produced everyday in metropolitan areas. The non-scientific disposal of municipal solid waste has the potential to have a negative influence not only on human health, but also on the quality of the environment in the surrounding area. This is because

human health is closely tied to the quality of the surrounding ecosystem. As India work towards its goal of being an industrialized nation by the year 2020. It's expected that the volume of municipal solid rubbish will rise significantly in the near future.

The solid waste management sector in India has witnessed significant growth in recent year due to government push towards cleanliness and sanitation. Increasing population and rapid urbanization resulted in a substantial increase in the amount of waste generated, leading to the need for efficient and sustainable waste management practices. The government Swachh Bharat Abhiyan (Clean India Mission) has provided a boost to the sector, resulting in a surge in demand for waste management solutions. The market for solid waste management in Indian is expected to grow at a CAGR 7.5% during the forecast period (2021-2026) driven by factor such as increasing urbanization, rising awareness of waste management, and growing investment in waste management infrastructure.

Due to rapid urbanization, economic growth and higher rates of Urban consumption, India is among the world's top 10 countries generating municipal solid waste. According to a report by The Energy and Resource Institute (TERI), India generated over 62 million tons of a waste in a year. Only 43 million tons of total waste generated gets collected, with 12 million tons being treated before disposal and the remaining 31 million tons simply discarded in waste yards. Most of the waste generated remains untreated and even unaccounted for inadequate waste collection, transport, treatment and disposal have become major cause for environmental and public health concerns in the country.

One of the study published in a journal of Urban management in December 2021 reports, that the 62 MT of waste generated annually which include 7.9 MT of hazardous waste , 5.6 MT of plastic waste , 1.5 MT of e-Waste and 0.17 MT of biomedical waste . The Indian Central Pollution Control Board (CPCB) currently published that the annual waste generation in India will increase to 165 MT by the year 2030. The market for solid waste management in India can be segmented into various categories such as collection, transportation, treatment and disposal. The collection and transportation segment accounts for the largest share of the market due to lack of proper collection and transportation infrastructure In India solid waste management has been traditionally viewed as the responsibility of the local municipal authorities or Urban local bodies (ULBs). Very few municipal authorities have set up proper waste processing centres because of proper disposable place, poor financial resources, lack of scientific and technical knowledge of waste management .Over the past decades the government of India, in collaboration with state government and union territories has initiated projects such as Swachh Bharat Mission in 2014 and the development of 100 smart cities across the country initiated in 2015. With the three basic principles of economy in mind that is (reduce, reuse, recycle). The ministry of environment, forest, and climate change also amended India's SWM rules in 2016. The initiatives combined with strict enforcement of the updated solid waste management rules by the CPCB, encourage every ULB in India to develop integrated waste management system, wet and dry segregation Source specific collection, home composting ,energy recovery from waste. However, there is substantial variation in technologies adopted for SWM across different states and UTs in India. For example composting as a technology is adopted by all the 28 states and 8 UTs in India. , but waste to energy (W2E) plants have been set up in only 10 states and UTs and biomethanation can only be found in 22 states and UTs in the country.

Status of Solid Waste Management: - Central pollution and control board prepared a consolidated annual report and forward to the ministry of environment, forest and climate change along with suggestions and recommendations. Overall solid waste management status is the total quantity of waste generated in the country is 160038.9 TPD of which 152749.5 TPD of waste is collected at a collection efficiency of 95.4%.

79956.3 (50%) of waste is treated and 29427.2 (18.4%) TPD is landfilled. 50655.4 TPD which is 31.7 % of the total waste generated remains un accounted.

SWM Trend (Year Wise):

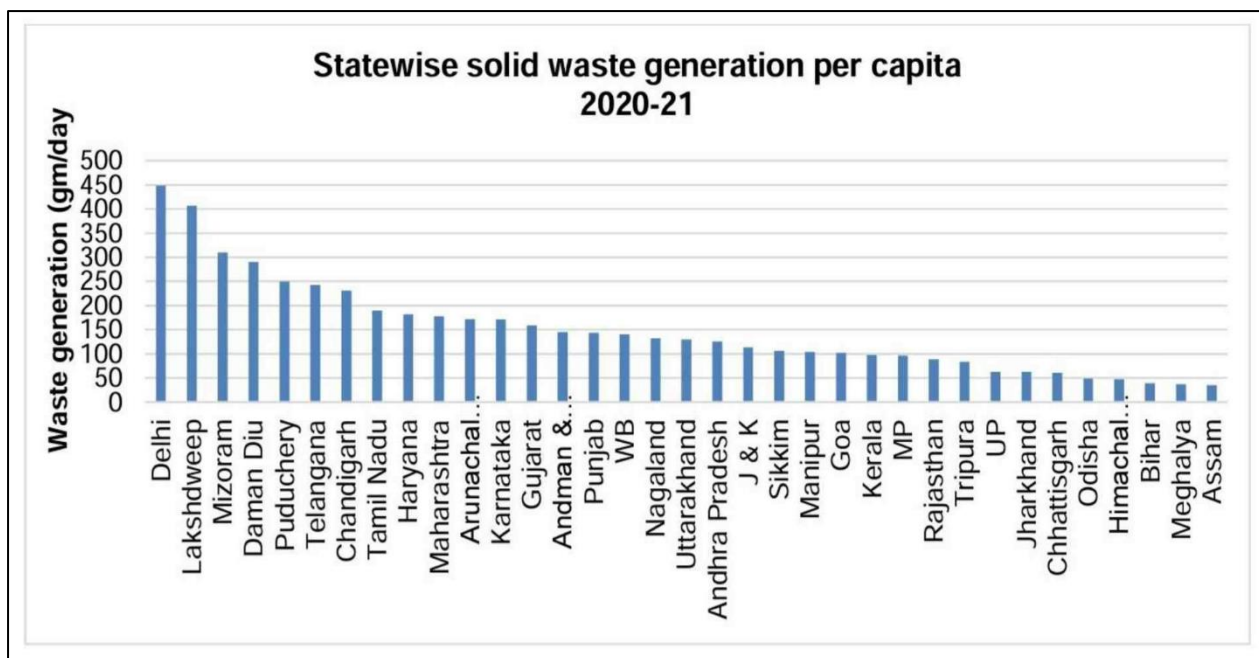
Per Capita Solid Waste Generation: Per capita solid waste generation has been calculated for the last six years. And the marginal decreasing trend is observed in per capita solid waste generation over the last six years.

Solid Waste Generation Per Capita:

YEAR	SOLID WASTE GENERATION PER CAPITA (gm./day)
2015-2106	118.68
2016-2017	132.78
2017-2018	98.79
2018-2019	121.54
2019-2020	119.26
2020-2021	119.07

Source: Annual report on SWM 2020-2021,CPCB, Delhi

SWM Trend (State Wise):

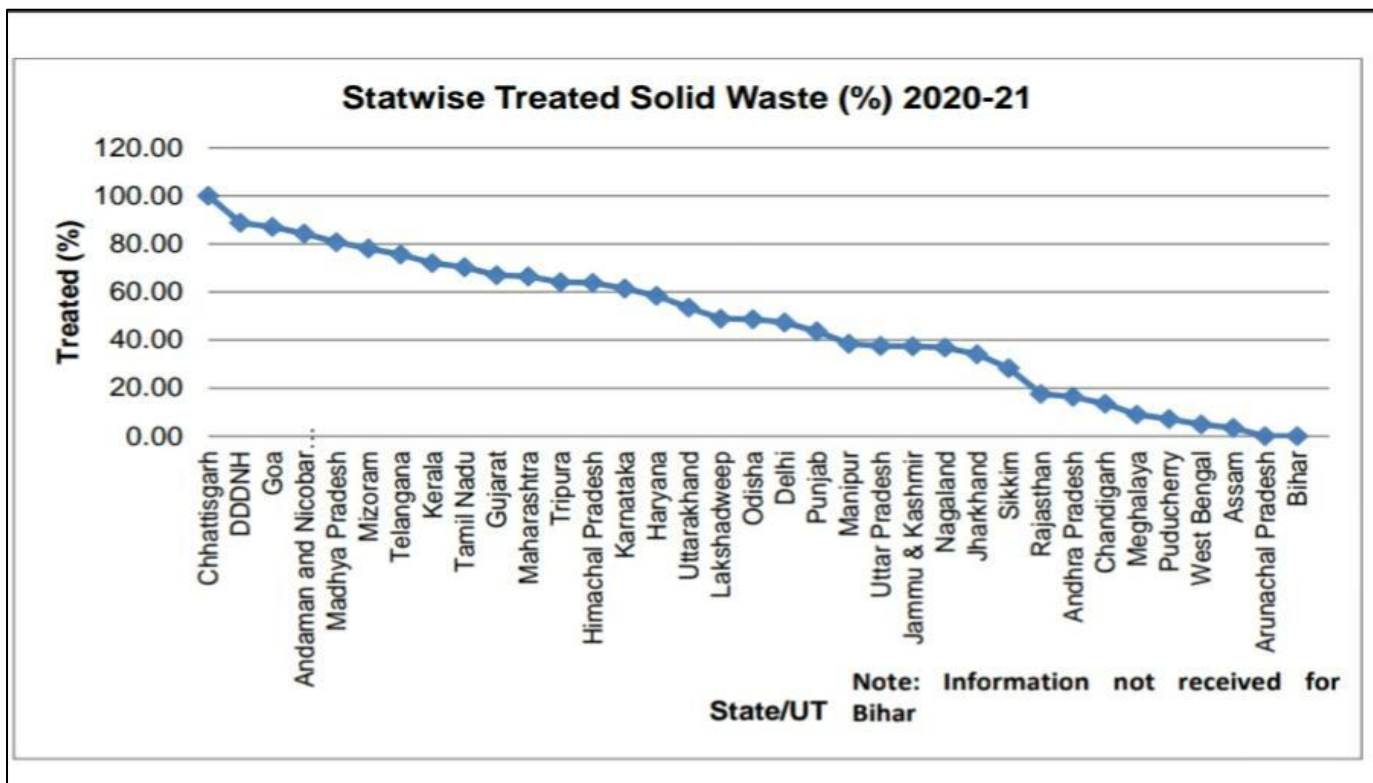


(A)

Trend In Solid Waste Generation: It is observed that Maximum quantity of per capita solid waste is generated in Delhi followed by Lakshadweep and Mizoram in that order.

Source: Annual report of solid waste management by CPCB, Delhi

(B) Trend In Solid Waste Processing: It is observed that maximum percentage of solid waste treated is in Chhattisgarh (100%) followed by DDDNH (88.76%), Goa (87.04%), Andaman and Nicobar Island (84.7%) and Madhya Pradesh (80.67%) in that order.



Source: Annual report of solid waste management by CPCB, Delhi

Contribution of GIS In SWM:- Solid Waste Management begins when rubbish is created and ends when it is no longer hazardous to the environment. Effective garbage management needs planning on several fronts . A solid strategy would support ethical and successful management. There are many difficulties to be solved and all relevant elements must be considered. Prioritizing and ordering these criteria might effect the conclusion credibility .Manually investigating several components would be time consuming and tiresome. Also inefficient this way merging non-spatial and spatial data increase the probability of mistakes. GIS work is done in layers , so misunderstanding and errors are less. GIS is an effective waste management planning tool. A report was published as a result of a study on where to locate a landfill in Malaysia. According to the study, the research aimed to evaluate the GIS value as a decision making aid by comparing it to government laws. After the research information may be geographically correlated owing to the multifunctional nature of GIS, which also allows tremendous facility for transferring, comparing, evaluating and analysing data . ‘You can make a conclusion you could not make before by analysing something position and it’s surrounding says San Francisco GIS manager.

Importance of Effective Management of Municipal Solid Waste:- Inappropriate solid waste management can harm local environment instances, pollution contaminates surface and groundwater.

1. Garbage stench pollutes the air.
2. Green house gases SO , CO2
3. Germs, rodents, strays, flies, mosquitoes and other insects may damage humans and animals.
4. Increased soil acidity around rubbish dumps.

5. Disease and pandemic risk in region.

Solid Waste Management Techniques:- In India, the management of solid waste now makes use of three important treatment technique. These strategies were recently introduced with the help of segregation both the correct valorization of residues and the segregation of waste according to the qualities of the waste. As well as the transportation of the waste to the various processing stations. Those remnants that cannot be processed, recycled or treated biologically are delivered to the facilities that either burn waste or process fuel obtained from trash. First, the emission of gases are neutralized and then with the help of the filters the gases are going to be filtered before they are finally discharged into the environment.

Before being put in a landfill the ash that is left over after the burning process is subjected to a definitive method. Composting is the technique that is utilised when organic leftovers are being vaporized via the usage of an organic process. This method requires the correct segregation of organic residues at their point of generation. Composting provides a lot of benefits and also work as a soil conditioner, which enhances nutritive and the physical aspects of the soil.

Incineration: This is one of us technologies for managing solid waste that is most commonly recognised and successful and it's usage is widespread across the country. Incineration facility have the ability to reduce the amount of solid waste by as much as 90% and it has been states that some modern plants have achieved a reduction of 95%. It is possible to achieve this goal without having any impact on the plants capacity to generate power and heat.

Gasification and Pyrolysis:- The gasification of waste residue is a complex thermochemical process that take place at the temperature that is quite high. This procedures result in the production of a product known as syngas, which may afterward be reused as a reactant in a wide range of other chemical processes. When both the gasification and pyrolysis processes have contributed to the completion of the thermochemical process, it is considered to have reached its final stage. The pyrolysis process comprises the thermal breakdown of the organic material which constitutes the thermal cracking that includes the transfer of mass and heat. .Due to high pressure that is present through- out the gasification process, a greater temperature is reached , which converts the organic component of municipal solid waste into syngas of high quality.

Biological Treatment Technique:- When contrasted with developed nations , which have an organic concentration of just 30% the waste composition of developing countries consist of a significantly larger percentage of organic matter (50%) that industrialised nations have only (30%) . In India, composting techniques are more frequently classified as falling into one of these three categories: aerobic composting, vermicomposting or anaerobic decomposition. Composting is a process that take place in the presence of the air in an environment that is both warm and humid. This environment is ideal for the decomposition of the municipal solid waste. Compost produced by aerobic decomposition is famous for having an unusually high nutrient density in its end products. In rural areas and communities with a smaller population, composting is done by the hand. However, in urban areas with a bigger population composting is typically done with the hand of the machinery. Cities like Delhi, Mumbai, Bangalore and Vadodara all have mechanical composting system that have capacity ranging from 150 to 300 tonnes per day.

Vermicomposting is a form of composting that differs from traditional composting it makes use of earth worms to decompose the organic matter. The amount of organic matter that an individual earthworm consumes in a single day is directly proportional to the earthworms body mass. A number of cities in India, such as Mumbai, Faridabad and Hyderabad have each constructed vermicomposting factories of varied size. The facility in

Bangalore which is the largest of them has a capacity of one hundred million tonnes per day and is located in India.

Aerobic decomposition process is one of the most ecologically beneficial approaches which is carried out in an atmosphere devoid of oxygen and this is also known as bio-mechanization, result in the production of biogas that is composed of methane in addition to carbon dioxide . Biogas which consist of 60% of methane has the potential to be utilised in place of fossil fuel.

Landfill: The most significant benefit of landfill is their capacity to generate methane gas , which possesses a higher energy potential and more advantageous quality.

Conclusion:- The solid waste management sector in India is expected to witness significant growth in the coming years, driven by factors such as increasing urbanization , rising awareness of waste management and increasing investment in waste management infrastructure.

Innovative technologies, equipment and cost efficient waste handling system and solution especially for waste sorting, recycling of plastic, tire, e-waste and batteries, construction waste management, landfill design and technologies and solution generating energy from waste will find multiple opportunities in India.

Reference:-

- Abram, C.(1953).” Slums "in Desai , A . R .and Pillai , S.D.(ed.)from Urban land problems and policies, housing ,town and country planning , United nations , New York
- Central pollution control board (2000) status of municipal solid waste generation collection treatment and disposal in cities. Detailed project report (revised) , regional centres for urban and environmental studies.
- World environment expo, international trade administration environmental studies regarding solid waste.
- Annual report 2020-2021 on implementation of solid waste by CPCB, Central Pollution Control Board.
- Namita Gupta and Rajiv Gupta ,Solid Waste Management and Sustainable Cities in India: A case of Chandigarh, environment and urbanization (2015): 573-
- Shyamala Mani and Satpal Singh , Sustainable Municipal Solid Waste Management in India: A policy Agenda, procedia environmental sciences (2016):206-
- Ranjith kharvel Annepu, Sustainable Solid Waste Management in India (Columbia : Columbia University, 2012),pp-3&7-
- Swachhata Sandesh Newsletter, September 2019-, Ministry of Housing and Urban Affairs.
- Is her Judge Ahluwalia and Utkarsh Patel, Solid Waste Management in India:An Assessment of resources, recovery and environmental impact.
- Swachh Bharat Mission Urban , www.swachhbharaturban.gov.in
- Some Dutta Banerjee Scope of private Participation in municipal solid waste management: the chase of India.