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Waste generation and management in Meerut: A case study on associated health hazards

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Abstract

Solid waste management (SWM) is becoming a serious environmental burden and a rising issue for urban local bodies (ULBs) in India, particularly in high population density regions. Because of India's high rates of population growth and excessive urbanisation, the lack of proper SWM facilities has posed a severe health concern to diverse populations. This report examines the current situation and practices of waste generation and management in Meerut, a large industrial city in Uttar Pradesh and one of India's fastest developing cities. This study also addresses the potential problems, impediments, and possibilities connected with improving waste management in Meerut in order to reduce the health risks associated with inappropriate waste disposal.

Keywords: Waste Management, Health Hazards, Water, Biodegradable, Waste disposal, Recycling, Landfilling, Solid Waste Management

Introduction

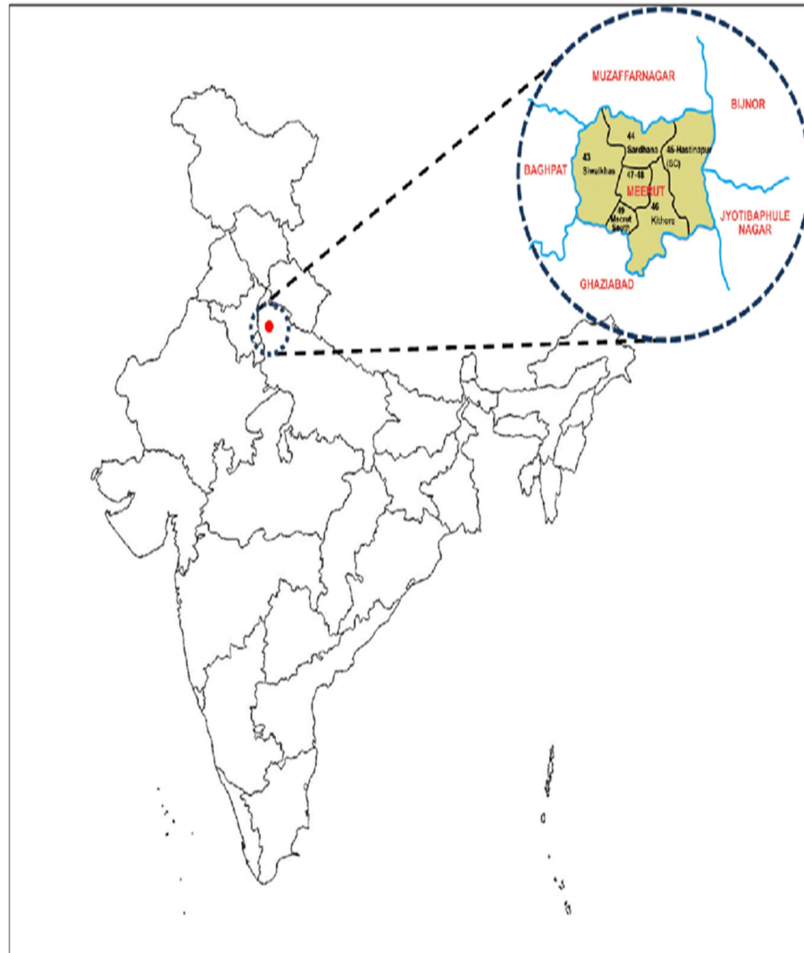
Meerut gets its name from the word "Maya Rashtra," which means "land of Maya," who, according to Hindu mythology, was the architect of the asuras (demons). From the mediaeval period forward, the city's proximity to Delhi (India's capital) allowed it to play a significant role in the country's affairs. Meerut is renowned as India's "sports city" since it is the country's top producer of sporting goods. Traditionally, it is known for its handloom works and scissor Industry. Meerut is also the second-largest city in the National Capital Region (NCR) and a major educational centre in western Uttar Pradesh.

Physical Characteristics of Meerut City

The research area Meerut is located in the upper Ganga-Yamuna doab, between 28° 47' and 29° 18' north latitude and 77° 7' and 78° 7' east longitude. The city is located between the Ganga and Yamuna plains and was rated 292 on the list of the world's largest

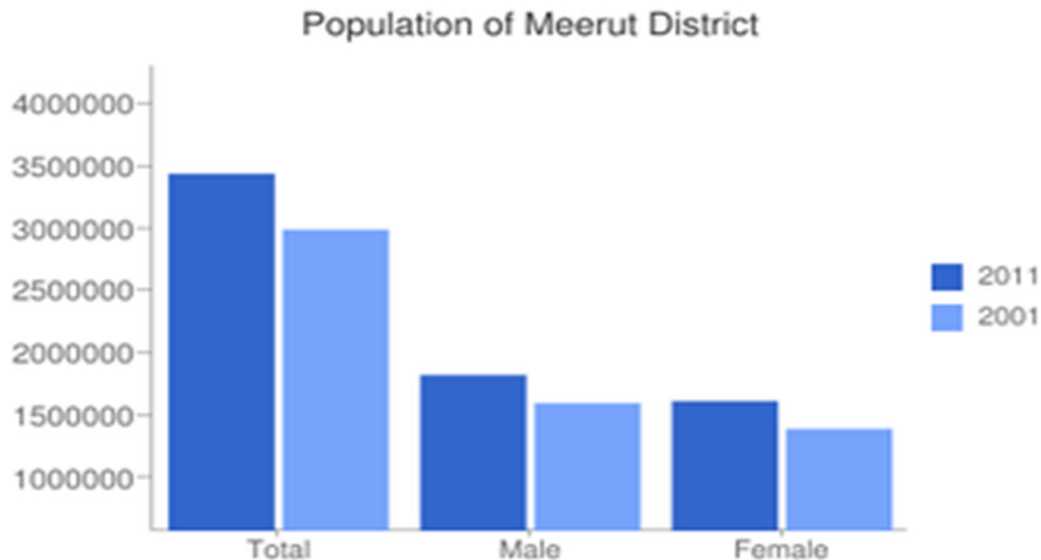
cities and urban areas in 2006. It covers an area of 172 square kilometres and is India's 14th fastest growing city. The literacy rate in the district is 74.80%, which is higher than the state average of 69.72 percent. Meerut has one Lok Sabha seat in the district. Kithore, Meerut Cantonment, Meerut, Meerut South, Siwalkhas, Sardhana, and Hastinapur are among the district's assembly constituencies.

Population Profile of Meerut



The population of Meerut city (Nagar Nigam) as per 2011 census is 12,15,339 from the graph below, it can be interpreted that the population density of Meerut has increased consecutively from the year 1981 to 2011. The population density of the city was 31 persons per Hecate in 1981. In the year 1991 it was 53 and in 2001 it became 75 persons per hectare.

Figure 1: Population of Meerut District



Literacy and Sex Ratio in Meerut

Meerut's average literacy rate in 2011 was 77.70 percent, with male literacy rates of 83.18 percent and female literacy rates of 71.64 percent, respectively. According to Annexure 1 data, the average literacy rate in slums is 62 percent, compared to 39 percent in census 2001. According to the 2011 census, Meerut's sex ratio was 898 females for every 1000 males. It was 881 in 2001 and 1991, and it was 872 in 1981.

Table 1. Demographic status of Merrut

Meerut City	Total	Male	Female
City population	1305429	688118	617311
Literates	858441	482308	376133
Children(0-6)	170823	92472	78351
Avarage Literacy (%)	75.66	80.97	69.79
Sexratio	897	-	-
Child Sexratio	847	-	-

Waste Generation and Sewage System in Meerut

All solid waste generated in Meerut (approximately 450 grams per capita waste) is collected, transported, and disposed of by the Meerut Nagar Palika. The city generates

112 MLD of sewage, but only has a 45 MLD disposal capacity. As of 2006, the city's entire sewer line length was over 132 kilometres, with 23 kilometres of trunk line. In Meerut, solid waste management is arguably the most critical area. Only about 78 percent of the Municipal Corporation's area is covered by daily collection, with the rest being collected monthly or fortnightly. Waste generation rate depends on factors such as population density, economic status, level of commercial activity, culture and city/region. Other aspects of a typical solid waste management process, such as waste storage and segregation, primary and secondary collection, waste processing and disposal, and reuse and recycling, are largely absent in Meerut, despite widespread complaints about plastic and biomedical waste management from various stakeholders. Aside from residential waste, hospitals, nursing homes, health centres, labs and veterinary institutes contribute significantly to waste generation.

Table 2. Wastes generation capacity

S.No.	City	Wastes generation rate (kg/Capita/day)
1	Delhi	0.60
2	Banglore	0.53
3	Calcutta	0.51
4	Hyderabad	0.35
5	Sonepat	0.34
6	Hardwar	0.40
7	Meerut	0.45

Source: Kumar and Pandit (2013)

Solid Waste Composition and Waste Disposal System

Waste generation is everyone's business. In almost everything we do, we produce undesired by-products and leftovers. Solid waste is a collection of coarse materials discarded by households, businesses, and farms. Unnecessary dumping of these wastes pollutes the environment. All abandoned items are included in the municipal solid garbage. It includes both biodegradable and non-biodegradable items. Microbial activity can quickly degrade biodegradable materials. Garbage, junk, and ashes, for example. Non-biodegradable things cannot be decomposed by microbial activity. They include broken glasses, iron pieces, broken tiles, bottles, used syringes etc. Other than mining and mineral production, industrial waste is recycled and turned into other forms. Private landfills or deep injection wells were used to dispose of the waste. Approximately 60 million metric tonnes of industrial waste are classified as hazardous or toxic waste. Solid

waste treatment involves two main steps. They are removal of non-biodegradable things and treatment of biodegradable things. Solid wastes of municipalities contain nearly 15-30% non-biodegradable things. These wastes cannot be degraded by microbial activity. The treatment of biodegradable waste is done in various ways like Landfill, Composting, Pyrolysis and Incineration.

Landfill is the collection of biodegradable wastes in pits or on a shallow ground surface. Landfills degrade biodegradable solid wastes. Landfills treat municipal solid waste, hospital waste, animal waste, plant residues, and slurry. The burning or combustion of wastes is referred to as incineration. Incineration takes place in a plant known as an incinerator. The chosen microbial strain is cultivated in a medium before being sprayed onto the polluted target hydrocarbon. Enough nutrients are dispersed throughout the solution to promote microorganism growth. *Pseudomonas*, *Mycobac* *Nocardia*, and several yeasts produce long chain aliphatic hydrocarbons in a mixed culture. The hydrocarbons are first oxidised into aldehydes, and then the fatty acids are oxidised via the β -oxidation pathway.

Composting is the microbial decomposition of wastes to produce manure that takes place in an aerobic environment. It converts biodegradable wastes into compost, which is a type of manure. Nutrients, growth-promoting chemicals, and microorganisms abound in the compost. As a result, it is an excellent source of organic manure. The municipally collected biodegradable garbage is sent to a landfill.

Swachh Bharat Mission for Waste Management

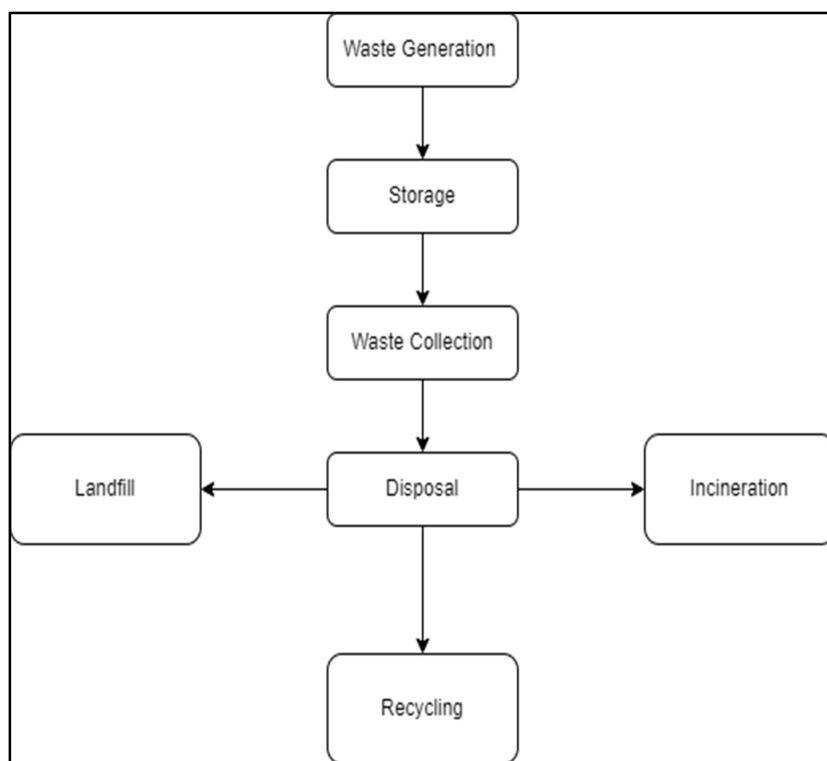
Swachh Bharat Mission (SBM), which began on October 2, 2014, is the country's largest-ever cleanliness campaign, with a budget of over \$10 billion. It seeks to improve the levels of cleanliness through Solid and Liquid Waste Management activities. The components of the SBM are:

1. Provision of household toilets,
2. Community toilets,
3. Public toilets
4. Solid Waste Management,
5. IEC and Public Awareness and,
6. Capacity Building and A&OE

Materials and methods

The research was done out in a small area of Meerut's Hapur Road, where open dumping is frequent. Sweepers collect rubbish by moving from door to door and collecting waste that inhabitants have collected in dustbins; they have been given with hand carts or tricycles. Apart from the regular collection system provided by the Meerut

Municipal Corporation, certain regions still practise open dumping, in which individuals simply leave their waste out in the open, causing a horrible odour during the monsoon and making the area an ideal breeding ground for mosquitoes and flies. Vegetable peels, typical home waste, medical waste, e-waste, and other wastes are thrown away. The study only included people who were willing to participate and cooperate. They were interviewed using a self-administered health questionnaire, which was used to assess the potential health hazards connected with garbage exposure in the community. The observations were taken where people here frequently contract ailments such as diarrhoea, malaria, and dengue fever as a result of an unscientific and unsanitary way of life. They do not segregate the e-waste from the regular wastes and throw it all along in one place. Very few of them have the awareness and perception about the harmful effects of open dumping. They dispose of the medical wastes, e-wastes and different types of daily wastes in the same place. There is no segregation of wastes. As per the results of the study it became evident that neighboring people face a lot of problems due to the foul smell and the mosquitoes and flies that create a menace to the total area. The tools used for street sweeping are generally inefficient and out-dated.



Results and discussion

The overall goal of this research was to look into the health risks posed by the increasing amount of waste generated in Meerut City. Lack of waste infrastructure,

informal waste disposal, and a lack of civil awareness among locals are the main reasons for inappropriate waste disposal in Meerut, despite the adoption of SBM. Development of waste disposal technology, public awareness programmes on waste segregation, initiation of environmental taxes that can be used to fund SWM, and stricter policies on the use of polythene bags are some of the measures that can be taken to reduce the threat of health hazards posed by inefficient waste. Meerut will continue to have inadequate waste management till these basic prerequisites are satisfied.

Conclusion

Meerut has a unique set of challenges for SWM because of its geographical configuration, growing urbanization, and lack of awareness among the residents. Difficulties in controlling SWM have resulted in improper waste disposal methods, such as open dumping and open burning, which are wreaking havoc on the delicate ecosystem. In Order to build a healthy community in Meerut it is essential to implement solid waste management in the city at all levels and spread awareness among the city dwellers.

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