

MUNICIPAL SOLID WASTE MANAGEMENT IN BAREILLY

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Abstract— Open dumping is the most common method of solid waste disposal in many developing countries including urban areas. Appropriate landfill site selection is important to minimize negative impacts associated with open dump sites. Landfill siting is an extremely difficult task to accomplish due to strong public opposition and regulations. Developing countries do not have a systematic process for landfill site selection and hence unsuccessful landfill siting leading to environmental degradation is typically the result especially in the developing world. Data were collected from Bareilly district, India. Waste disposal is the last stage of waste management which is the subject of a precise process including site selection, preparation and operation; every stage needs research and management actions. Selection criteria include engineering, environmental and economic criteria. For storage, maintenance, management and analysis of geographical data and it has been designed for working with data that has spatial and descriptive dependency. No site selection study focusing waste disposal has been performed in Bareilly town of Uttar Pradesh, India, which is located at 250 Km East of Delhi and have a population of over 9.5 lakh people and total waste production of approx. 129813 Metric tons per year. This study has been done using Guidelines for Selection of site on different parameters in which criteria such as distance from residential areas, distance from roads, land use, distance from wells, and distance from faults, geology, and distance from sensitive ecosystems, etc. were used and after data geo referencing, the weighting of the criteria and adjusting them with the geographical features of the area, data overlaid and finally three locations proposed for landfill were introduced in Bareilly town. Among the proposed areas, one was selected as the best location according to the hypotheses. The obtained results of this study may be helpful for policy makers of Bareilly town.

Index terms- Solid Waste Landfill Site Selection Analytic Hierarchy Process GIS MCDA Bareilly,

I. INTRODUCTION

The solid waste from Bareilly municipal is rising in Bareilly Municipal Area. Such rise in solid waste generation is observed by Bareilly Municipal Corporation. An increase in solid waste is observed because of increase in urbanization, population density and income, changing food habits, taste and pattern. The growth of industry, commercial units such as hotels, theaters, restaurants, malls are rising fast. Such units are positively contributing to the solid waste generation. There are

37 out of 70 wards Door to Door waste collection is done by Bareilly Municipal Corporation, No segregation and disposal capacity of Bareilly Municipal Corporations is nil because of Municipal Solid Waste Treatment Facility is closed and inadequate with rising solid waste. Only dumping of waste at Bakarganj duming site is happening. Now the site is situated nearby the community area and over exhausted Therefore Bareilly Municipal Corporation must adopt scientific methods for collection, segregation and disposal of solid waste and proposed new site for treatment & Landfilling of Municipal Solid Waste. Urgent steps in this direction will reduce the water, air, soil pollutions and health hazards. It will improve the quality life of people nearby the site of Bakarganj Dumping site.

II. MATERIALS AND METHODOLOGY

Bareilly Municipal Corporation area is located at 28°10'N, 78°23'E, and lies in northern India. It borders Pilibhit and Shahjahanpur on east and Rampur on west, Udham Singh Nagar (Uttarakhand) in north and Badaun in south and area coverage of about 106.10 sq km (**Figure 1**)



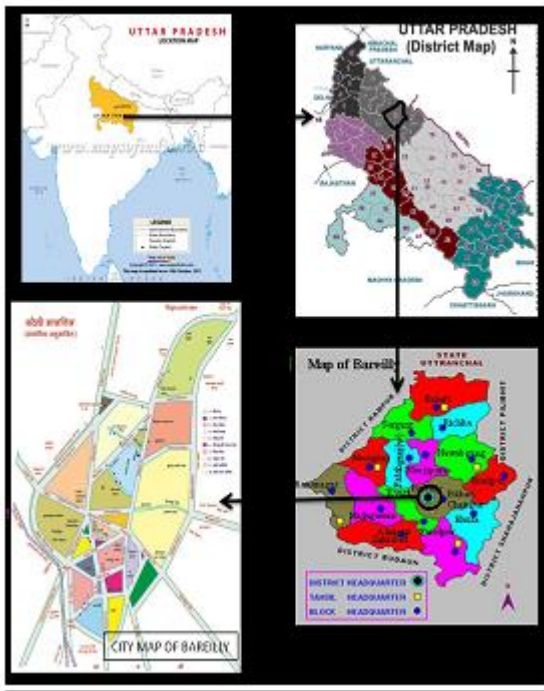


Fig-1 Bareilly Municipal Corporation Area

Bareilly lies entirely in the Ganges plains. The low-lying Ganges plains provide fertile alluvial soil suitable for agriculture. However, these some lower part of plains is prone to recurrent floods. Bareilly lies on the bank of river Ramganga and there are seven rivers passing through this district. The lower Himalayan range is just 40 km from it and it lies in north of it. Bareilly is a city in Bareilly district in the northern Indian state of Uttar Pradesh. The city is 252 kilometres (157 mi) north of the state capital, Lucknow, and 250 kilometres (155 mi) east of the national capital, New Delhi. Bareilly is the fourth city in Uttar Pradesh with compressed natural gas (CNG) filling stations (after Lucknow, Kanpur and Agra). It is the seventh-largest metropolis in Uttar Pradesh and the 50th-largest in India. Nagar Nigam Bareilly was established in 1981 and before this it was Naga Palika Parishad Bareilly. Nagar Nigam Bareilly has been divided in 70 wards, as Health and sanitation scenario, it is divided in 7 Zones.

The Temperature of Bareilly ranges between 30°C and 42°C, and the rainfall ranges between 400 mm and 800 mm and annual mean of 750 mm. The population of the town has been estimated to be about 9,40,895. Most recently the increase in population as well as the economic growth in the study area has transformed and urbanized the area and led to the change in landuse and a substantial increase in municipal solid waste generated.

Solid waste management system in the town is not effective as wastes are seen dumped on all manner of places including roads, near sensitive areas, and on private properties. It is therefore of importance that solid waste collected are properly disposed at designated sites in the city in order to avoid environmental degradation.

In locating proper sites (Landfills), consideration is giving to environmental factors mainly to avoid environmental risk. Again landfill site should be located far from residential areas and settlement. The site should be away from areas that are susceptible to flooding, as this could result in washout of disposal waste into groundwater or stream and would pose risk to human health, the local aquifer and the environment. Other factors relating to land use, roads, slope, wind direction etc are considered in locating a risk free and environmentally friendly waste disposal site. These spatial information and other related factors have been used in identifying and selecting landfill site in Bareilly.

Recent research work on MSW activities in the Bareilly for the siting of waste disposal sites. Landfill siting basically considers multiple data and from different sources as may be observed in the next segment of data collection and processing.

A. Conceptual Framework and Qualitative Research

The conceptual framework for this study has been adopted from taking into account three important dimensions scope of waste management activities i.e. what needs to be covered? Actors and development partners i.e. who can contribute for taking the system towards higher sustainability? How to address strategic objectives and issues i.e. what is the best course of action to take?

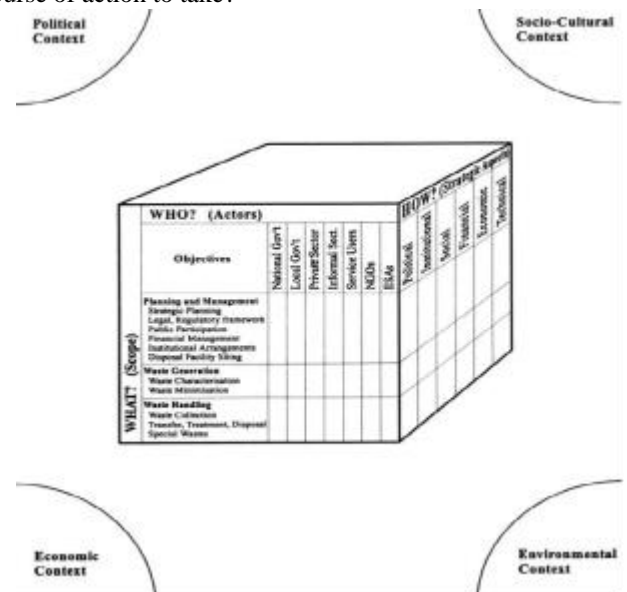


Fig 2: Conceptual framework

Qualitative research generally involves interactive and participatory methods of data collection; strong emphasis is given to the need for the researcher to build rapport with the participants and involvement of the participant in the discussions. Qualitative research is emergent and process oriented; several aspects emerge during the study, which allows the researcher to “view social phenomenon holistically”. The objective of this study is to recommend measures that will ensure long term sustainability of the solid waste management

system in Bareilly. Hence, a need of an approach, which was both flexible yet organized. Keeping in view the above requirement, a qualitative study was the most appropriate approach to follow.

The study was undertaken from November 2015 to April 2016. The study was developed to understand the solid waste management system in an urban settlement in a developing country framework in order to suggest ways the system might achieve higher level of sustainability. It have examined in depth the nature and features of the system and problems associated with it. In order to gain knowledge of the system being studied, interviews were conducted in conjunction with other methods for obtaining qualitative data. The main approach employed for this study is a qualitative case-study, Bareilly Municipal Corporation, India. The case study approach allows use of inductive methods, such as interviews, focus group discussions, which allows for general conclusions to be drawn from particular facts.

This research helps in unraveling the problems related to solid waste management in Bareilly, which in turn provides direction for people to change the system towards greater sustainability.

B. Data collection and analysis

Data collection of the study started with discussion with Municipal Corporation, Bareilly Development Authority, UPPCB, Town & Planning Department were used to extract the following information layers of the town: the Land use which comprise of residential areas, settlement, roads, water bodies, groundwater, commercial areas, sensitive areas, recreation, educational institution, agricultural, etc. Others are slope from the contour intervals as extracted

from the topographic maps, rainfall data, wind direction and speed, and soil. The organized data was then overviewed to get a general sense of emerging trends, patterns and concepts. During the visit and discussion with Municipal Corporation working on Solid waste and Bakarganj Dumping Ground visit it was observed that:

- 37 out of 70 Wards Door to Door Waste Collection is being implemented by Municipal Corporation through private contractors.
- No segregation of solid waste is carried out. Government yet to decide should the segregation be at source or at dumping ground.
- Segregation MSW rule 2000 flouted
- Transportation of Waste from Door to Door collection to DalaoGhar by the contractor and from Dalaoghar to Bakarganj Dumping site by Municipal Corporation Bareilly
- Municipal Waste Treatment Facility is closed due to Hon'ble NGT order
- Only Dumping of waste is happening
- No treatment and disposal is happening in Bareilly
- No Leachate treatment plant at dumping site

- No Air Pollution Monitoring frequency to be increased per month as dumping site is in vicinity to City population
- No proper conveying road inside the site
- Burning of MSW in open was observed, polluting the air
- Existing dumping site is nearby the community area.

The study found that about 100% of the total MSW generated in Bareilly is openly dumped at Bakarganj dumping site.

C. Present Disposal of Municipal Solid Wastes Disposal through Dumping

The Corporation disposes waste through landfill or land dumping method. At present there are one dumping sites in operation. Waste is brought here from various locations throughout the city as well as from the different Transfer Stations or Dalaoghra. Refuse and debris are leveled at these sites by means of bulldozers and landfill compactors. The land filling carried out here is open dump tipping.

Table 1: Details of Dumping Sites

Location	Area (hectares)	Quantity of MSW received (Maximum) (TPD)
Bakarganj Duping Site	8.58	356

Fig-3 Bakarganj Dumping Site



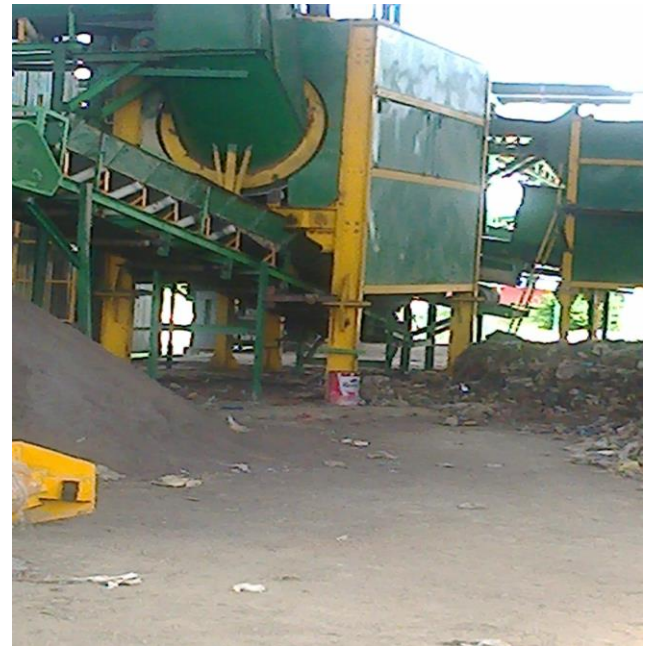


Fig-4 Closed Municipal Treatment Facility

The dumping site area is 8.58 Hectare which nearly located to community and 5 Km away from Municipal Corporation. Densely inhabited areas now surround the landfill sites. This has led to a situation where the residents have starting making complaints of environmental pollution caused due to burning of garbage and foul odor. Due to closing of dumping site which is situated at rajau parsupur, the daily waste generated in the Bareilly, daily dumped at bakarganj Dumping Site

III. ISSUES IN SOLID WASTE MANAGEMENT IN BAREILLY

A. Primary Collection

Because of non-segregation, part of the waste that gets dumped on the disposal sites is recyclable in nature. This has led to increase in quantity of waste required to be disposed. The problem in Bareilly is further aggravated due to a high density and large proportion of slum population.

B. Lack of Dumping Ground

With increasing urbanization, land available for dumping and creation of landfill sites for disposal of waste is becoming unavailable. There are only one landfill sites in the Bareilly area, whose expected lifespan fully exhausted. BMC is going to find it difficult to find new waste disposal sites in the near future to take care of present level of waste generations and that generated by the new population. Compost and RDF based MSW treatment facility is closed which is situated at rajau parsupur, the daily waste generated in the Bareilly, daily dumped at bakarganj Dumping Site.

C. Incompetency in Enforcement of MSW Rules

The BMC has not yet been able to enforce MSW Rules 2000. Although it is mandatory to segregate waste at the household level, notices to this effect have not been given for the implementation of the rules. Rules require that community waste storage bins are put up.

D. Lack of Participation/ Communication

It has been proven through research that in the case of Bareilly, there has been an absence of communication between local government and the communities.

E. Law provisions

Municipal Solid Waste (Management & Handling) Rule, 2000: The Ministry of Environment and Forest has notified the Municipal Solid Waste (Management & Handling) Rule, 2000 under the Environment (Protection) Act, 1986 to manage the Municipal Solid Waste (MSW) generated in the country. According to this rule there is specific provision for Collection, Segregation, Storage, Transportation processing and Disposal of MSW & it apply to all Municipal authorities. Under the Management of Municipal Solid.

IV. ENFORCEMENT OF NEW EFFORTS IN WASTE MANAGEMENT BY BAREILLY MUNICIPAL CORPORATION

Looking into the drawbacks, relating to the solid waste management that the city is facing at present and also anticipating the future problems, local NGOs along with the BMC have taken up certain new initiatives in order to control

the waste management problem. Bareilly Municipal Corporation made the Comprehensive plan for Municipal Solid Waste & Bio-Medical Waste which is submitted by Municipal Corporation Bareilly to NGT and following activities should be done by Municipal Corporation for MSW.

- Starting Door to Door Collection.
 - Survey of the household and commercial unit
 - A systematic route map for collection of waste
 - Community awareness program
 - Monitoring system for collection of waste by agency.
 - Educate the public through intensive Information Education and Communication (IEC) activities like Nukkad Natak, pamphlet, door to door inter personal communication.
 - Provision of litter bins, Provisions of containers for horticulture and construction and demolition waste.
 - Regular operation and maintenance of waste storage facilities.
 - Provision of bins for weekly markets, marriage halls and other functions.
 - Open sites to be eliminated.
 - Community Meeting, Door to Door awareness by College Student, Ward Meeting. An initiative "Safai Mitra" 'Know You Sanitary Worker is to be started,
 - The segregation of garbage at source is primarily meant to keep the two broad categories
 - of solid waste generated separately in different containers ie., biodegradable waste in
 - One container (GREEN) and non-biodegradable waste in another container (Black).
 - Mass awareness programmes for segregation of waste at;
 - At school level, residential, market/commercial areas Through Pamphlet, Interaction, Hoarding/newspaper/ local cable network, direct interaction, etc. Door - to - door collection of segregated waste followed by recycling/ utilization by appropriate environment friendly manner
 - New Site Selection for Dumping of Waste.
- Capping of existing dumping site

V. SUMMARY AND DISCUSSION

The Government of UP and BMC should work with their partners to promote source separation, achieve higher percentages of recycling and produce high quality compost from organics. Also, provisions should be made to handle the non-recyclable wastes that are being generated and will continue to be generated in the future. State Government should take a proactive role in leveraging their power to optimize resources.

Bareilly municipal corporation should choose following options or a combination of them, which are

- Best address the issue of overall solid waste management,

- Have the least impact on public health and environment and the Government should propose
- Try to coordinate with Urban Development Department for Capping of Existing Dump Site
- To identify new site for Land-filling as well as composting of waste
- Source segregation to be promote so can use and install Bio-methnataion plant

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