

## Solid Waste Management in Bengaluru-Current Scenario and Future Challenges

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### Abstract

Rapid growth in urban population coupled with economic growth and rise in community living standards have resulted in generation of huge quantities of municipal solid waste posing serious problem to municipalities, and corporations in terms of collection and disposal of solid waste. The current study reviews how the city of Bengaluru, which is a typical fast expanding city in India manages its solid waste through Bruhat Bengaluru Mahanagara Palike entrusted with the responsibility. It revealed that the current system of municipal solid waste management is not in tune with municipal solid waste (Management and Handling) rules, 2000. Approximately 5000 tons of waste is generated in Bengaluru city, out of which only 30% waste is collected by BBMP directly and the 70% of municipal solid waste is collected and transported through contractors. The solid waste is undergoing change in its composition. Due to several issues there is no properly operating sanitary landfill. Some of the landfills are either closed or badly managed. Much of municipal solid waste gets dumped in the open dumps, posing health risks to residents in their vicinity. This may cause in a high risk of contamination of ground water/surface water, soil and air.

**Keywords:** Contamination; Landfill; Municipal solid waste; Open dump

### Introduction

A harmonious and balanced relationship between human and nature on the earth is vital for the survival of life and sustainable growth. With advent of time, human directly or indirectly interfered with the natural environment for its comfort. One of the causes for pollution of air, water and soil is the way municipal solid waste is being managed. This solid waste problem cross is global and is a serious issue in developing countries such as India [1]. The waste generation rates are increasing and the characteristics are changing with increase in population explosion, Industrial development, and living standards, particularly in growing cities such as Bengaluru. Due to financial constraints a proper municipal solid waste collection and disposal mechanism is not in place [2]. For long, municipal solid waste management has not been recognized as a major attribute for the pollution of air, water and soil pollution. It is now abundantly clear that improper disposal of solid waste can affect all the spheres of the nature and can affect every form of life. For evolution of proper management of solid waste it is necessary to review the status of the current scenario of its collection and disposal methods. Bengaluru, which represent a typical fast growing cities is taken up for detailed review as a case study.

### Bengaluru Scenario

The Municipal Solid Waste (MSW) consists of organic and inorganic waste materials generated by various societal activities. The improper disposal of MSW pollutes all the vital components of the living environment, i.e., air, land, and water. Bengaluru, located in the southeast of India state. It is situated at 12.97N 77.56E and covers an area of 2,190 square kilometers at an average elevation of 920 meters.

Bengaluru city experiences a moderate weather throughout the year. In summers from March to May the maximum temperature rise up to 38°. In winter months the temperature varies between 28° and 32°. The annual rainfall is about 900 mm.

### Dimension of Solid Waste Problem

Currently, Bengaluru city generates around 5000 MT/day of MSW at an average of 0.5 kg/day/per capita with a population of about 10.18 million. Bengaluru city is facing serious problems due to existing disposal practices of generated waste incurring high cost due to lack of proper infrastructural facilities, also the open dumping in the expanding zone of the city poses serious problems to the structures constructed on these old dumps in addition to the groundwater quality due to improper leachate management. However, with an increasing population and the growing necessities of the Information Technology (IT) sector, the local authorities are struggling to provide the proper solid waste management system to a satisfactory level. Recently, the authorities have taken initiatives and measures to organize municipal solid waste management (MSWM) sector. Bengaluru city being a historical city has several narrow streets and gulleys, high population density and has pockets of rural area which have been amalgamated with developed areas, posing serious problems for collection and transport of Municipal waste. The phenomenal growth of vehicles on roads makes the task even more difficult.

### Present Waste Management Scenario

Presently, the Bruhat Bengaluru Mahanagara Palike (BBMP), the agency vested with responsibility of collection and disposal of solid waste, is engaged in a series of approaches such as involvement of citizen, investment in infrastructure and technology, as well as monitoring the various systems that are involved in managing the present mix of actions and techniques. For a more efficient and

effective approach, BBMP has been divided into different administrative units. There are 294 Health wards within the BBMP. Presently, in Bengaluru there are 198 such administrative or political wards. Within the BBMP, there are two departments which are directly involved in municipal solid waste management; they are Health Department and Engineering Department. The health Department is mainly responsible for collection, transportation and disposal of solid waste. The Engineering Department is responsible for the removal of construction and demolition waste, whilst they also provide technical and infrastructural support to the health department.

### Solid Waste Generation

In Bengaluru, at present only 10% of the waste is recycled. Most of the literature reported that the waste generation rate is 0.4–0.6 kg/capita/day. The 0.5 kg/capita/day is proposed as waste generation rate for Bengaluru city [3]. From past two decades of economic growth (since 1990), the composition of India's urban wastes has changed. In Bengaluru, presently the waste generation is about 5000 metric tons and the waste generation is likely to grow over the coming years. Going by the present trend of increase in the quantity of waste the waste quantity projected to increase to in the next 20 years.

### Characteristics of Municipal Solid Waste

The biodegradable waste is about 55–60% matter. This biodegradable waste can be converted into manure. Recyclable materials such as paper, cardboard, glass, metal, plastic, electronic is 16–25% and used for recycling purpose. 15% of inert materials will go to landfill. These percentages differ from city to city depending upon food habits. Also it has been noted that the characteristics of the waste are undergoing changes with time. The climate of Bengaluru being very modest, the rates of decomposition of organic waste is slow.

### Collection

Source segregation is still a concern in Bengaluru though awareness in picking up slowly. BBMP manages about 30% of MSW and 70% of MSW activity starting from primary collection to disposal has been outsourced. The collection of solid waste is carried out in two phases. The first stage is a primary collection, in which the solid waste is collected on auto tipper & pushcarts. An Auto tipper has been provided for every 1000 households and a pushcart for every 200 households. About 20000 Pourakarmikas (Sweepers) are being utilized (both BBMP and contractors) in the door-to-door collection, street sweeping and transportation of MSW. The waste collected from the households is brought to a common point, i.e., secondary locations from where the waste is transferred to landfill sites/ treatment through tipper trucks & compactors.

The BBMP has assigned the primary and secondary collection and transportation activity to Self Help Groups (SHG's) which are basically below poverty women's groups and landfill sites are operated by the private sector based on public-private partnership (PPP). Annually about 250crores is spent on solid waste management-towards salaries for 3197 Pourakarmikas by BBMP directly, and for 18562 Pourakarmikas through contractor who performs door-to-door collection, Tipping fees etc. The system and practice continued to be outdated and inefficient [4]. There are no clear plans to enhance their efficiency or improve working conditions through the provision of modern equipment and protective gear. There is a lack of knowledge of the quantity and characteristics of MSW aids in the preparation of a

long-term plan for an MSWM system. Hence, it was deemed necessary by the BBMP, Government of Karnataka, Bengaluru to assess the existing status of the MSWM system in Bengaluru city.

### Disposal Practices in Bengaluru

Presently, Bengaluru does not have any scientific treatment method facilities for solid waste generated by municipal and industries around Bengaluru. This has led to the development of several illegal and unauthorized dump sites in Bengaluru. The waste produced by the bulk generators such as hotels, restaurants, kalayana mandapas, markets, etc., is being directly collected and transported to the treatment/disposal facilities. The treatment facilities have been developed around the city, and their spread over the entire zone (Table 1).

Sl.No	Zone	Existing Disposal Site/Facility
1	South	Bingipura, Mavallipura, KCDC
2	East	MSGP, Mavallipura, KCDC,
3	West	Terra firma, Mavallipura, KCDC
4	Yelahanka	Mavallipura, Terrafirma
5	Bommanahalli	Bingipura, Laxmipura
6	Mahadevapura	Terrafirma
7	Dasarahalli	MSGP
8	Raja Rajeshwari Nagar	MSGP/Terrafirma

Table 1: Existing Treatment & Disposal facilities in BBMP.

### Sanitary landfill site

At present, Bengaluru can handle the municipal solid waste of about 2100 TPD only. The existing capacity of a waste treatment facility at Mavallipura is 600 TPD, Karnataka Composting Development Corporation Ltd (KCDC) is 300 TPD, and Terra Firma is about 1500 TPD. To achieve 100% processing of waste in Bengaluru, Government has sanctioned six new facilities. These new facilities are being set up at the following locations: Kannahalli is 500 TPD, Seegihalli is 200 TPD, Doddabidarakallu is 200 TPD, Lingaderenahalli is 200 TPD, Subrayanpalya is 200 TPD, Chikkanagamangala is 500 TPD, KCDC (upgradation) is 500 TPD. These are majorly wet waste composting plants with a provision to screen compost out of mixed MSW & provision also to store the non-compostable/ non-recyclable materials. These materials can be used for co-incineration in cement industries/ power generation [3].

### Illegal Dump Sites

There are more than 60 dump sites and it consists of both municipal and industrial waste existing in and around Bengaluru city. While the Bruhat Bengaluru Mahanagara Palike (BBMP) and the Karnataka State Pollution Control Board (KSPCB) close these sites, the new ones emerge elsewhere posing health risks to residents in their vicinity. The BBMP is merely collecting waste and dispose it. While the waste should be ideally segregated at the source, it is not done scientifically at present.

## Transportation

Transportation of solid waste from collection centers to final disposal site/landfill is another important step in the solid waste management. Currently, transportation of municipal solid waste is using pushcarts, auto, etc. Which bring the municipal solid waste to primary collection centers. From there trucks collect the municipal solid waste and transport it to waste disposal sites/landfill.

### Major issues in transporting waste

1. Due to open beds in tractors and trucks, the waste spills from the truck, during transport, thereby causing a nuisance.
2. Loading of waste by manual without the use of the protective gears is dangerous to the health of workers.
3. The secondary storage system is not synchronized with the transport system. Problems arise when a transport fleet is modernized because waste at secondary storage system is still dumped on the ground.
4. Due to an inadequate number of vehicles, the area cannot be serviced properly.
5. Due to inadequate workshop facilities and maintenance procedures, the vehicles are poorly maintained. This problem leads to break down of trucks and become out of service for a long time.

### Future Options for Improper Management of MSW

The following are some of the major problems for BBMP are:

1. Inappropriate plan for the disposal of MSWM taking the actual quantities and its composition
2. Less expertise and exposure to the urban city MSW adopting the modern techniques and best practices.

3. Lack of technical and trained manpower
4. Lack of community involvement
5. Partial awareness creation in MSW
6. Outdated management information systems
7. Low budgetary provision in BBMP

### Suggestions for effective management of MSW

1. Construction and operation of properly planned sanitary landfill through public private partnerships/private sector.
2. Effective segregation of waste at source itself, and send the recyclable separately to the respective processing units
3. It is better to concentration on energy production through anaerobic digestion and for land application rather than composting which is not economical.

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