



Research Paper

## “A Study on Bengaluru’s Initiatives for Solid Waste Management”

Sampath Kumar C  
Assistant Professor

Pooja Sharma  
Assistant Professor

Rakshitha R Ilager  
Assistant Professor

### ABSTRACT

Bengaluru, Karnataka's most urbanized district, is facing serious ecological and social problems as a result of labor migration and population growth. Every day, the city produces between 5,000 tonnes of solid waste, with the figure expected to rise to around 6,000 tonnes by 2029, with an average of 0.4 kg to 0.6 produced per person. Open dumping, insufficient infrastructure, and ineffective disposal methods in growing urban areas have led to high management costs and negative effects on the built environment. This study explores the solid waste management practices of Bengaluru's residents, with a focus on their methods of waste disposal and overall engagement in sustainable waste handling. Additionally, the Bruhat Bengaluru Mahanagara Palike replaced by Greater Bengaluru Authority's (GBA) functions in garbage collection, street sweeping, disposal, and transportation are also studied.

**Key words:** GBA(BBMP), Labor migration, Disposal, Open dumping, Waste management cost.

Received 26 Oct., 2025; Revised 07 Nov., 2025; Accepted 09 Nov., 2025 © The author(s) 2025.

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### Graphical Abstract

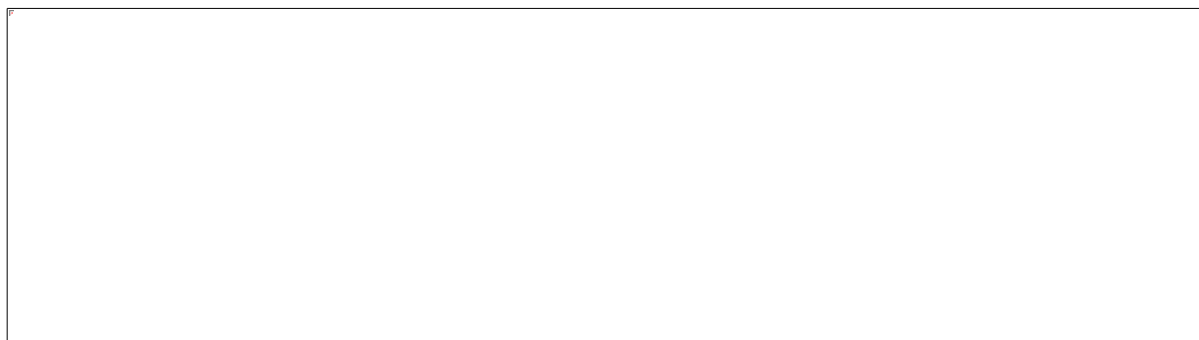


Figure 1 : Area/Locality where Solid waste is collected & disposed regularly.

### I. INTRODUCTION

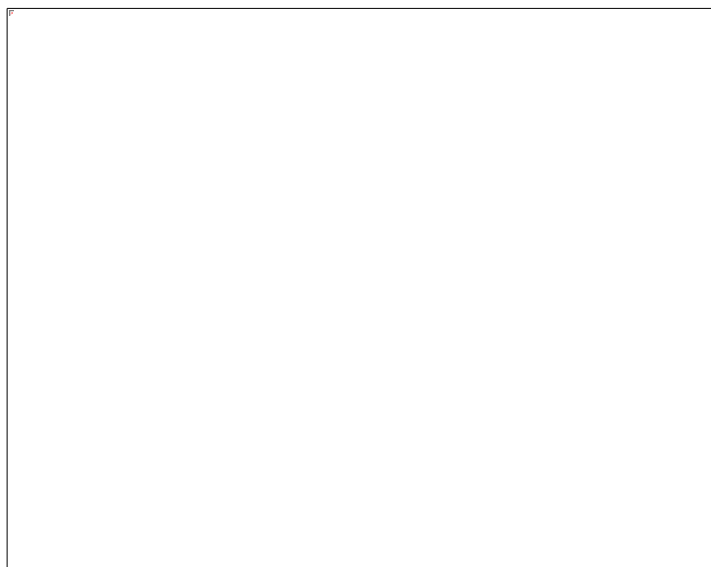
Solid waste management plays a vital role in maintaining environmental balance and safeguarding public health, especially in rapidly urbanizing cities like Bengaluru. Proper solid waste management is crucial, as poor handling can lead to serious health risks, environmental degradation, and a decline in the city's aesthetics. In this regard, the government has proposed strengthening the Municipal Solid Waste Management (MSWM) system by improving processes such as collection, segregation, recycling, transportation, processing, and disposal, along with promoting composting and waste-to-energy initiatives.

Kaza et al. (2018) estimate that global waste generation could reach 3.40 billion tonnes by 2050—more than twice the rate of population growth during the same time. Encouragingly, Bengaluru has recently experienced a surge in citizen involvement and awareness towards better waste practices. Residents, local groups, and organizations are actively using social media platforms like WhatsApp, Facebook, and Twitter to raise concerns, share solutions, and enhance accountability in civic management. Various initiatives—such as awareness campaigns, rallies, waste segregation drives, composting, upcycling, compost santhe (compost

markets), anti-plastic movements, and cutlery banks—are steadily gaining traction in the city, promoting a more sustainable and community-driven approach to waste management.

Solid waste management involves the handling, storage, and disposal of solid waste, along with offering recycling solutions for materials that can be reused. Communities have faced issues related to waste management since the beginning of human settlements. The core concepts of waste management apply to solid, liquid, and gaseous waste and serve as an effective approach for safely discarding certain hazardous substances.

Municipal solid waste (MSW) is typically classified into six main types: food waste, wood debris, paper and pulp materials, textiles, plastics, and rubber. The key components of solid waste management include handling, processing, and storage at the source; waste collection; transfer and transportation; waste reduction; and final disposal. Solid waste can consist of household garbage, construction debris, industrial waste, sewage sludge, emissions control residues, and various recyclable materials.



**Figure 2: Flow chart illustrating collection of solid waste.**

## **II. PROBLEM STATEMENT**

The problem statement for “**solid waste management in Bengaluru**” highlights the need for efficient waste handling and a better understanding of the types of waste produced. Like many other growing cities, Bengaluru is facing serious challenges in managing solid waste. Rapid urban growth and rising population levels have caused a sharp increase in waste generation. Unfortunately, the current waste management systems and practices have not been able to keep up with this rise.

Inadequate waste management also brings negative impacts on the environment, public health, and the city’s appearance. It can contaminate water sources, damage soil quality, pollute the air, and contribute to the spread of diseases. Tackling this issue is essential not only to keep the environment clean and safe but also to protect the health and quality of life of the city’s residents.

### **Objective of the Study**

- To study the disposal of solid waste management practices by Bengaluru residents.
- To investigate the environmental impacts of solid waste management practices in Bengaluru
- To assess how improved waste management practices can contribute to sustain the development processes in Bengaluru.

## **III. REVIEW OF LITERATURE:**

**V Gawaiker (2006)** he said the most important aspect of solid waste management is the quantity of waste to be managed. The quantity determines the size and number of functional units and equipments required for managing the wastes. The quantities are measured in terms of weight and volume. The weight is fairly constant for a given set of discarded objects where as volume is highly variable.

**Dinesh Kumar Mittal, IAS (2008)** has defined India, one of the fastest growing economies in the world, faces a challenge of MSW management. To address the issue, the Indian Govt. enacted MSW (Handling and Management) rules in the year 2000 with a view to improve the present scenario. All Urban Local Bodies (ULBs) were supposed to have MSW management by the end of the year 2003. This edition of the Newsletter focuses on the opportunities available in the management of Municipal Solid Waste and the successful

projectization of one such opportunity in the form of Timarpur-Okhla Integrated municipal processing facility in the state of Delhi.

Identifying the gap in literature, this paper tries to draw the relationship between population explosion and municipal waste generation. Population has a great effect on waste generation which impacts the environment and sustainability which includes space availability, landfill leachate, global warming, loss of habitat and consumption of natural resources (Franchetti, M.,2009). Apart from this, an attempt has also been made to show the effect of economic growth and changing lifestyle on composition and generation of MSW in India.

## SCOPE OF THE STUDY

This study looks at how people in Bengaluru separate and manage their waste at home. It also looks at how this affects the environment. The study will suggest better ways to manage waste that can help keep the city clean and support a healthy future.

## IV. RESEARCH METHODOLOGY

A survey was conducted among residents of Bengaluru to collect information about their solid waste management practices. The survey included questions on waste segregation, disposal methods, collection of garbage by GBA (BBMP) and awareness about environmental impacts. The data was then analyzed to understand current practices and suggest improvements.

### Primary Data:

A total of 118 respondents participated in the study. Some completed the questionnaire online, while others were collected manually from residents in Bengaluru. This helped gather diverse information about solid waste management practices.

### Secondary Data :

Secondary data was gathered from the (GBA) BBMP’s online reports to support the findings on solid waste management practices.

### Sample Size

The data was collected from residents of Bengaluru & then analyzed.

## V. DATA ANALYSIS AND INTERPRETATION

### What type of waste do you generate the most?

| Options       | No. of respondents | Percentage(%) |
|---------------|--------------------|---------------|
| Kitchen waste | 52                 | 44%           |
| Plastic       | 38                 | 32%           |
| Paper         | 19                 | 16%           |
| E- waste      | 9                  | 8%            |

### Interpretation

The data shows that kitchen waste is the most commonly generated type of waste, reported by 44% of respondents. Plastic waste follows at 32%, while paper and e-waste are less significant, indicating a need to prioritize organic and plastic waste management.

### Approximately how much waste do you generate per day?

| Options        | No. of respondents | Percentage (%) |
|----------------|--------------------|----------------|
| Less than 1 kg | 66                 | 56%            |
| 1- 2 kg        | 32                 | 27%            |
| More than 2 kg | 20                 | 17%            |

### Interpretation

The majority of respondents (56%) generate less than 1 kg of waste daily, suggesting relatively low individual waste output. However, 44% still produce 1 kg or more, highlighting the importance of promoting waste reduction practices.

**How often is waste collected from your area?**

| Options        | No. of respondents | Percentage(%) |
|----------------|--------------------|---------------|
| Daily          | 22                 | 19%           |
| Alternate days | 54                 | 46%           |
| Weekly         | 25                 | 21%           |
| Irregularly    | 17                 | 14%           |

**Interpretation**

Most respondents (46%) says that waste are collected on alternate days, showing a moderate level of regularity in cleanliness habits. Only 19% clean daily, while 14% do so irregularly, indicating room for improvement in maintaining consistent hygiene. Encouraging more frequent cleaning could enhance overall environmental health.

**If there any public bins, how often are the nearest public Bins emptied?**

| Options      | No. of respondents | Percentage(%) |
|--------------|--------------------|---------------|
| Once a week  | 37                 | 31%           |
| Twice a week | 52                 | 44%           |
| Everyday     | 10                 | 8%            |
| Don't know   | 19                 | 16%           |

**Interpretation**

The data indicates that public bins are (44%) disposed of waste twice a week, followed by 31% who do so once a week. A smaller portion disposes of waste daily or is unsure, suggesting that regular waste disposal habits are common but not consistent across all respondents.

**How do you usually dispose the household waste?**

| Options                 | No. of respondents | Percentage(%) |
|-------------------------|--------------------|---------------|
| Collected by GBA (BBMP) | 94                 | 80%           |
| Dumped in open area     | 13                 | 11%           |
| Burned                  | 6                  | 5%            |
| Compost at home         | 5                  | 4%            |

**Interpretation**

The majority of respondents (80%) rely on GBA (BBMP) for waste collection, indicating strong dependence on municipal services. A smaller percentage (11%) still dump waste in open areas, and a few resort to burning (5%) or home composting (4%). This highlights the need to improve awareness and promote sustainable waste disposal methods.

**How satisfied are you with the waste collection service in your area?**

| Options        | No. of respondents | Percentage(%) |
|----------------|--------------------|---------------|
| Very satisfied | 16                 | 14%           |
| Satisfied      | 30                 | 25%           |
| Neutral        | 51                 | 43%           |
| Disagree       | 21                 | 18%           |

**Interpretation**

A large share of respondents (43%) remain neutral, suggesting mixed or uncertain opinions. Positive responses make up a combined 39%, showing a moderate level of satisfaction. Only 18% expressed dissatisfaction, indicating that negative perceptions are relatively low.

**Do you face any problems with waste collectors(eg., irregular collection, fees, attitude)**

| Options | No. of respondents | Percentage(%) |
|---------|--------------------|---------------|
| Yes     | 70                 | 59%           |
| No      | 48                 | 41%           |

**Interpretation**

This data shows of respondents (59%) answered "Yes," showing a favorable or positive stance toward the issue. However, a significant portion (41%) disagreed, indicating some division in opinion. This suggests moderate support but also highlights the need to address concerns of the dissenting group.

**Have you attended any awareness campaigns or workshop on waste management?**

| Options | No. of respondents | Percentage(%) |
|---------|--------------------|---------------|
| Yes     | 26                 | 22%           |
| No      | 74                 | 63%           |
| Maybe   | 18                 | 15%           |

**Interpretation**

Most of respondents (63%) answered "No," indicating a lack of willingness or interest regarding the issue. Only 22% responded positively, while 15% are uncertain. This highlights a general reluctance and suggests the need for engagement or awareness efforts to shift perceptions.

**Do you believe citizens have a responsibility to manage waste properly?**

| Options        | No. of respondents | Percentage(%) |
|----------------|--------------------|---------------|
| Strongly agree | 16                 | 14%           |
| Agree          | 29                 | 25%           |
| Neutral        | 28                 | 24%           |
| Disagree       | 45                 | 38%           |

**Interpretation**

A significant portion of respondents (38%) disagree with the statement, indicating skepticism or dissatisfaction regarding the issue in question. Only 39% (strongly agree & agree) show a positive response, while 24% remain neutral. This suggests a divided opinion, with a lean toward disagreement that may require further investigation or action.

**What incentives would motivate people to practice better waste management?**

| Options                 | No. of respondents | Percentage(%) |
|-------------------------|--------------------|---------------|
| Discounts/ tax benefits | 11                 | 9             |
| Rewards/ Recognition    | 31                 | 26            |
| Penalties               | 41                 | 35            |
| Awareness Program       | 35                 | 30            |

**Interpretation**

The majority of respondents (35%) believe penalties are the most effective way to ensure proper waste management, followed closely by awareness programs (30%). Rewards and recognition (26%) also hold value, while only a few (9%) see tax benefits as a strong motivator. This suggests that both enforcement and education are key to promoting responsible waste practices.

**Limitations of the Study**

- This study focused on residents of Bengaluru, covering selected areas within the city.
- This study was restricted to the functions of the BBMP, the newly formed GBA was not included, as it was introduced recently.
- Residents’ responses may be subjective and influenced by personal experiences.

## VI. Findings

This study results that kitchen waste is the largest part of Bengaluru’s household waste, indicating a need for composting. While awareness about waste segregation exists, many people still throw mixed waste. Segregation and door-to-door collection work better in planned areas, but unplanned settlements face irregular collection. Dry waste like plastics and paper is being recycled, but e-waste management is still weak. Waste-to-energy plants and composting units exist but face operational challenges. Public-private initiatives like community composting and smart bins have been helpful. Poor disposal in some areas causes health and environmental problems, though smart technologies are showing promising results in improving waste management.

## VII. Suggestions:

- **RFID tags** can be used to waste bins, municipalities to automate data collection on waste levels, collection times, and locations, allowing for optimized collection routes, reduced fuel consumption, and better service.
- **GPS-enabled waste collection vehicles** for optimized routes.
- Conduct campaigns via social media, apps, and local workshop.
- Launch **citizen reporting apps** to report littering or overflowing bins.
- Provide **color-coded bins** and **awareness campaigns** & use **smart bins** with sensors to detect waste levels and send alerts when full.
- Implement strict regulations for **industrial, commercial, and household waste**
- Introduce **Extended Producer Responsibility (EPR)** for packaging and e-waste.

## VIII. Conclusion:

Bengaluru needs an efficient and well-planned solid waste management system that ensures proper collection, segregation, and disposal of waste. The BBMP should be empowered to strictly enforce waste management rules and penalize violators. Public awareness and active community participation are essential to promote waste segregation at the source and reduce waste generation.

Eco-friendly methods such as vermicomposting, biomethanation, and plastic reuse for road construction should be encouraged to minimize landfill waste and pollution. Moreover, adequate financial and administrative support from the state and central governments is necessary to strengthen local bodies and improve waste treatment facilities.

Overall, a combined effort of the government, citizens, and private sector can help Bengaluru achieve a cleaner, healthier, and more sustainable urban environment.

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