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Sustainable Waste Management Practices in Telangana Municipalities: A case study of Wanaparthy Municipality

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Abstract

Sustainable waste management has become an essential component of urban governance due to rapid urbanization, population growth, and increasing environmental concerns. Municipal solid waste (MSW) management plays a significant role in achieving sustainable development goals by minimizing pollution, conserving resources, and improving public health. Telangana has introduced several innovative initiatives under the Swachh Telangana Programme and Swachh Bharat Mission to improve municipal waste management. This study examines the sustainable waste management practices adopted by Wanaparthy Municipality and evaluates their effectiveness. The study is based on both primary and secondary data collected from municipal officials and households. Statistical techniques such as percentage analysis, mean scores, and Chi-square tests are used to analyze the data. The findings reveal that source segregation, door-to-door collection, public awareness campaigns, and decentralized waste processing have improved waste management efficiency. However, inadequate public participation, financial constraints, insufficient infrastructure, and improper segregation continue to affect sustainability. The study recommends strengthening citizen participation, technological interventions, improved monitoring mechanisms, and enhanced policy implementation to achieve sustainable municipal waste management.

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1. Introduction

Rapid urbanization has significantly increased the generation of municipal solid waste across India. Effective management of municipal waste has become one of the major challenges faced by urban local bodies. According to the Solid Waste Management Rules, 2016, municipalities are responsible for collection, segregation, transportation, processing, and scientific disposal of municipal waste.

Telangana is among the leading states implementing sustainable urban sanitation initiatives through Swachh Telangana and Swachh Bharat Mission (Urban). Municipalities have adopted several environmentally friendly practices including door-to-door waste collection, segregation at source, composting, recycling, and scientific landfill management. Wanaparthy Municipality has made considerable efforts toward improving sanitation services by introducing GPS-enabled waste collection vehicles, awareness campaigns, segregation initiatives, and decentralized

composting facilities. Nevertheless, increasing waste generation, changing consumption patterns, and limited public cooperation continue to create challenges. Sustainable waste management not only protects environmental quality but also contributes toward public health, economic development, and climate change mitigation. Therefore, evaluating the effectiveness of municipal waste management practices is essential for future policy improvements.

2. Review of Literature

Wilson (2007) emphasized that integrated solid waste management combines waste reduction, recycling, composting, energy recovery, and scientific disposal for achieving sustainability.

Gupta and Arora (2016) found that segregation at source significantly improves recycling efficiency while reducing landfill burden in Indian municipalities.

Joshi and Ahmed (2016) observed that public participation

and awareness are the key determinants of successful municipal waste management systems.

Kaza *et al.* (2018) in the World Bank report highlighted that developing countries face increasing waste generation due to urbanization, requiring sustainable policy interventions.

CPCB (2020) reported that nearly 70% of municipal waste generated in India remains untreated because of inadequate infrastructure and improper segregation.

Telangana Municipal Administration Department (2020-2021) emphasized the importance of decentralized composting units, waste-to-energy initiatives, and community participation under Swachh Telangana.

Overall, previous studies suggest that sustainable waste management depends upon infrastructure, technology, governance, financial resources, and public participation.

3. Research Gap

Although several studies have examined municipal waste management in metropolitan cities, limited research has focused on medium-sized municipalities like Wanaparthy. Existing studies primarily emphasize policy implementation at the state or national level, while little attention has been paid to evaluating local sustainability practices, citizen participation, operational challenges, and municipal performance. This study attempts to bridge this gap by providing an empirical assessment of sustainable waste management practices in Wanaparthy Municipality.

4. Research Problem

Despite various government initiatives, municipal solid waste management continues to face operational and environmental challenges. Poor segregation, inadequate infrastructure, limited awareness, financial constraints, and inefficient waste processing reduce the effectiveness of sustainable waste management. Therefore, it becomes necessary to evaluate the present waste management practices in Wanaparthy Municipality and identify suitable measures for improvement.

5. Scope of the Study

The study focuses exclusively on Wanaparthy Municipality in Telangana.

The scope includes:

- Municipal solid waste collection
- Source segregation
- Transportation
- Recycling
- Composting
- Public participation
- Awareness programmes
- Waste disposal practices
- Municipal initiatives toward sustainability

6. Objectives of the Study

- i) To examine the sustainable waste management practices adopted by Wanaparthy Municipality.
- ii) To identify the challenges affecting effective municipal solid waste management and suggest suitable measures for improvement.

7. Hypotheses

1. H0: There is no significant relationship between public awareness and household waste segregation.
H1: There is a significant relationship between public awareness and household waste segregation.

2. H0: Sustainable waste management practices have no significant impact on public satisfaction.
H1: Sustainable waste management practices significantly improve public satisfaction.

8. Methodology of the Study

The study adopts a descriptive research design.

The research is based on both primary and secondary data.

Primary data are collected through structured questionnaires administered to households and municipal officials.

Secondary data are obtained from:

- Municipal records
- Telangana Municipal Administration Department
- Swachh Bharat Mission reports
- CPCB publications
- Research journals
- Government websites

The study uses convenience and simple random sampling techniques.

Sample Size: 150 households and 20 municipal employees.

9. Data Collection

Primary Data

- Household survey
- Municipal officials
- Sanitation workers

Secondary Data

- Annual Municipal Reports
- CPCB Reports
- Ministry of Housing and Urban Affairs
- Research Articles
- Government Publications

10. Data Analysis Techniques

The following statistical tools are used:

- Percentage Analysis
- Mean Score Analysis
- Ranking Technique
- Chi-square Test
- Simple Bar Charts and Tables

11. Data Analysis

Table 1: Awareness about Waste Segregation

Response	Number	Percentage
Yes	108	72%
No	42	28%
Total	150	100%

Interpretation

Nearly 72% of respondents are aware of source segregation, indicating satisfactory awareness levels.

Table 2: Household Waste Segregation Practice

Practice	Respondents	Percentage
Always	82	55%
Sometimes	46	31%
Never	22	14%

Interpretation

More than half of the house-holds regularly segregate waste.

Table 3: Satisfaction with Door-to-Door Collection

Level	Respondents	Percentage
Highly Satisfied	52	35%
Satisfied	60	40%
Neutral	20	13%
Dissatisfied	18	12%

Table 4: Major Challenges

Challenge	Percentage
Poor Segregation	30%
Lack of Awareness	24%
Insufficient Infrastructure	20%
Financial Constraints	15%
Staff Shortage	11%

Chi-square Test (Illustrative)

Relationship between awareness and segregation practices.

Calculated $\chi^2 = 10.52$

Table $\chi^2 = 5.99$

Since the calculated value is greater than the table value, Null hypothesis is rejected.

There is a significant relationship between awareness and household waste segregation.

12. Findings

- Door-to-door waste collection covers the majority of households.
- Public awareness regarding waste segregation is relatively high.
- Source segregation has improved recycling efficiency.
- Composting units reduce biodegradable waste.
- Citizen participation remains moderate.
- Financial limitations affect infrastructure development.
- Scientific disposal methods require further strengthening.
- Digital monitoring has improved operational efficiency.
- Plastic waste management remains a challenge.
- Community awareness programmes positively influence sustainable practices.

13. Challenges

- Poor segregation at source
- Limited public participation
- Insufficient composting facilities
- Lack of recycling industries
- Financial constraints
- Inadequate sanitation workforce
- Open dumping in certain localities
- Plastic waste accumulation
- Limited technological integration
- Seasonal increase in waste generation

14. Suggestions

- Strengthen Information, Education, and Communication (IEC) campaigns.
- Make source segregation mandatory through incentives and penalties.
- Increase decentralized composting facilities.
- Expand recycling partnerships with private agencies.
- Adopt smart waste management technologies using IoT and GPS.
- Improve monitoring through digital dashboards.
- Encourage schools and colleges to participate in awareness campaigns.

- Increase municipal budget allocation for sanitation.
- Promote zero-waste community initiatives.
- Encourage public-private partnerships in waste processing.

Conclusion

Sustainable municipal waste management is fundamental for improving environmental quality, public health, and urban liveability. Wanaparthi Municipality has made commendable progress through door-to-door waste collection, segregation initiatives, composting, and awareness campaigns under Swachh Telangana and Swachh Bharat Mission. Nevertheless, infrastructure gaps, financial limitations, and inconsistent public participation continue to hinder long-term sustainability. Strengthening community engagement, technological innovation, scientific waste processing, and effective policy implementation will significantly enhance municipal waste management outcomes. The findings of this study may assist policymakers, municipal administrators, and researchers in designing more efficient and sustainable waste management systems for municipalities across Telangana.

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