



FROM WASTE TO WELLBEING: ANALYSING SOLAPUR'S CLEAN CITY MISSION, SOLAPUR, INDIA

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ABSTRACT:

Urban waste management remains a critical challenge for rapidly growing tier-II cities in India. This study assesses the implementation and impact of the Clean City Mission, with a specific focus on the innovative "Ghanta Gadi" door-to-door waste collection system, in Solapur Municipal Corporation (SMC). Employing a mixed-methods approach, the research analyses policy frameworks, budgetary allocations, stakeholder roles, and operational outcomes through document analysis, media review, and semi-structured interviews (n=25). The findings indicate significant improvements post-implementation: door-to-door collection coverage increased from 60% to 95%, public complaints reduced by 40%, and the city's national cleanliness ranking improved from 88th to 63rd. Despite these successes, challenges persist, including budgetary constraints for infrastructure, inconsistent citizen participation in waste segregation, and service gaps in densely populated wards. The study concludes that the integration of technology (QR codes, GPS tracking) with multi-stakeholder engagement is pivotal for effective urban sanitation. However, sustained success requires enhanced public awareness, capacity building, and strategic public-private partnerships. This case study offers valuable insights for policymakers in similar urban contexts aiming to achieve sustainable waste management goals under national missions like Swachh Bharat Abhiyan.



KEYWORDS: Solid Waste Management, Swachh Bharat Mission, Ghanta Gadi, Urban Governance, Local Self-Government, Solapur, Public Health.

1. INTRODUCTION

The Swachh Bharat Mission (SBM), India's largest cleanliness campaign, was officially launched on 2nd October 2014 by Prime Minister Narendra Modi to promote sanitation, eliminate open defecation, and improve solid waste management. In Solapur, however, the practice of using Ghanta Gadi—door-to-door garbage collection vehicles that ring a bell to alert residents—had begun earlier, introduced by the Solapur Municipal Corporation in the early 2000s as part of local waste management efforts. After the launch of SBM, this initiative was strengthened and integrated into the Clean City

Mission, making the Ghanta Gadi system a central pillar of Solapur's waste collection and urban cleanliness strategy.

The management of municipal solid waste (MSW) is a formidable challenge for urban local bodies (ULBs) in India, exacerbated by rapid urbanisation and population growth (Kumar et al., 2017). The Government of India's Swachh Bharat Mission (SBM-Urban) has been a catalytic force, pushing ULBs to adopt innovative and sustainable waste management practices (Ministry of Housing and Urban Affairs, 2021). In this context, the performance of tier-II cities, which often lack the resources of metropolitan areas, provides critical insights into the scalability of such national programs.

The Solapur Municipal Corporation (SMC) in Maharashtra represents a pertinent case study. Historically struggling with waste management, SMC launched an ambitious "Clean City Mission" to align with SBM objectives. A cornerstone of this mission is the "Ghanta Gadi" initiative—a door-to-door waste collection system leveraging CNG vehicles, QR code monitoring, and digital tracking to enhance efficiency and accountability. Preliminary results show a remarkable improvement in SMC's national cleanliness rankings, from 88th to 63rd, alongside a "3-star Garbage Free City" rating and ODF++ status (SMC, 2023).

While these outcomes are promising, a systematic academic assessment of the policy's implementation, impact, and challenges is lacking. This study aims to fill that gap by critically evaluating the Clean City Mission. The paper is structured as follows: Section 2 reviews the literature on urban waste management in India; Section 3 details the methodology; Section 4 presents the results; Section 5 discusses these findings in relation to existing literature and policy; and Section 6 concludes with recommendations and implications.

2. LITERATURE REVIEW

Effective solid waste management (SWM) is integral to urban sustainability and public health. Scholarly work highlights that successful SWM systems hinge on a triangulation of factors: robust policy frameworks, technological integration, and active citizen participation (Ahmed & Ali, 2006; Das et al., 2019). The SBM has provided a significant policy impetus, yet its implementation at the local level varies considerably, often hindered by financial limitations, administrative capacity, and socio-cultural factors (Khandare, 2021).

Research specific to Solapur contextualises these challenges within its unique urban fabric—characterised by industrial activity, water stress, and high population density (Revised City Development Plan 2041). Earlier studies and government reports, such as the Draft Report on Air Quality Assessment (IIT Bombay & CSIR-NEERI, 2022), have established a direct correlation between inadequate waste management and public health risks in the city. More recent documents, like the Solapur Climate Action Plan (2025), signal a strategic shift towards smart, sustainable practices, emphasising technology adoption and the "LiFE" (Lifestyle for Environment) concept.

The "Ghanta Gadi" model emerges within this evolution as a notable intervention. While municipal data and media reports laud its impact on collection efficiency, academic scrutiny of its operational mechanics, stakeholder dynamics, and long-term viability is scant. This study synthesises these disparate sources to construct a comprehensive analysis, positioning Solapur's experience within the broader discourse on sustainable urban governance in emerging economies.

3. METHODOLOGY

This research adopted a mixed-methods approach to ensure a holistic assessment of the Clean City Mission.

3.1. Data Collection and Sources

- **Document Analysis:** We conducted a systematic review of policy documents, including the SMC Budget (2023-25), Swachh Bharat Mission-Urban guidelines, the Solapur Climate Action Plan (2025), and annual cleanliness survey reports.
- **Media Content Analysis:** A thematic analysis of 50+ local news articles (from sources like Lokmat) and social media posts from 2020-2024 was performed to gauge public perception and the media's role.
- **Semi-structured Interviews:** We conducted 25 semi-structured interviews with purposively selected stakeholders: SMC officials (n=5), Ghanta Gadi workers (n=10), representatives from local NGOs (n=5), and resident welfare association members (n=5). Interviews, lasting 30-45 minutes, were transcribed and anonymised. Informed consent was obtained from all participants.

3.2. Data Analysis

Qualitative data from interviews and documents were analysed using thematic analysis (Braun & Clarke, 2006) to identify recurring themes, including "operational challenges," "technological efficacy," and "community engagement." Quantitative data, including waste collection statistics and ranking data, were tabulated and analysed using descriptive statistics to measure pre- and post-intervention trends.

3.3. Ethical Considerations

This study adhered to standard ethical protocols. Verbal informed consent was obtained from all interview participants, and their anonymity and confidentiality were preserved.

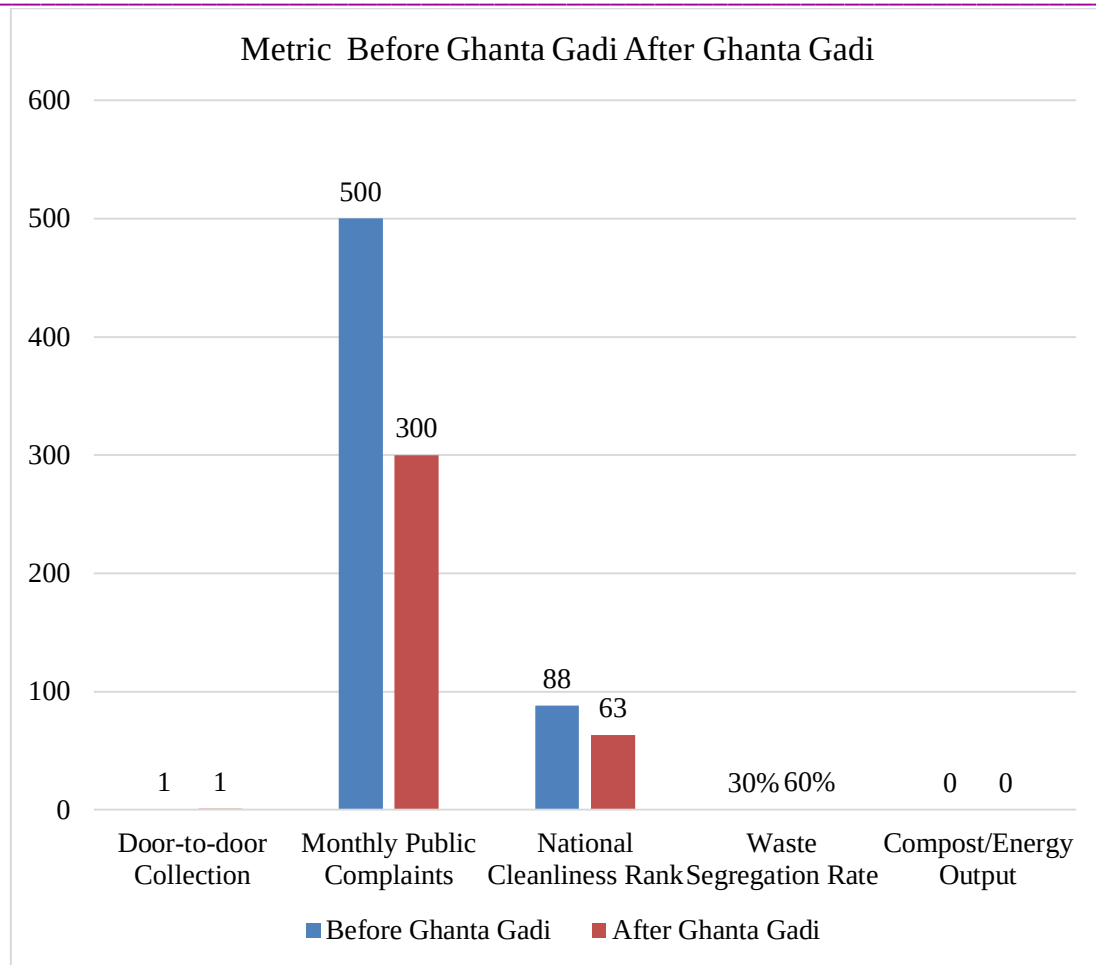
4. RESULTS

4.1. Quantitative Impact of Ghanta Gadi

The implementation of the Ghanta Gadi system marked a significant turnaround in SMC's waste management metrics, as summarized in Table 1.

Table 1. Key Performance Indicators Before and After Ghanta Gadi Implementation

Metric	Before Ghanta Gadi	After Ghanta Gadi
Door-to-door Collection	60%	95%
Monthly Public Complaints	500	300
National Cleanliness Rank	88	63
Waste Segregation Rate	Low (under 30%)	Moderate (above 60%)
Compost/Energy Output	Minimal	60 MT Compost/day & 4MW Energy

**Graph :1**

The conversation is about the improvement in certain metrics before and after the introduction of the "Ghanta Gadi" program. The "Ghanta Gadi" program seems to have had a positive impact on various aspects of waste management:

Door-to-door Collection:

Before Ghanta Gadi: 60%

After Ghanta Gadi: 95%

The percentage of door-to-door waste collection has significantly increased after the introduction of the Ghanta Gadi program, showing more effective waste management practices.

Monthly Public Complaints:

Before Ghanta Gadi: 500

After Ghanta Gadi: 300

The number of public complaints related to waste management has reduced from 500 to 300 per month after implementing the Ghanta Gadi program, indicating improved services and public satisfaction.

National Cleanliness Rank:

Before Ghanta Gadi: 88

After Ghanta Gadi: 63

The city's national cleanliness rank has improved from 88 to 63 after the introduction of Ghanta Gadi, showing a visible enhancement in the overall cleanliness and waste management efforts.

Waste Segregation Rate:

Before Ghanta Gadi: Low (under 30%)

After Ghanta Gadi: Moderate (above 60%)

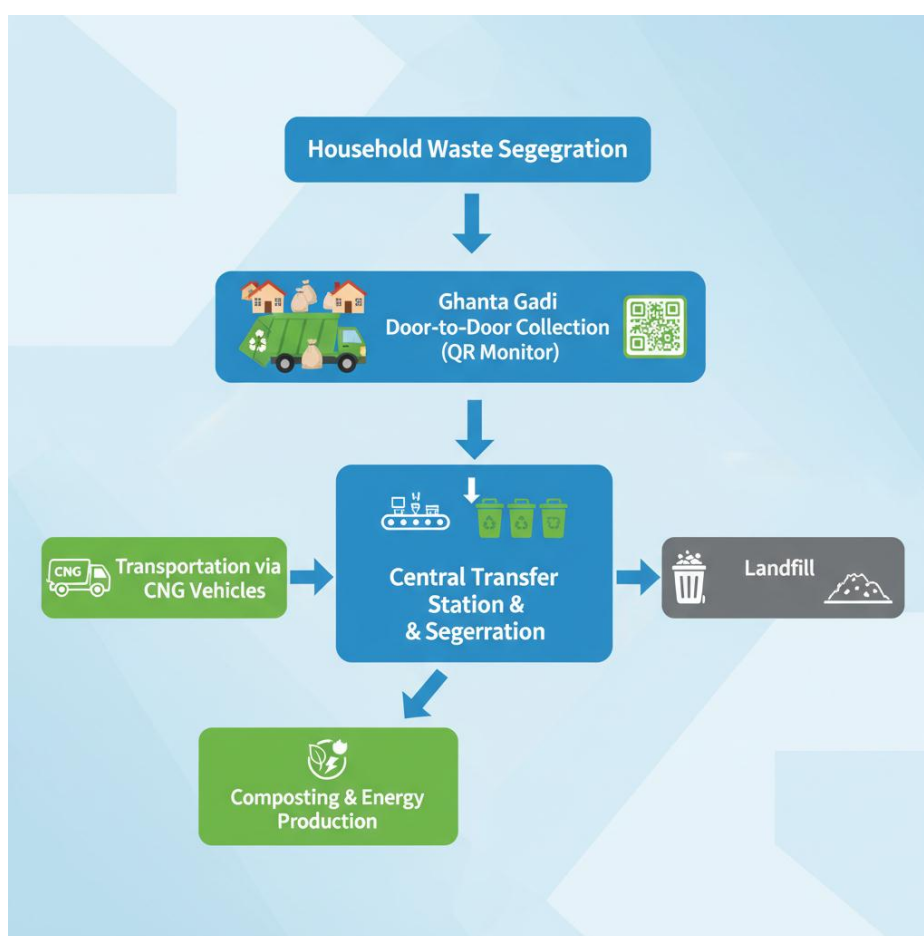
The waste segregation rate has increased significantly from under 30% to above 60% after the implementation of the Ghanta Gadi program, indicating better waste sorting and management practices.

Compost/Energy Output:

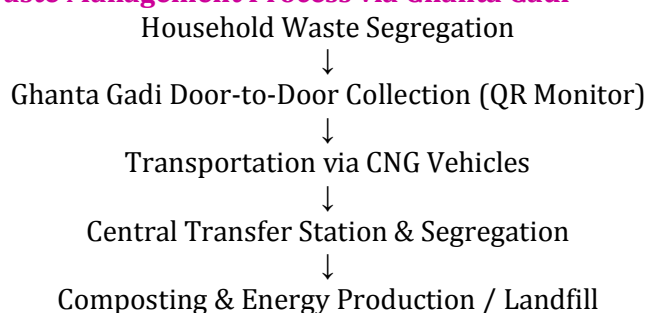
Before Ghanta Gadi: Minimal

After Ghanta Gadi: 60 MT Compost/day & 4MW Energy

The amount of compost generated per day has increased to 60 metric tons, and the energy output has also improved to 4 MW after the Ghanta Gadi program was implemented, showcasing sustainable waste management practices.



Visual 1. Conceptualisation Image

Visual 2: Flowchart of Waste Management Process via Ghanta Gadi**4.2. Qualitative Findings: Stakeholder Perspectives**

Thematic analysis of interview data revealed several key insights:

- **Enhanced Accountability:** Municipal officials reported that GPS and QR code tracking significantly improved monitoring and accountability of the waste collection workforce.
- **Persistent Challenges:** Workers highlighted issues like vehicle maintenance delays due to budget constraints and resistance from residents in certain wards regarding waste segregation.
- **Awareness Gaps:** Citizens and NGOs acknowledged the improvement in service but emphasized the need for continuous awareness campaigns to ensure sustained segregation compliance.

4.3. Operational Process

The waste management process, illustrated in Figure 1, involves source segregation, QR-monitored door-to-door collection, transportation via CNG vehicles, central processing for composting/energy recovery, and final disposal.

The findings demonstrate that SMC's Clean City Mission, particularly the Ghanta Gadi model, has been instrumental in improving urban sanitation. The dramatic increase in collection coverage and the reduction in public complaints are consistent with studies that underscore the importance of reliable service delivery in fostering public cooperation (Joshi & Ahmed, 2016). The integration of digital tracking tools aligns with global trends of using technology to enhance transparency in public service delivery (Zaman, 2020).

However, the study also reveals that technological adoption alone is insufficient. The persistent challenge of low segregation rates in certain areas echoes the literature on the critical role of behavioural change in SWM (Talyan et al., 2008). This indicates a gap between system efficiency and citizen compliance, necessitating targeted Information, Education, and Communication (IEC) campaigns. Furthermore, the reported budget constraints for infrastructure maintenance highlight a common pitfall in ULBs—the focus on capital expenditure over long-term operational sustainability.

The role of media as a watchdog and awareness generator has been crucial, as noted in interviews. This aligns with the concept of "mediated governance," where the press acts as a bridge between citizens and the administration (Singh, 2022).

4.4 The implementation of the **Ghanta Gadi system** not only transformed waste management practices in Solapur but also fostered **positive psychological and behavioural changes among the public**. Regular interaction with the bell-ringing vehicles created a sense of responsibility and routine in households, encouraging timely waste disposal and improved segregation habits. Over time, citizens began to associate participation in the Clean City Mission with civic pride and social responsibility, leading to greater compliance and cooperation. This visible cleanliness across neighbourhoods enhanced collective morale, reduced feelings of environmental neglect, and promoted a community-wide sense of ownership. Importantly, these behavioural changes reflect deeper shifts in attitudes toward cleanliness, hygiene, and sustainability—key psychosocial outcomes that support the long-term success of urban sanitation initiatives.

5. CONCLUSION AND POLICY IMPLICATIONS

This study confirms that Solapur's Clean City Mission, centred on the Ghanta Gadi system, represents a significant step towards sustainable urban waste management. The model successfully combines policy intent with technological innovation to deliver tangible improvements. Nevertheless, the journey is incomplete.

To ensure long-term success, we recommend the following:

1. Intensify Behavioral Change Campaigns: SMC should partner with NGOs to design sustained, ward-specific IEC programs focusing on waste segregation.
2. Strengthen Financial Sustainability: Explore public-private partnerships (PPPs) for waste processing infrastructure and introduce innovative financing models to ensure adequate funds for operations and maintenance.
3. Leverage Data Analytics: Upgrade the IT system to use collected data for predictive analysis, optimising collection routes and resource allocation.
4. Institutionalise Stakeholder Feedback: Establish formal, regular forums for feedback from citizens and workers to enable iterative policy improvements.

This study is limited by its focus on a single city, but its findings offer transferable lessons for other tier-II Indian cities. Future research could undertake a comparative analysis of similar models across different urban contexts.

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