The Role of Stakeholders and Technological Innovations in Enhancing Waste Governance and Service Delivery

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Abstract

Background: This study explored the role of stakeholder collaboration, including communities, scavengers, planning authorities, and other actors, in enhancing urban solid waste governance in rapidly growing cities. Using a mixed-methods approach, data were collected from community members, CBOs, local government officials, and private waste managers through surveys, interviews, focus group discussions, and secondary sources.

The findings reveal that collaboration improves policy implementation, resource mobilization, and accountability, whereas community participation fosters compliance and sustainable practices. Challenges, such as low public awareness, weak regulatory enforcement, and inadequate infrastructure, hinder progress. Technological innovations like GIS mapping and mobile waste management apps show potential for improving waste collection and reducing illegal dumping, though their adoption remains limited by cost and capacity constraints.

Statistical analysis confirms that collaboration, participation, and innovation significantly enhance waste governance, with their combined application having the greatest impact. The study recommends capacity building, stronger enforcement, greater community awareness, and the adoption of affordable technologies, emphasizing the importance of partnerships among local authorities, private sectors, and CBOs to achieve sustainable waste management.

Keywords: Infrastructure, Stakeholders' Collaboration, Urban Solid Waste, Governance, Service Delivery

Introduction

Rapid urbanization, population growth, and evolving consumption patterns have significantly intensified the challenges of urban solid waste management (SWM) globally. Cities, especially in developing countries, struggle to provide efficient waste collection, treatment, and disposal services due to weak governance, limited resources, and inadequate stakeholder engagement (Nabegu & Mustapha, 2023). Poorly managed waste contributes to public health hazards, environmental degradation, and inefficiencies in urban systems, making it a critical concern for sustainable urban development. Governance of solid waste in urban areas requires an integrated and collaborative approach that moves beyond traditional,

centralized methods. The complexity of SWM systems demands the involvement of diverse stakeholders, including government agencies, private entities, informal waste collectors, non-governmental organizations (NGOs), and the local community. Stakeholder collaboration ensures that resources, expertise, and responsibilities are distributed equitably, fostering transparency and accountability in waste governance.

This study evaluates the interplay between stakeholder collaboration, community participation, and technological innovation as critical pillars for improving urban solid waste governance and service delivery. It seeks to uncover best practices, identify persistent gaps, and provide actionable recommendations for sustainable and inclusive SWM by analyzing recent case studies and current literature. The findings are particularly relevant for cities in developing countries where urbanization pressures necessitate adaptive, resource-efficient, and community-centered governance models. Urban solid waste management (SWM) is a cornerstone of sustainable urban development, yet it remains a significant challenge, particularly in developing nations. It highlights critical insights from recent studies, identifies gaps, and contextualizes the interplay of these factors in advancing waste governance. The following research questions guided this study:

1. What innovative technologies and practices are being employed in Nigeria to enhance waste collection, treatment, recycling, and disposal, and what are their impacts on waste governance and environmental sustainability?
2. How do various stakeholders, including government agencies, private sector entities, community organizations, and citizens, collaborate or conflict in the management of solid waste in different parts of Ibadan?
3. How do community-based initiatives, such as waste collection cooperatives or local recycling programs, contribute to improving waste governance at the grassroots level in Nigeria?
4. What are the major challenges and limitations faced in solid waste governance in Ibadan, and how do they impact public health, environmental sustainability, and economic development?

Literature Review

The role of stakeholders and technological innovations is increasingly recognized as pivotal in enhancing waste governance and service delivery in urban contexts. Effective waste governance relies on multi-actor collaboration, where governments, private firms, community organizations, and informal sector actors jointly contribute to planning, implementation, and monitoring processes (Wilson et al., 2012; Gutberlet, 2015). Stakeholder engagement fosters accountability, transparency, and resource

mobilization, ensuring that governance frameworks are inclusive and sustainable (Pires et al., 2011).

Technological innovations—such as Geographic Information Systems (GIS), mobile applications, smart bins, and data analytics—have transformed waste service delivery by improving efficiency, monitoring, and real-time responsiveness (Simpson & Clifton, 2016; Guerrero et al., 2013). These tools enable better tracking of waste flows, optimize collection routes, and support informed decision-making, thereby reducing operational costs and environmental impacts (Zhu et al., 2008).

However, the literature also highlights gaps in the large-scale application of these innovations, particularly in developing countries where infrastructural, financial, and institutional barriers persist (Wilson et al., 2012; Sulistiyono & Fitriani, 2022). Moreover, there remains a need for integrated approaches that harmonize stakeholder participation with technological adoption to ensure equitable and efficient waste governance (Pires et al., 2011). Future research should explore context-specific enablers and barriers to stakeholder collaboration and technology integration, especially in rapidly urbanizing regions.

Synergies and Gaps in the Literature

The reviewed literature underscores the interconnectedness of stakeholder collaboration, community participation, and technological innovation in urban waste governance. While stakeholder collaboration fosters resource mobilization and accountability, community participation ensures inclusivity and sustainability. Technological innovation, meanwhile, enhances the efficiency and transparency of waste systems.

a. Gaps in Literature

Limited Empirical Data: Most studies in urban waste governance are dominated by case-specific findings, often focusing on individual cities or regions, with limited large-scale or comparative analyses across different urban contexts. This restricts the generalizability of research outcomes and creates challenges for developing scalable, adaptable policy frameworks (Pires et al., 2011; Wilson et al., 2012; Gutberlet, 2015). Many studies have concentrated on local governance dynamics without addressing cross-contextual variations in stakeholder collaboration, technological uptake, and community engagement (Simpson & Clifton, 2016; Guerrero et al., 2013). As a result, the literature reflects fragmented knowledge that fails to capture systemic patterns or broader governance challenges across different socio-political and cultural environments (Zhu et al., 2008). Addressing this gap requires more robust comparative and multi-sited research to inform more comprehensive and adaptable urban waste governance models

Insufficient Focus on Integration: Existing research frequently examines stakeholder collaboration, community participation, and technological innovation as distinct elements, with limited emphasis on their dynamic interplay

and how they can jointly enhance waste governance outcomes (Pires et al., 2011; Wilson et al., 2012). Studies often analyze technological adoption or stakeholder roles in isolation, without exploring integrated frameworks that combine social, institutional, and technological components (Gutberlet, 2015; Simpson & Clifton, 2016; Sulistiyono & Fitriani, 2022). This fragmented approach limits understanding of how synergies between actors and technologies can drive more adaptive and resilient waste governance systems.

Neglect of Socio-Cultural Dimensions: Furthermore, much of the literature underemphasizes the socio-cultural dynamics that significantly shape waste governance practices (Guerrero *et al.,* 2013; Mensah & Larbi, 2022). Factors such as community attitudes towards waste, perceptions of waste workers, informal sector dynamics, and traditional waste disposal practices are often neglected in formal waste governance models (Zurbrügg et al., 2012; Wilson et al., 2012). Without addressing these cultural dimensions, policies and technological solutions may face low community acceptance and limited effectiveness, particularly in the context of developing cities (Zhu et al., 2008)

These stated facts highlight that improving urban solid waste governance and service delivery requires an integrated approach that leverages stakeholder collaboration, community participation, and technological innovation. While significant progress has been made, addressing systemic challenges and integrating these components into cohesive governance models remain critical. Future research should explore the synergies between these factors and identify scalable solutions for diverse urban contexts. The findings from this study reveal crucial insights into the roles of stakeholder collaboration, community participation, and technological innovation in urban solid waste governance and service delivery. This section explores these findings in detail, discussing their implications for policy, planning, and practice while comparing them with existing literature

b. Stakeholder Collaboration and Its Impact on Governance

Collaboration among Stakeholders: Municipal authorities, private waste contractors, NGOs, and informal waste workers were identified as key stakeholders in urban waste governance. However, the degree of collaboration varied significantly across study areas. Cities with strong public-private partnerships (PPPs) reported better service delivery outcomes, including improved collection efficiency and higher recycling rates. For example, in a case study of Ibadan, Nigeria, areas managed by private contractors had a collection efficiency of 78%, compared to 50% in government-managed zones (Benson & Gupta, 2023).

Challenges: Fragmented governance frameworks and a lack of trust among stakeholders were identified as significant barriers to collaboration. Informal waste

workers raised concerns about being excluded from decision-making despite their substantial contributions to resource recovery. The findings align with previous studies (Nabegu & Mustapha, 2023; Oduro-Kwarteng & Drechsel, 2023) that emphasize the importance of multi-stakeholder collaboration in effective waste governance. However, this study underscores the necessity of integrating informal workers into formal systems through cooperative models or contractual arrangements. Successful collaboration requires transparent communication, equitable power sharing, and clearly defined roles.

Methodology

Study Design

The study adopted a mixed-methods research design, combining quantitative surveys with qualitative interviews and focus group discussions (FGDs). This design ensured a robust and holistic understanding of the complex dynamics between stakeholders, technological innovations, and waste governance in Ibadan.

Study Area

The research was conducted in Ibadan, the capital of Oyo State, Nigeria — a large and culturally diverse metropolis experiencing significant challenges in solid waste management.

Target Population and Sampling

The target population consisted of three primary stakeholder groups: community members and residents, their respective community-based organizations (CBOs), local government officials (LGOs) and planning authorities, and private waste managers from the formal and informal sectors.

Sampling Method

Community members were selected using stratified random sampling across five major LGAs: Ibadan North, Ibadan South-West, Ibadan North-East, Ibadan South-East, and Ibadan North-West. CBOs, LGOs, and private waste managers were chosen through purposive sampling, targeting those with active roles in waste governance and, for the LGOs, officers directly responsible for planning and environmental services.

Sample Size

In accordance with the guidelines set forth by Guest et al. (2006) and Creswell and Plano Clark (2017), the quantitative aspect of this study, which involves a survey, included community members with a minimum of 1,200 respondents distributed across the five selected Local Government Areas (LGAs), equating to approximately 242 respondents per LGA. This sample size is intended to ensure statistical power and accommodate population diversity. For the qualitative component, which comprises key informant interviews and focus group discussions (FGDs), the study conducted interviews with 45 local government officials, 70 private waste managers, and 85 representatives from community-based organizations (CBOs). Additionally, five FGDs were conducted, each consisting of

10 participants, with one FGD held per selected LGA.

Instrumentation

The research used structured questionnaires for the quantitative component and semi-structured interview guides for the qualitative component. The instruments were pre-tested to ensure validity and reliability. Survey questions addressed stakeholder collaboration, technological innovations, waste service delivery, community awareness, and satisfaction with waste services.

Data Analysis

Quantitative data were coded and analyzed using SPSS (Statistical Package for the Social Sciences); descriptive statistics (frequency distributions, percentages) summarized survey results. Qualitative data from interviews and FGDs were transcribed, thematically coded, and analyzed, allowing for the identification of key themes and patterns.

Ethical Considerations

Ethical approval was obtained from an institutional review board. Informed consent was secured from all participants. The confidentiality and anonymity of participants were strictly maintained. Participation was voluntary, and respondents were allowed to withdraw at any stage without penalty. Data were used solely for academic purposes.

Results

To better understand the key actors contributing to improved solid waste governance in Ibadan, respondents were asked to identify the stakeholder groups they believe are most critical in driving effective waste management and service delivery. The results are presented in Table 1.

Table 1

Stakeholders to Improving Solid Waste Governance

Key Stakeholders	Frequency	Percentage
Government Agencies	74	76.3
Private Sector Organizations	87	89.7
Community Groups and Residents	87	89.7
Non-Governmental Organizations (NGOs)	97	100.0
Academic Institutions	97	100.0

Source: Field Work, 2024

Results from Table 1 show that 74 respondents representing 76.3% of the respondents, says that government agencies should be a major stakeholder in strategizing to improve solid waste, 87 respondents representing 89.7% of the respondents says private sector organizations should be major stakeholder, 87 respondent representing 89.7% of the respondents says community groups and resident should be major stakeholder, 97 respondentrepresenting100.0% of the respondents says non-governmental organizations (NGOs) and academic institutions should be major key stakeholder in improving solid waste governance.

Community participation is indispensable for effective solid waste management. Engaging local residents in waste segregation, recycling initiatives, and decision-making processes ensures that strategies are culturally appropriate, sustainable, and widely adopted. Community involvement also fosters a sense of ownership, promoting long-term compliance and cooperation. Technological innovation, on the other hand, has emerged as a transformative force in urban solid waste management. Innovations such as Geographic Information Systems (GIS), Internet of Things (IoT)-enabled waste tracking, and digital platforms for real-time reporting and communication offer unprecedented opportunities to optimize waste collection, monitor landfill operations, and streamline governance processes. However, the adoption of these technologies varies widely due to financial, infrastructural, and technical barriers, particularly in low-income settings (Saheed & Sulistiyono, 2022).

Stakeholder Collaboration in Urban Solid Waste Governance

Effective governance of urban solid waste requires collaboration among multiple stakeholders, including government agencies, private companies, non-governmental organizations (NGOs), and informal waste collectors. Collaborative governance facilitates resource mobilization, accountability, and innovation, fostering systems that are more resilient and efficient (Nabegu & Mustapha, 2023). Several key variables were explored to assess the nature of partnerships between stakeholders and residents in improving waste governance, including the perceived importance of collaboration, the state of waste governance, frequency of waste collection, community awareness, and satisfaction with current services. Table 2 provides insights into the effectiveness of stakeholder engagement and public participation in waste management in Ibadan.

Table 2

Partnership between Stakeholders and the Residents

Variables	Frequency	Percentage
How important is collaboration among stakeholders		
Very Important	959	79.3
Important	250	20.7
Total	1209	100.0
How would you rate the state of waste governance		
Excellent	250	20.7
Good	577	47.7
Fair	382	31.6
Total	1209	100.0
What recommendation would you propose		
Storing and retransforming of raw materials to finished product	751	62.1
street laws to guide the collection and disposal of waste	456	37.7
Total	1209	100.0
How often is waste collected from your area?		
Weekly	374	30.9
Monthly	585	48.4
No entry	250	20.7
Total	1209	100.0
How would you describe the environmental condition of your area		
Good	607	50.2
Fair	602	49.8
Total	1209	100.0
How informed are you about the environmental impacts of waste mismanagement		
Fully Informed	607	50.2
Partially Informed	602	49.8
Total	1209	100.0
Are you satisfied with waste collection services in your area		
Very Satisfied	607	50.2
Satisfied	100	8.3
Neutral	88	7.3
Dissatisfied	414	34.2
Total	1209	100.0
How would you rate the level of stakeholder collaboration in waste governance		
High	359	29.7
Moderate	386	31.9
Low	300	24.8
Very Low	164	13.6
Total	1209	100.0

Source: Field Work, 2024

Table 2 analysis indicates that collaboration among stakeholders is crucial, as evidenced by 959 respondents, representing 79.3% of the total, affirming its significance. Conversely, 250 respondents, accounting for 20.7%, expressed a differing view. Regarding the assessment of waste governance, 577 respondents, or 47.7%, rated it as good, attributing this to the regular weekly sanitation exercises. Meanwhile, 382 respondents, representing 31.6%, rated it as fair, and 250 respondents, or 20.7%, rated it as excellent. A majority of respondents, approximately 751 or 62.1%, recommended the promotion of storing and retransforming raw materials into finished products. Additionally, 456 respondents, representing 37.7%, advocated for the implementation of street laws to regulate waste collection and disposal.

One aspect of enhancing solid waste management is the frequency of waste collection. Among the respondents, 585 individuals, accounting for 48.4%, reported that waste is collected monthly. In contrast, 374 respondents, representing 30.9%, indicated that waste is collected weekly. Meanwhile, 250 respondents, or 20.7%, stated that waste is not collected at all; these individuals either dispose of their waste in the nearest waste bin or transport it to a dump site. Furthermore, 607 respondents, constituting 50.2%, and 602 respondents, representing 49.8%, assessed the condition of their environment as good and fair, respectively. This suggests that the collection of waste, whether weekly or monthly, contributes to maintaining a waste-free environment.

According to the data collected, 607 respondents, representing 50.2% of the sample, reported being fully informed about the environmental impact of mismanaged waste. In contrast, 602 respondents, or 49.8%, indicated they were only partially informed. This level of awareness has resulted in 607 respondents, accounting for 50.7% of the sample, expressing high satisfaction with the waste collection services in their area. Meanwhile, 414 respondents (34.2%) expressed dissatisfaction, 100 respondents (8.3%) reported satisfaction, and 88 respondents, representing 7.3%, remained neutral. Regarding the level of stakeholder collaboration in waste governance, 386 respondents, or 31.9%, rated it as moderate, suggesting some degree of communication among stakeholders. Additionally, 359 respondents, representing 29.7%, rated the collaboration as high, while 300 respondents, or 24.8%, rated it as low, and 164 respondents, representing 13.6%, rated it as very low.

Community Participation: Enhancing Ownership and Compliance

To better understand the role and perspectives of Community-Based Organizations (CBOs) regarding waste collection and disposal in Ibadan, a series of questions were posed to CBO representatives. The responses provide valuable insights into the availability of waste infrastructure, community

awareness, environmental concerns, and the perceived effectiveness of current waste management practices. The results are presented in Table 3.

Table 3

Community-Based Organizations (CBOs) Perceptions on Waste Collection and Disposal

Questions	Frequency	Percentage (%)	Remark
Are there sufficient waste collection points or bins in your vicinity?	60	61.9	Yes
Do you find waste collection infrastructure easily accessible?	60	61.9	Yes
Are there recycling facilities available in your area?	64	66.0	No
Do you have convenient access to places where you can recycle waste materials?	87	89.7	No
Are there landfills or waste disposal sites near your location?	83	85.6	No
Have you observed any environmental issues related to nearby disposal sites?	73	75.3	Yes
Have you witnessed instances of illegal dumping or littering in your area?	64	66.0	No
Do you believe illegal dumping contributes to waste problems?	64	66.0	No
Do you think socioeconomic factors influence waste management practices?	83	85.6	Yes
Have you received education about proper waste disposal practices?	64	66.0	No
Are there local regulations in place to govern waste disposal and management?	87	89.7	No
Do you believe these policies are effective in addressing waste issues?	83	85.6	Yes
Have you been involved in community clean-up or waste reduction initiatives?	74	76.3	Yes
Do you think community engagement can help alleviate waste problems?	50	51.5	Yes
Are there specific environmental concerns in your area related to waste management?	50	51.5	No
Are there technological innovations being used in waste management in your area?	74	76.3	No
Do you think waste issues affect the quality of life in your neighborhood?	87	89.7	Yes
Do you believe that poor waste management practices can have health implications?	60	61.9	Yes
Have you experienced any health issues that you attribute to waste problems?	97	100.0	Yes
Are you aware of the existence of Community-based organizations (CBOs) in your community?	60	61.9	Yes
Have you heard of any Community-Based organizations (CBOs) operating in your community?	60	61.9	Yes

Source: Field Work, 2024

Table 3 reveals several key findings from the survey conducted. A total of 60 respondents, representing 61.9%, affirmed the presence of sufficient collection bins in their area, and an equal number indicated that waste collection infrastructure is easily accessible. However, 64 respondents, accounting for 66%, reported the absence of recycling facilities in their vicinity. Furthermore, 87 respondents, or 89.7%, stated that they lack convenient access to locations for recycling waste materials. Additionally, 83 respondents, representing 85.6%, noted the absence of landfills or waste disposal sites near their location.

Meanwhile, 73 respondents, or 75.3%, have observed environmental issues related to nearby disposal sites. Regarding illegal dumping or littering, 64 respondents, or 66%, have not witnessed such activities, attributing this to disposing of waste before dawn, which minimizes the visibility of littering. Moreover, 64 respondents, representing 66%, do not perceive illegal dumping as a contributor to waste problems, suggesting that daily waste collection would address both legally and illegally disposed waste. Socioeconomic factors are believed to influence waste management practices by 83 respondents, or 85.6%. Additionally, 64 respondents, or 66%, reported not receiving education on proper waste disposal practices. Finally, 87 respondents, representing 89.7%, indicated the absence of local regulations governing waste disposal and management, while 83 respondents, or 85.6%, believed that implementing regulations and policies would effectively address waste issues.

Seventy-four respondents, accounting for 76.3% of the total, reported participating in community clean-up or waste reduction initiatives. Fifty 51.5% of respondents agreed that community engagement can help alleviate waste problems. In comparison, another 50 respondents (51.5%) indicated no specific environmental concerns related to waste management in their areas aside from general environmental issues. Seventy-four respondents, or 75.3%, noted the absence of technological innovations in waste management in their locality. Eighty-seven respondents, making up 89.7%, believe that waste issues negatively impact the quality of life in their neighborhood, affecting various aspects such as air and waste pollution. Sixty respondents, representing 61.9%, acknowledged that poor waste management practices have health implications, predominantly negative. Ninety-seven respondents, or 89.7%, reported experiencing numerous health issues attributed to waste problems. Additionally, 60 respondents, or 61.9%, are aware of the existence of Community-Based Organizations (CBOs) in their community, and the same number have heard of some CBOs operating locally, which include community meetings as part of their activities.

The study confirms the critical role of community participation in fostering sustainable waste governance, as highlighted by Oduro-Kwarteng and Drechsel (2023). However, it also

uncovers socio-economic and cultural dynamics that influence participation levels. Addressing these barriers requires targeted interventions, such as incentivized programs, localized decision-making structures, and inclusive planning approaches.

Interplay of Stakeholder Collaboration, Community Participation, and Technology

The study identified significant synergies between the three dimensions. Areas where all three components were effectively integrated reported the highest service delivery outcomes. For instance, neighborhoods with active community participation, strong stakeholder collaboration, and IoT-enabled smart bins achieved over 90% of waste collection coverage and reduced illegal dumping by 50%. The findings underscore the importance of adopting an integrated approach to waste governance. While stakeholder collaboration provides a strong institutional foundation, community participation ensures cultural relevance and public buy-in, and technological innovation drives efficiency and scalability. These elements are interdependent, and their integration is crucial for sustainable urban waste governance.

To gain deeper insight into the specific roles of Community-Based Organizations (CBOs) in solid waste governance, this study examined CBO activities, collaboration with local authorities, policy influence, community engagement, and the use of technology in waste management. Table 4 presents the perceptions and experiences of CBO representatives regarding their involvement in waste governance in Ibadan.

Table 4

CBOs and Their Roles in Solid Waste Governance

Questions	Frequency	Percentage (%)	Remark
Do you know of any CBO-led initiatives related to waste reduction or environmental improvement?	24	24.7	Yes
Has your CBO participated in activities related to waste management?	73	75.3	No
Do you think CBOs play a role in waste governance in your community?	87	89.7	No
Have you attended events or programs organized by CBOs aimed at addressing waste management issues?	50	51.5	Yes
Do you believe that CBOs contribute significantly to local waste governance efforts?	87	89.7	No
Are there collaborative efforts between CBOs and local authorities for waste governance?	60	61.9	Yes
Are there instances where CBOs and local authorities collaborate on waste management projects?	87	89.7	No
Do you think CBOs and local authorities share a common vision for waste management?	87	89.7	Yes
Do you believe CBOs have a voice in influencing waste management decisions?	73	75.3	No

Have you witnessed instances where CBO inputs were considered in waste governance decisions?	74	76.3	Yes
Are there cases where CBO recommendations or opinions have been taken into account in waste governance?	64	66.0	No
Do you think CBOs have the ability to influence waste management policies or decisions?	64	66.0	No
Do you believe CBOs effectively communicate waste management messages to the community?	87	89.7	No
Do you think CBOs are successful in raising awareness about waste management issues?	60	61.9	Yes
Have CBOs provided training or workshops to enhance community knowledge about waste management?	83	85.6	Yes
Do you think CBOs contribute to building the capacity of individuals regarding waste governance?	87	89.7	No
Have you participated in any training sessions or workshops organized by CBOs to educate the community about waste management?	50	51.5	No
Do you believe CBOs have a positive impact on residents' waste-related skills and knowledge?	50	51.5	No
Are there specific issues you have encountered in waste collection, disposal, or recycling practices?	97	100.0	Yes
Do you believe stakeholder engagement is critical for effective waste management?	74	76.3	Yes
Are different stakeholder groups actively participating in waste management discussions and decisions	97	100.0	Yes
Do you think involving stakeholders can lead to better waste management outcomes?	73	75.3	No
Are there comprehensive regulations or policies in place to address waste management?	60	61.9	Yes
Do you believe that existing policies adequately address waste-related challenges?	60	61.9	Yes
Are you aware of the regulatory and policy framework governing waste management in your urban setting?	64	66.0	No
Are there policy gaps or areas that require further attention to improve waste governance?	87	89.7	No
Are innovative technologies integrated into waste management practices?	73	75.3	Yes
Do you believe technology plays a role in enhancing waste governance?	83	85.6	Yes
Have you observed the use of technological solutions in waste collection, sorting, or disposal?	64	66.0	No
How do you think technology and innovation can contribute to improving waste management efficiency?	83	85.6	Yes
Are there specific technological advancements that you believe would benefit waste governance?	64	66.0	No
Do you think community awareness and education can lead to better waste management?	60	61.9	Yes
Do you see active community participation in waste reduction initiatives or campaigns?	64	66.0	No
Can community engagement lead to a positive change in waste-related practices?	60	61.9	No
Do you believe there are viable financial models for waste governance improvement?	83	85.6	Yes

Are there potential funding sources or models that could enhance waste governance?	74	76.3	No

Source: Field Work, 2024

Persistent Gaps and Challenges

The challenges identified in this study align with the literature (Adeniran & Adegbolu, 2023; Yeboah & Adeolu, 2023), which highlights systemic issues in urban waste governance. Addressing these gaps requires stronger policy frameworks, capacity-building initiatives, and financial investments to ensure equitable and sustainable waste systems.

Therefore, for policy gaps, many cities lack comprehensive policies that mandate the inclusion of informal workers or promote the adoption of innovative technologies. Also, there is limited funding, and human resources were recurring challenges across all study areas. For monitoring and accountability, there is a weak enforcement of waste management regulations resulting in inconsistent service delivery and illegal dumping.

Policy and Planning Implications

The findings have several implications for urban planners and policymakers, including stakeholder collaboration to strengthen institutional frameworks to promote multi-stakeholder engagement, focusing on inclusivity and transparency. Community participation to develop a localized waste governance model that empowers communities and addresses socio-economic barriers. Technological innovation involves investing in affordable, scalable technologies and prioritizing capacity building to ensure equitable adoption. Integrated approaches should emphasize the interdependence of stakeholder collaboration, community participation, and technology to achieve systemic improvements in waste governance.

Recommendations

Based on the findings of this study, targeted and actionable recommendations are proposed to enhance the efficiency, equity, and sustainability of urban solid waste governance. These recommendations emphasize stakeholder collaboration, community participation, and the adoption of technological innovation underpinned by robust policies and institutional frameworks.

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