



Public Perception Towards Women Representation in Solid Waste Management: Obstacles Towards Effective Solid Waste Management Practices

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Abstract

Background: Globally, 2.01 billion tons of municipal solid wastes are generated annually, and at least a third of these are not managed environmentally safely. Nigeria, with a population exceeding 180 million, ranks among the leading producers of solid waste in Africa. Globally, women are predominantly involved in waste handling at the household level, but face marginalisation and reduced participation as the sector becomes more formalised. **Objectives:** This study investigated public perceptions of women's representation in solid waste management (SWM) and its impact on effective and sustainable waste management practices. **Methodology:** The study utilised a descriptive cross-sectional survey design conducted across three metropolitan cities: Osogbo, Ilorin, and Ibadan, selected for their urbanisation levels and diverse demographics. Data collection methods involved stakeholder consultations, field surveys, and a context-specific questionnaire administered to 122 respondents. The analysis included descriptive and inferential statistics conducted using the SPSS version. Descriptive statistics were utilised to summarise age, gender, awareness level, knowledge scores, and attitudes. Inferential statistics, including Analysis of Variance (ANOVA), Chi-square test, or Pearson correlation, were applied to test the relationships and differences between variables. **Results:** Results indicated that societal norms significantly influence occupational roles in SWM, with men predominantly occupying waste collection roles (53.3%), while women face underrepresentation, particularly in managerial positions (9.83%). Public perception favours women's participation, viewing their roles as effective and associated with positive attitudes. However, cultural norms, lack of training, and stigmatisation emerged as significant barriers to women's managerial advancement. The ANOVA results confirmed significant ($p < 0.05$) differences in these barriers across occupations. **Conclusion/Recommendations:** This study highlighted the critical role of gender integration in achieving effective waste management and significantly contributed to the global conversation on sustainable development. This study also observed that addressing cultural norms and promoting equitable representation can foster sustainable practices and improve SWM efficiency. Policy recommendations included gender-sensitive strategies such as increased training for women, awareness campaigns, and supportive work environments to enhance inclusivity.

Keywords: SDG4: gender inequality, Chi-square test, Waste workers, Environmental Sustainability

Introduction

According to Kaza et al. (2018), 2.01 billion tons of municipal solid waste are produced annually, and at least a third of these are not managed in an environmentally safe manner; this is estimated to increase to 3.40 billion tons by 2050, with the biggest growth in low- and middle-income countries. In Nigeria, solid waste management has become a menace in urban and rural areas. According to Bakare (2020), Nigeria, with a population of over 180 million (National Bureau of Statistics, 2018), ranks among the leading producers of solid waste in Africa. Effective solid waste management is one of the essential services required to have been a part of the global debate on sustainable human development according to Social Development Goal 6, which aims to ensure universal and equitable access to safe and affordable water alongside adequate and equitable sanitation and hygiene for all. Although efforts are being made to protect the environment, there are still challenging issues like solid waste management, which makes maintaining environmental quality a pressing task in the 21st century.

Socially constructed roles and expectations dictate different occupational roles that men and women are expected to carry out as their societal responsibilities. Conventional gender roles are assigned to women, i.e., work and activities related to domestic and care work, such as childbearing and caregiving, as well as household care tasks that support family well-being—cooking, cleaning, fetching water, washing, and attending to the sick and elderly—are traditionally assigned to women. Meanwhile, men are typically assigned productive roles, encompassing activities that generate goods and services for consumption or trade (Muhammad & Manu, 2013). This traditional gendered division of labour extends to solid waste management, where roles often reflect broader societal norms and expectations

regarding gender in the domestic sphere and the public sphere; therefore, Much Angos & Vaughter (2019) reported that gender issues permeate waste management, manifesting in everyday handling activities at the household level and extending to decision-making processes at the highest organisational and policy levels. This study aimed to explore public perception towards women's representation in solid waste management and its influence on effective solid waste management in Nigeria. The study sought to bring to the limelight the women's participation in promoting effective and sustainable solid waste management from its outcome.

Materials and methods

Study area

The study was conducted using three (3) metropolitan cities they include Osogbo (Osun State), Ilorin (Kwara State), and Ibadan (Oyo State) in Nigeria, selected due to (1) the significant amount of waste generated as a result of daily influx or immigration of people (2) the residents include the different classes of people like: aged and youth, educated and uneducated and different tribes which have different roles for women in the society and (3) they are the location or centre of government policy, decision, and management; therefore, execution of solid waste management should be effective there. State(s) Waste Management Agencies visited include Osun Waste Management Agencies (OWMA), Kwara Waste Environmental Protection Agencies (KWEPA), and Oyo Waste Management Agencies (OYOWMA).

Methodological approach

This study adopted a descriptive cross-sectional survey design to explore public perceptions of women's representation in solid waste management. Respondents were selected using a stratified random sampling technique.

Sample size calculation

A sample size of one hundred and twenty-two (122) respondents was determined using the formula provided by Taro Yamane (1967).

$$n = \frac{N}{1 + N(e)^2}$$

n = Sample size, N = total size of waste workers in the cities under study, e= Margin of sampling errors (constant).

The questionnaire for this study consists of simple open-ended and close-ended questions. The questionnaire was prepared in English, Nigeria's official language, and translated into Yoruba and Hausa, the dialects of the people working in the selected locations.

Data sources and collection methods

The study used two major sources of data collection:

Field survey and stakeholder consultations

A field survey was conducted to collect primary data through interviews and copies of the questionnaire; a stakeholders' consultation meeting was held with the State(s) Ministry of Environment, State(s) Waste Management Agencies (OWMA, KWEPA, and OYOWMA) and Private Service Providers (PSP); this stakeholders' consultation helped in designing a context-specific questionnaire for waste workers.

Questionnaire development and administration

A well-structured questionnaire was developed based on the information gathered from the stakeholder consultations. The questionnaire was distributed to the selected respondents.

Statistical analysis

The study employed descriptive statistics, including mean, standard deviation, frequency, and percentage, to summarise the demographic characteristics of the respondents and occupational roles

Inferential statistics, specifically Analysis of Variance (ANOVA) and post hoc tests, were employed to examine significant differences among variables. A one-way ANOVA was conducted to compare the means of the variables across different groups of public perception across gender roles, while a two-way ANOVA was performed to examine interaction effects between gender and perception across occupational roles. Post-hoc tests, specifically Tukey's HSD, were conducted to determine significant group differences. The significance level was set at $p \leq 0.5$, and all analyses were performed using Statistical Package for the Social Sciences (SPSS) software version 25.

Results

Table 1 revealed that the gender of the study sample included 61.5% (male) and 38.5% (female) respondents, indicating that they were mainly men. Waste collection has the highest respondents (53.3%), with 38% male respondents in this occupational role. Table 2 provides a comprehensive overview of respondent's perceptions and attitudes toward women's participation outside the domestic sphere. 43.4% and 23.8% of respondents' perceptions and attitudes were positive, respectively. Table 3 highlights gender-based differences in perceptions and attitudes towards various roles in solid waste management. Females consistently show higher perceptions of effectiveness and more positive attitudes than males across all roles, with statistically significant differences observed in policymaker, recycler, and sorter roles. For instance, female policymakers (78%) and Sorters (80%) have notably higher perceptions of effectiveness than their male counterparts (72% and 64%, respectively) and also hold more positive attitudes toward these roles.

Similarly, female recyclers (77%) and waste collectors (73%) also report higher effectiveness and more favourable attitudes

than males. These differences are significant in the policy maker ($p = 0.04$), recycler ($p = 0.02$), and sorter ($p = 0.01$) roles, reflecting a notable gender disparity in how roles are perceived and valued.

Table 4 revealed that the public generally perceived female roles in solid waste management as more effective and held more positive attitudes towards them than male roles. The perception of effectiveness is higher for female roles (75%) than for male roles (70%), and attitudes towards female roles are also more positive (65%) than male roles (60%). These differences were statistically significant (F-statistic = 3.8, p-value = 0.05), indicating that gender influences perceptions and attitudes. Figure 1 illustrates the expected changes across occupational roles within solid waste management. It was observed that they all

desired training followed by salary increments and loan accessibility. Notably, the managerial position for women had the lowest representation, which indicated that respondents do not see this as an expected change within solid waste management. Figure 2 highlighted key barriers to women's managerial positions across occupational roles within solid waste management. Cultural norms (CN) are the most significant barrier overall, with 40.2% of respondents citing it, particularly impacting policymakers (15.6%) and waste collectors (17.2%). Lack of training (LT) also notably affects participation, especially among waste collectors (13.9%). Stigmatisation (SM) is exceptionally high among waste collectors (16.4%), indicating a significant barrier in this role.

Table 1: Occupational role by gender

Occupation	Sex		Frequency	Percentage (%)
	M	F		
Policy Maker	18	12	30	24.6
Waste Collector	46	19	65	53.3
Recycler	8	11	19	15.6
Sorter	2	4	6	4.9
Other	1	1	2	1.6
Total	75	47	122	100

Source: Field Survey

Table 2: Perception and attitudes towards gender roles in solid waste management

Occupation	Perception and attitudes about gender roles and management (n =122)										
	No of Respondents	V Positive		Positi ve		Neutra l		Negat ive		V Negati ve	
				%		%		%		%	
Policy Maker	30	15	12.3	5	4.1	8	6.6	1	0.8	1	0.8
Waste Collector	65	30	24.6	15	12.3	7	5.7	3	2.5	10	8.2
Recycler	19	8	6.6	7	5.7	3	2.5	1	0.8	0	0.0
Sorter	6	0	0.0	2	1.6	3	2.5	1	0.8	0	0.0
Other	2	0	0.0	0	0.0	2	1.6	0	0.0	0	0.0
Total	122	53	43.4	29	23.8	23	18.9	6	4.9	11	9.0

Table 3: Perception and attitudes of community members towards gender roles in solid waste management

Role	Gender	Perception of Effectiveness (%)	Attitude Towards Gender Roles (%)	F-Statistic	p-Value
Policy Maker	Male	72	68	4.1	0.04
	Female	78	74		
Waste Collector	Male	68	62	3.5	0.07
	Female	73	67		
Recycler	Male	65	60	5.6	0.02
	Female	77	72		
Sorter	Male	64	59	7.3	0.01
	Female	80	75		
Other	Male	70	65	2.8	0.09
	Female	73	68		

Table 4: Perception and attitudes of the public towards gender roles in solid waste management

Gender Role	Perception of Effectiveness (%)	Attitude Towards Gender Roles (%)	F-Statistic	p-Value
Male Roles	70	60	3.8	0.05
Female Roles	75	65		

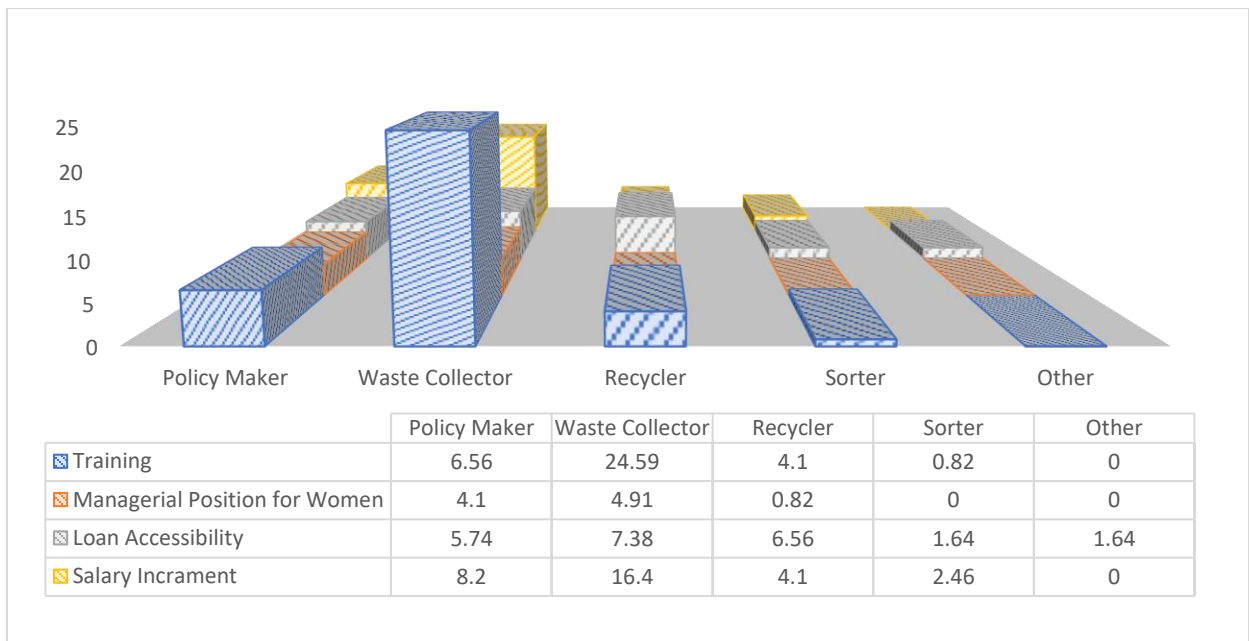


Figure 1: Expected changes across occupational roles in solid waste management

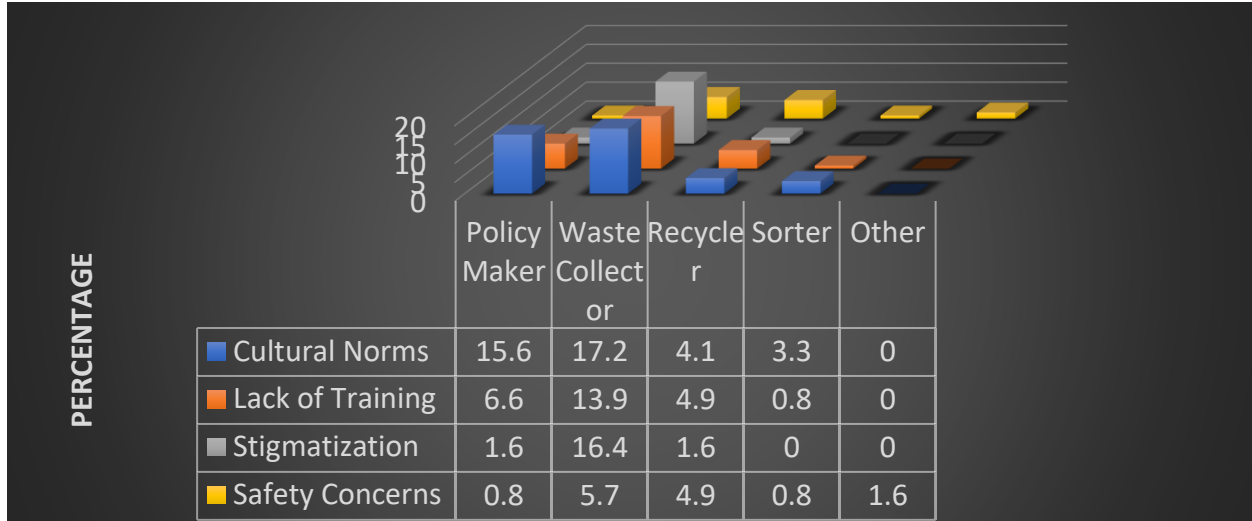


Figure 2: Barriers to women's managerial positions in solid waste management

Safety concerns (SC) are less prevalent but reported, notably by some waste collectors (5.7%). Table 4 revealed that the public generally perceived female roles in solid waste management as more effective and held more positive attitudes towards them than male roles. The perception of effectiveness is higher for female roles (75%) than for male roles (70%), and attitudes towards female roles are also more positive (65%) than male roles (60%). These differences were statistically significant (F-statistic = 3.8, p-value = 0.05), indicating that gender influences perceptions and attitudes. Figure 1 illustrates the expected changes across occupational roles within solid waste management. It was observed that they all desired training followed by salary increments and loan accessibility. Notably, the managerial position for women had the lowest representation, which indicated that respondents do not see this as an expected change within solid waste management. Figure 2 highlighted key barriers to women's managerial positions across occupational roles within solid waste management. Cultural norms (CN) are the most significant barrier overall, with 40.2% of respondents

citing it, particularly impacting policymakers (15.6%) and waste collectors (17.2%). Lack of training (LT) also notably affects participation, especially among waste collectors (13.9%). Stigmatisation (SM) is exceptionally high among waste collectors (16.4%), indicating a significant barrier in this role. Safety concerns (SC) are less prevalent but reported, notably by some waste collectors (5.7%).

Table 5 presents the ANOVA results for barriers to women's participation in solid waste management. Cultural norms (CN) and lack of education (LE) show significant differences across occupations, with p-values of 0.03 and 0.05, respectively; these barriers significantly vary between different roles. Stigmatisation (SM) and safety concerns (SC) have higher p-values (0.07 and 0.12), suggesting that these barriers do not significantly vary across occupations. Figure 3 outlines policy recommendations for gender-sensitive solid waste management. Increased training for women (IW) is the most frequently recommended policy overall, with the highest endorsement from waste collectors (24.6%). Awareness campaigns (AC) are notably supported by waste

collectors (13.9%) and policymakers (6.6%). Safety measures in SWM (SMM) are less emphasised but recommended, especially by waste collectors (14.8%). The data highlights a strong preference for training and awareness initiatives, with a lesser focus on safety measures.

Considering occupational roles in the context of broader societal perception and attitudes within the waste solid waste management sector is essential because of the complex interplay of societal norms and occupational roles. An uneven gender classification was observed, with males dominating the study sample; this agrees with Ziaei et al. (2018), who reported that most of their participants drawn from African countries were males.

Discussion

Table 5: ANOVA results for barriers to women's participation

Barrier	F-statistic	p-value
Cultural norms (CN)	5.2	0.03
Lack of education (LE)	4.7	0.05
Stigmatisation (SM)	3.9	0.07
Safety concerns (SC)	2.8	0.12

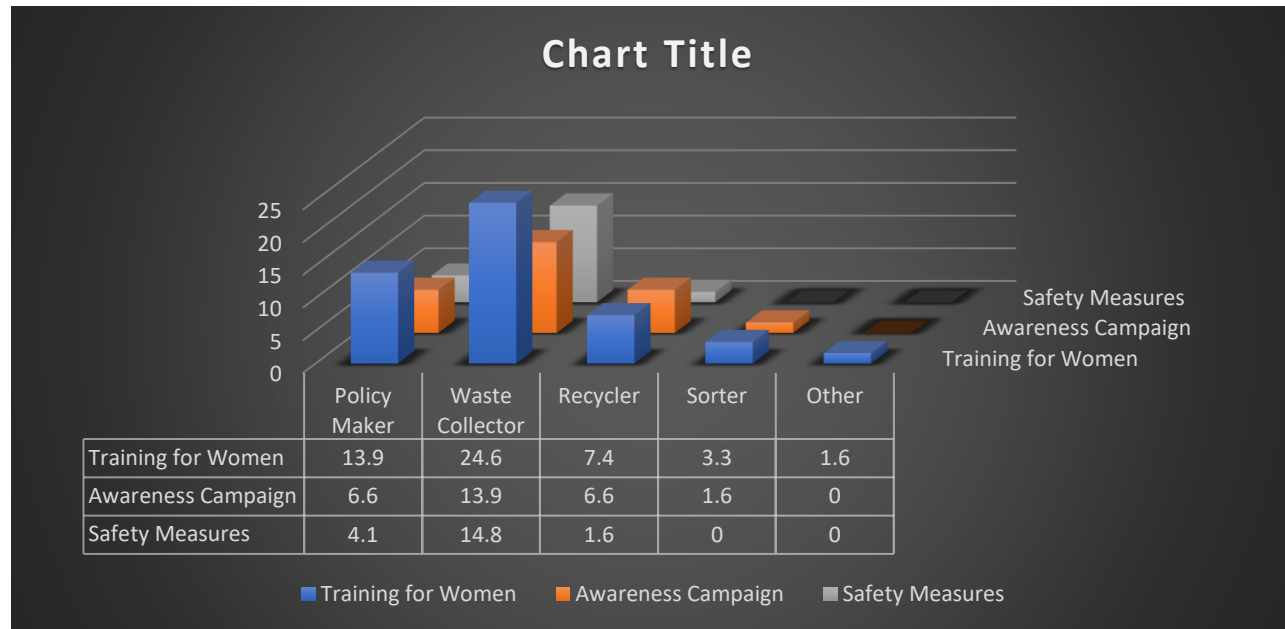


Figure 3: Policy recommendations for gender-sensitive solid waste management

Moreover, the occupation/livelihood with the highest occurrence among the respondents is that of a waste collector, and the majority of respondents in this category are males. The findings agree with Abd El-Wahab et al. (2014), who reported that male workers performed most of the waste collection work in Egypt. In Nigeria, Inyang (2007) reported male participants as waste collectors. According to Davis & Greenstein (2009), gender norms influence people's beliefs about appropriate tasks for women and men, and this substantiates the findings of the current study, which emphasises the importance of traditional gender roles and societal expectations on occupation within solid waste management; this public attitude and perception will promote a friendly working environment where individuals can pursue roles based on their skills and interests, free from predefined stereotypes. Solid waste management roles within the domestic space are ascribed to women, who are expected to have high effectiveness and positive attitudes.

As this study observed, the females consistently show a higher perception of effectiveness and positive attitudes than their male counterparts within the same occupational role; this agrees with the findings of Asteria (2019), who reported that projects that are driven by women are based on women's experiences in interacting with the environment in everyday life, and connecting the daily tasks to conservation work contributes to strengthening society and the women's personal life. Table 4 underscores the public's strong perception of females' roles over males' roles as more effective and hold more positive attitudes towards them than male roles; this is in agreement with Davis & Greenstein's (2009) report on the gender division of labour and occupational sex segregation in solid waste management reflecting societal gender ideologies and socialisation processes.

The statistically significant difference (F-statistic = 3.8, p-value = 0.05) further indicated that gender influences public perceptions and attitudes. Interestingly, the public has a higher perception of effectiveness and more favourable attitudes towards female participation in various gender-specific roles; this indicates that traditional beliefs determine the division of responsibilities in the solid waste management sector.

Figure 1 revealed that the managerial position for women in this study is in line with a study undertaken by Akanbi & Salami (2011); they found that obstacles and limitations hinder women's career advancement in management, often attributed to gender-related preconceptions and biases. Stereotypes and perceptions about women's managerial and administrative abilities were identified as key factors contributing to these barriers; this indicates that the respondents don't see it as an expected change to be embraced within solid waste management. Furthermore, Figure 2 highlighted key barriers to women's managerial positions across occupational roles within solid waste management. Cultural norms (CN) are the most significant barrier; this agrees with the findings of Foster et al. (2012), who reported social stereotypes associating masculinity with authority in the workplace, as seen in cultural norms as a barrier to women's managerial positions. Table 5 presents the ANOVA results for barriers to women's participation in solid waste management. Cultural norms (CN) and lack of training (LT) show significant differences across occupations, thus supporting the findings of Dalal (2020), who reported that women tend to be left out in the decision-making process, policies, and implementation of clean-up projects. When such a central aspect is left out, the chances of success are reduced mainly, leading to failed interventions and projects from

governmental agencies and non-profit organisations (Dalal, 2020). Figure 3 outlines policy recommendations for gender-sensitive solid waste management. Increased training for women (IW) is the most frequently recommended policy, followed by awareness campaigns (AC). Safety Measures in SWM (SMM) are less emphasised. The data highlights a strong preference for training and awareness initiatives, with a lesser focus on safety measures.

Conclusion and recommendations

In conclusion, this study provides valuable insights into public perception of women's representation in solid waste management. The findings highlight the importance of gender inclusion in promoting effective waste management and underscore the need for policies and training programs that foster gender equality within the sector. This research contributes to the existing literature on gender and waste management by offering practical recommendations for policymakers and practitioners. The study observes that public awareness campaigns are crucial for addressing cultural norms and societal stereotypes that hinder women's participation and advancement in solid waste management. These initiatives emphasise the effectiveness and positive impact of women's contributions to environmental and waste management efforts.

Based on the findings of this research, several recommendations are proposed to promote equitable and effective participation in solid waste management (SWM) while addressing the identified gender disparities.

❖ *Develop Gender-Sensitive Policies:* Gender-sensitive policies should be formulated to ensure fair representation of men and women in SWM roles, particularly in decision-making and managerial positions. These policies should actively promote women's

inclusion and support their advancement within the sector.

- ❖ *Community Education Programmes:* Community education programs should challenge and reshape societal norms and stereotypes. These initiatives aim to foster an environment where roles are assigned based on skills and interests rather than traditional gender expectations. By doing so, they can help dismantle barriers to women's participation in SWM.
- ❖ *Training Programs for Women:* Tailored training programs should be provided to enhance women's skills and confidence in managerial and technical roles. Continuous professional development opportunities should also be encouraged for all workers to ensure inclusivity and bridge skill gaps.
- ❖ *Create a Supportive Work Environment:* A supportive work environment should be fostered through policies that promote safety, respect, and inclusivity for all genders; this includes implementing mentorship programs for women, establishing equal pay policies, and providing the necessary infrastructure, such as safety equipment, to encourage women's participation in SWM.
- ❖ *Affirmative Action Strategies:* Affirmative action strategies should be implemented to increase women's representation in managerial and leadership positions. These strategies can help address barriers such as cultural norms and lack of training by integrating women into decision-making processes and leadership development programs.
- ❖ *Incorporate Gender-Sensitive Frameworks:* Policymakers should integrate gender-sensitive frameworks into the design and implementation of SWM policies. Collaboration with NGOs and community-based organisations is crucial to ensure inclusivity. Efforts

should focus on dismantling cultural and societal barriers by engaging community leaders and stakeholders to advocate for gender equality in occupational roles.

- ❖ *Monitor and Refine Strategies:* Monitoring frameworks should be established to assess the effectiveness of gender-sensitive policies and interventions in SWM. Data-driven insights should be used to refine strategies, promote equitable practices, and ensure that the solid waste management sector becomes more inclusive and effective by leveraging the strengths and contributions of all individuals, regardless of gender.

Limitations to the study

This study has several limitations that should be considered when interpreting the findings:

- ❖ *Sample Size and Selection:* The study was conducted across only three metropolitan cities in Nigeria—Osogbo, Ilorin, and Ibadan; this limits the generalizability of the findings to the broader population of Nigeria, as the demographic and cultural variations within other regions may result in different perceptions and attitudes towards women's roles in solid waste management.
- ❖ *Self-Reporting Bias:* Using self-reported questionnaires for data collection could introduce response bias, where respondents might provide socially desirable answers rather than their actual perceptions; this could affect the accuracy of the findings, especially regarding gender roles and perceptions.
- ❖ *Cross-Sectional Design:* The study's cross-sectional design captures data at a single point, limiting the ability to infer causality. Changes in perceptions and attitudes towards women's participation in SWM over time could not be assessed.
- ❖ *Cultural Factors:* The study did not account for the influence of local cultural factors on perceptions and attitudes. The cultural context of each city might affect how gender roles are perceived and valued in SWM, which could influence the study results.
- ❖ *Generalizability:* The results may not represent rural areas or other less urbanised settings within Nigeria. The perceptions and barriers to women's participation in solid waste management may differ significantly in these areas.

Environmental health implications

The findings of this study have significant environmental health implications:

- ❖ *Enhanced Waste Management Efficiency:* The study highlights the importance of gender inclusion in SWM, which can lead to more effective waste management practices. By integrating women into decision-making and managerial roles, the sector can benefit from diverse perspectives and innovative solutions that enhance the efficiency of waste collection, recycling, and disposal processes; this not only improves the overall performance of SWM but also contributes to better environmental health outcomes.
- ❖ *Reduced Environmental Pollution:* Addressing cultural norms and barriers to women's participation in SWM can lead to more inclusive policies and practices; this, in turn, can reduce environmental pollution by ensuring that waste management strategies are more comprehensive and include all possible sources of pollution, thus improving environmental quality.
- ❖ *Promotion of Sustainable Development:* Including women in SWM roles promotes sustainable development by ensuring that the environmental impacts of waste are managed responsibly.

Women's involvement can lead to more sustainable waste management practices prioritising recycling, waste reduction, and environmental protection, ultimately contributing to achieving Sustainable Development Goals related to environmental health.

- ❖ *Community Awareness and Education:* The study also underscores the need for community education to challenge societal stereotypes and norms that hinder women's involvement in SWM. By promoting gender equality, the sector can foster a healthier and more engaged community that supports sustainable environmental practices, reduces health risks associated with improper waste management, and enhances public health.

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