

Public Awareness, Attitudes, and Practices Toward Waste Segregation and Recycling in Kano Metropolis

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Abstract

The rapid urbanization and population growth in Kano Metropolis have led to significant challenges in waste management, with improper waste disposal posing serious environmental and health risks. Effective waste management practices, including waste segregation and recycling, are crucial for mitigating these issues. However, the success of such initiatives depends on the attitudes and practices of the public. This study investigates the public's awareness, attitudes, and practices toward waste segregation and recycling in Kano Metropolis, providing insights into the factors that influence these behaviors and identifying opportunities for improvement. A cross-sectional survey was conducted among 384 respondents in Kano Metropolis using a structured questionnaire. Data were analyzed using descriptive statistics to assess awareness levels, attitudes, and current waste segregation and recycling practices. Some of the major findings reveals that majority of respondents were aware of waste segregation (100%), only 42.45% reported consistent practice. It is found out that According to Table 5, polythene (59.38%) and plastic bottles (34.38%) are the most recycled materials and awareness/education is the most influencing factors (47.40%); followed by provision of infrastructure (25.52%) for recycling in the study area. Findings also highlight a strong willingness to engage in waste management behaviors if supported by government and non-governmental organizations. The study recommends that governments and NGOs should increase public sensitization efforts about the benefits of waste segregation and recycling through media, community workshops, and school programs. Also, municipal policies must enforce recycling standards and offer incentives for compliance.

Keywords: Kano Metropolis, public awareness, recycling, waste segregation, urban waste management

1. INTRODUCTION

Solid waste management has emerged as a critical environmental and public health challenge globally, particularly in rapidly urbanizing regions of developing countries (Muhammad & Marzuk, 2024). The explosive growth of urban populations, coupled with shifting consumption patterns, has led to an exponential increase in waste generation that often outpaces the capacity of local governments to manage it effectively. In Kano Metropolis, Nigeria's second-largest city, this issue is particularly acute, with vast quantities of uncollected solid waste accumulating on streets, in drainage systems, and on open lands, contributing to a range of socio-environmental problems. Waste segregation, a key component of sustainable waste management, involves the separation of different types of waste materials at the point of generation (Khalil, Abdullahi, Manaf, Sharai, & Nabegu, 2017). This practice is foundational to recycling, as it prevents contamination and allows for the efficient processing of valuable materials such as plastics, paper, glass, and metals. Despite its importance, waste segregation remains a largely underdeveloped practice in Kano Metropolis, where a mix of organic and inorganic waste is commonly disposed of in a single stream (Ali, Tanko, & Kovo, 2017).

This lack of source segregation can be attributed to several factors, including a general lack of public awareness regarding the benefits of recycling and the environmental harm caused by improper waste disposal. Although residents may be aware of the visible unsanitary conditions, their understanding of the underlying principles

of a circular economy and the value of waste as a resource is often limited (Flores, 2021). This knowledge gap is a primary barrier to behavioral change and the adoption of more sustainable waste management habits. Furthermore, public attitudes toward waste management significantly influence individual actions. Many residents of Kano hold the view that waste collection and disposal are the sole responsibility of the government, specifically the Kano State Refuse Management and Sanitation Board (REMASAB) (Nabegu & Mustapha, 2014). This passive attitude of dependency on public services disincentivizes proactive household-level engagement, such as sorting waste and reducing consumption.

The practices of waste disposal in Kano Metropolis are a direct reflection of these attitudes and awareness levels. Common methods include indiscriminate dumping on vacant lots, roadsides, and in drainage channels, which exacerbates flooding during the rainy season and serves as a breeding ground for disease vectors (Mustapha, 2017). The burning of waste, another widespread practice, releases harmful pollutants and greenhouse gases into the atmosphere, posing a serious threat to public health and air quality (Abubakar, & Bello, 2023).

Despite the challenges, the potential for a thriving recycling economy in Kano is substantial. The large volume of waste generated, including a high percentage of recyclable materials, presents an opportunity for creating green jobs and generating economic value from discarded resources (Aliyu, 2022). Informal waste collectors and scavengers already play a role in this sector, highlighting a

pre-existing but unorganized value chain that could be formalized and scaled up. This research, therefore, aims to provide a comprehensive analysis of the current state of public awareness, attitudes, and practices concerning waste segregation and recycling within Kano Metropolis (Aljaradin, Persson, & Sood, 2015).

Attitude refers to the degree to which a person has a good or bad, positive or negative, favourable or unfavourable evaluation of the behaviour of interest. It entails consideration of the outcomes of performing specific behaviour. The attitude must be specific, since this specificity will allow the prediction in the resulting behaviour (Ajzen, 1991; Abubakar et.al, 2023). Environmental knowledge is defined as a general knowledge of facts, concepts, and relationships concerning the natural environment and its major ecosystems. Most people do not know enough about environmental problems or issues to act in an environmentally manner. According to Mostafa (2009) environmental knowledge and altruism are among the factors that influence an individual's PEB. Many researchers failed to provide significant positive relationship between environmental knowledge and environmental awareness, and practicing pro-environmental behaviour. They believed that people were aware of and concerned about environmental problems, but yet they do not put it into practice (Ali, Khan & Ahmed 2011; Dunlap et al., 2000).

By investigating these three interconnected dimensions, the study seeks to identify the awareness and knowledge of waste segregation; willingness of residents to participate in waste recycling; and specific barriers to effective waste management and to provide actionable recommendations for policymakers, environmental agencies, and community leaders.

2. METHODOLOGY

2.1 Research Design

This study employed a descriptive cross-sectional survey design to assess the knowledge, attitudes, and practices (KAP) of residents in Kano Metropolis regarding waste segregation and recycling. This design was chosen because it allows for the collection of data at a single point in time from a large sample, providing a snapshot of public behavior and perception (Creswell & Creswell, 2018).

(a) Study Area

The research was conducted in Kano Metropolis, the commercial and demographic hub of Kano State, Nigeria. The metropolis includes densely populated urban and peri-urban communities facing significant waste management challenges due to rapid urbanization, high population density, and infrastructural constraints.

(b) Study Population

The target population comprised residents of Kano Metropolis, including both men and women aged 15 and above. Inclusion criteria were residents who had lived in the area for at least one year and were responsible, in part or whole, for household waste disposal.

(c) Sample Size and Sampling Technique

A sample size of 384 respondents was determined using the Cochran formula for sample size estimation in large populations, ensuring statistical representation with a 95% confidence level and 5% margin of error.

$$n = Z^2(P)(1-P) / e^2 \quad I$$

where:

n = sample size

Z = Z value (1.96 for 95% confidence)

P = estimated proportion of population with desired characteristic (0.5 used for maximum variability)

e = margin of error (0.05)

On the other hand, a multi-stage sampling technique was used: Stage 1: Kano Metropolis was stratified into its constituent Local Government Areas (LGAs) as stage 1. Similarly, two wards were randomly selected from each LGA (stage 2). Additionally, within each ward, incidental sampling was used to select households, with one eligible respondent per household (Stage 3). Similarly, 8 Key-informant interviews (KII) were conducted with the following stakeholders: Interviewee 1 (REMASAB Environmental Officer) Interviewee 2 (REMASAB Official); Interviewee 3 (District head); Interviewee 4 (Religious Leader); Interviewee 5 (Waste Scavenger); Interviewee 6 Waste Scavenger II); Interviewee 7; and Interviewee 8 (Waste Scavenger Association Member).

2.2 Data Collection Instrument

Data was collected using a structured questionnaire consisting of both closed- and open-ended questions. The questionnaire was organized into sections on demographics (including age, gender, education, occupation, etc.); Awareness of waste segregation and recycling; Attitudes, including perceived benefits and barriers; Current waste management practices and Willingness to engage in recycling programs. However, a pilot study was conducted on 50 individuals in a non-sampled ward to refine the instrument and enhance its reliability.

2.3 Data Collection Procedure

Trained research assistants administered the questionnaire via face-to-face interviews, which ensured inclusivity for respondents with varying literacy levels. The researchers conducted face-to-face interviews to Kano state stakeholders. Ethical protocols—including informed consent, voluntary participation, and confidentiality—were strictly observed throughout the process.

2.4 Data Analysis

Data was coded and analyzed using SPSS (version 22). Descriptive statistics (frequencies and percentages) summarize demographic characteristics and response distributions. Inferential analysis (Logistic Regression) analyzed socioeconomic determinants of waste segregation in Kano Metropolis where 1 = Yes and 0 = No/Sometimes. A significance level of $p < 0.05$ was adopted. On the other hand, five themes were created based on the literature reviewed. These themes were used in the analysis

2.5 Validity and Reliability

The result of pilot-study was analysed and found Cronbach's alpha value as 0.823, which signifies that the set of items shows good internal consistency. Content validity was ensured through expert review by professionals in environmental science and statistics.

3. DATA ANALYSIS AND INTERPRETATION

3.1 Socio-Demographic Influence on Waste Segregation

Demographic data indicates that females (53.39%) were slightly more represented than males, and the majority were married (79.69%) and housewives (48.44%). This demographic trend is important because studies such as that by Olayiwola et al. (2018) suggest that women, especially housewives, play a key role in household waste management decisions and practices. This role presents an opportunity for targeted education and incentive programs aimed at women to improve household segregation behavior.

Education levels were varied, with the largest group having secondary education (42.71%), which may influence their understanding and engagement in waste management. According to Ugwulebo and Okoli (2015), educational attainment positively correlates with environmental attitudes and waste management behaviors in Nigeria, supporting the current study's suggestion that education is a driver of responsible environmental practices.

Table 1: Socio-economic data

Response	Frequency	Per cent
Age		
15-24	65	16.93
25-44	148	38.54
45-64	132	34.38
65 and above	39	10.16
Total	384	100.00
Gender		
Male	179	46.61
Female	205	53.39
Total	384	100.00
Marital Status		
Married	306	79.69
Single	78	20.31
Total	384	100.00
Occupation		
Business	87	22.66
Farming	2	0.52
Trading	32	8.33
Civil servant	56	14.58
Student	21	5.47
Housewife	186	48.44
Total	384	100.00
Education Level		
Qur'anic	76	19.79
Education		
Primary School	43	11.20
Secondary School	164	42.71
Degree/HND	63	16.41
Post-graduate	37	9.64
Others	1	0.26
Total	384	100.00
Number of Household		
1-4	59	15.36
5-8	71	18.49
9-12	115	29.95
13 and above	139	36.20
Total	384	100.00

3.2 Awareness and Knowledge of Waste Segregation

(a) Heard about Waste Segregation and Recycling Before

The data shows that almost of respondents (96.88%) claimed awareness of waste segregation and recycling, which reflects a significant public knowledge base; with very little (3.13%) do not ever heard about. This high awareness level is consistent with the findings of Okechukwu et al. (2018), who reported that public awareness of waste management strategies has increased in urban Nigeria due to environmental campaigns and media outreach. Similarly, Ogbonna and Ekweozor (2017) found that awareness of waste segregation was relatively high among urban dwellers in Port Harcourt.

Table 2: Have you ever heard about waste segregation and recycling before?

Respondents	Response	Percentage (%)
Yes	372	96.88
No	12	3.13
Total	384	100

(b) Benefit of Separating Waste

Based on data analysis, it showed that majority of the respondents (59.11%) have knowledge of waste separation benefits (Figure 1). While 21.88% of the respondents are uncertain about benefit derived from waste separation. Additionally, the least responses came from those who did not have knowledge about any benefit of waste separation in the study area.

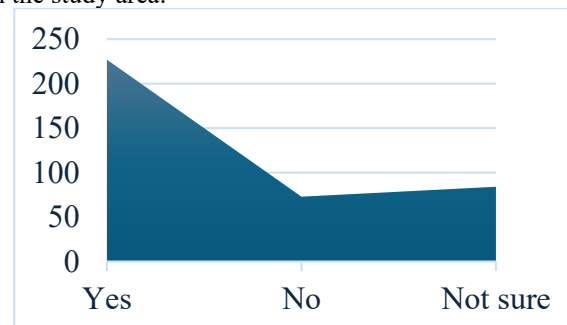


Figure 1: Waste separation benefits

(c) Respondents' level of Awareness about Recycling

The findings in Figure 2 reveal a relatively high level of awareness regarding recycling among respondents (63.80%). This corroborates with previous studies, such as that of Saphores et al. (2006), which found that general awareness is often high in urban or semi-urban communities where media campaigns and educational interventions are more frequent. However, awareness alone does not necessarily translate into active participation. Ojedokun and Balogun (2011) noted that despite high awareness levels, actual recycling behavior was significantly lower due to infrastructural and motivational gaps.

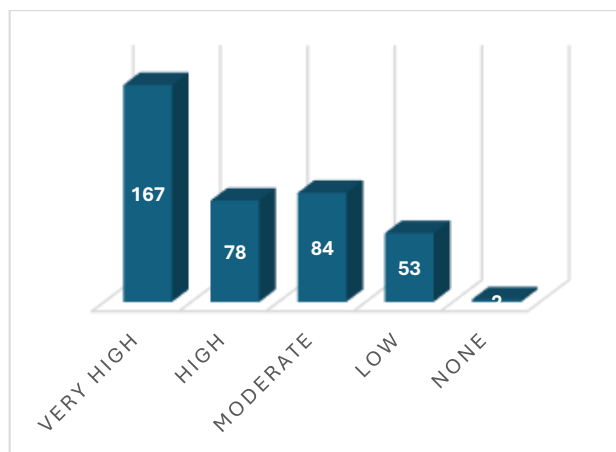


Figure 2: Level of Awareness about Recycling

(d) Waste Separation by the Respondents

Despite this awareness, practice remains inconsistent. Only 42.45% of households consistently separate waste, while 32.03% do not, and 25.52% do so occasionally (Table 3). This inconsistency suggests a gap between awareness and action, a phenomenon also documented by Afon (2012), who argued that awareness alone does not automatically lead to behavioral change in waste management unless it is accompanied by structural support and incentives.

Table 3: Waste Separation by the Respondents

Respondents	Response	Percentage (%)
Does your household currently separate waste?		
Yes	163	42.45
No	123	32.03
Sometimes	98	25.52
Total	384	100.00

3.3 Recycling Behavior and Reuse Practices

(a) Types of Waste Generated Most by the Respondents

The study reported that 72.66% of respondents have reused or recycled household materials, particularly polythene bags (59.38%) and plastic bottles (34.38%). This finding correlates with the research by Ikebude (2017), which indicated that households in urban Nigeria often engage in informal recycling, especially of plastic waste, as a means of reducing domestic clutter or generating small income. However, the reuse tends to focus on specific materials like polythene and plastic bottles, neglecting other recyclable items. This narrow focus aligns with the report by Abila and Kantola (2013), who noted that informal recycling in Nigeria tends to be opportunistic rather than systematic.

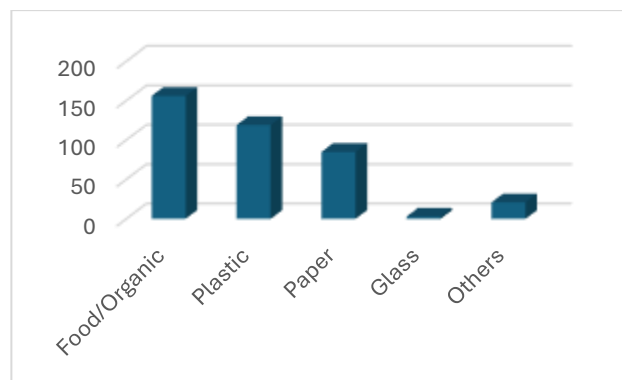


Fig. 3: Types of Waste Generated Most

(b) Methods Commonly Used in Disposing Waste

Figure 3 illustrates that traditional and unsustainable waste disposal methods such as open dumping (34.90%); followed by those dump their waste in an appropriate place assigned by authority (28.39%) are commonly used in the study area. Similarly, recycling method takes 22.92% while those burning their waste are (13.54%). This observation reflects findings by Aderemi et al. (2011), who reported that even in communities familiar with environmental risks, disposal practices remained informal due to limited access to formal waste management services.

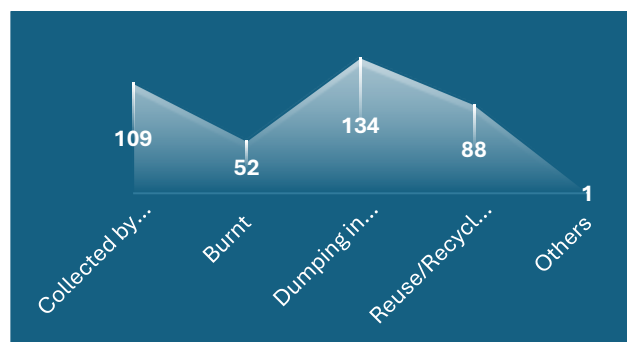


Figure 4: Methods commonly used in disposing waste

(c) Engagement in Household Recycling Practices

Table 4 indicates that 72.66% of respondents have engaged in reusing or recycling household materials. This result is encouraging and higher than figures reported in some similar settings such as Otitoju and Seng (2014) which found only about 48% participation in recycling among Nigerian urban households.

Table 4: Engagement in household recycling practices

Respondents	Response	Percentage (%)
Yes	279	72.66
No	105	27.34
Total	384	100.00

(d) If yes, What Materials, what Types of Materials Recycled

According to Table 5, polythene (59.38%) and plastic bottles (34.38%) are the most commonly recycled materials. This finding is in line with global findings where plastic waste dominates household recycling efforts (Hopewell et al., 2009). However, the low recycling of

glass and metals indications a knowledge or infrastructure gap.

Table 5: Types of materials recycled

Respondents	Response	Percentage (%)
Polythenes	228	59.38
Bottle	24	6.25
Plastic bottle	132	34.38
Total	384	100.00

(e) Factors Influencing Willingness to Segregate Waste

Figure 5 reveals that factors such as incentives, awareness, and ease of access to recycling facilities influence willingness to practice waste segregation. Awareness/education is the most influencing factors (47.40%); followed by provision of infrastructure (25.52%). The lowest factor responded by the respondents is community initiative (0.52%); followed by those said regular waste collection (5.47%). This observation supports Ajzen's (1991) Theory of Planned Behavior, which posits that attitude, perceived behavioral control, and subjective norms determine individuals' actions.

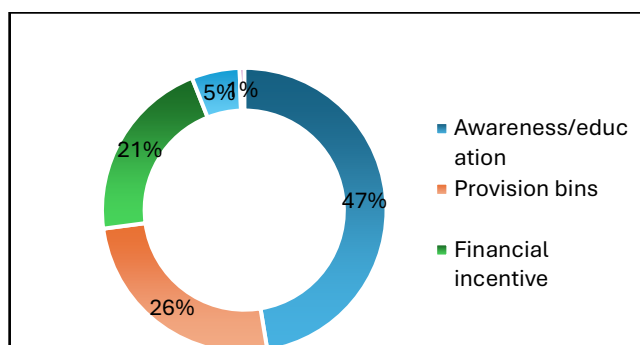


Figure 5: Factors Influencing Willingness to Segregate Waste

3.4 Barriers to Waste Segregation in Study Area

The study noted several barriers to regular waste segregation, including lack of government support (25.52%), inadequate infrastructure (22.40%), inconvenience (22.14%), not interested (14.32%) and other reasons (4.17%) respectively. These challenges are in line with the findings of Nzeadibe and Ajaero (2010), who identified institutional weaknesses and poor infrastructure as key barriers to effective waste management in Nigerian cities.

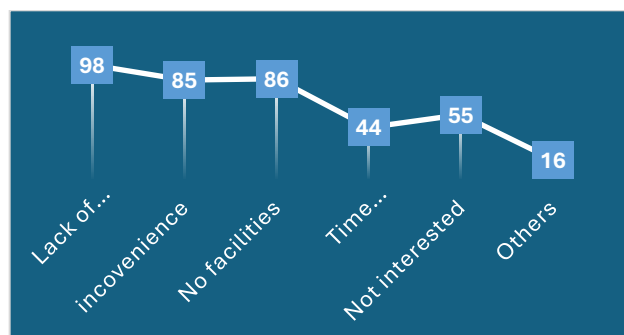


Figure 6: Barriers to regular waste segregation

3.5 Willingness of Residents to Participate in Waste Recycling

(a) Willingness to Participate in Waste Recycling

Majority of the respondents (66.93%) believed that they can participate in waste recycling in the study area if supported by government or NGOs (Table 6); followed by those did not willing to participate in waste recycling; with those in doubt to participate in waste recycling (15.36%). This corroborates with the findings of Wilson et al. (2012), who noted that public-private partnerships and community-based waste management systems tend to be more effective in developing countries due to their contextual responsiveness and adaptability.

Table 6: Willingness to participate in waste recycling

Respondents	Response	Percentage (%)
Yes	257	66.93
No	68	17.71
Maybe	59	15.36
Total	384	100.00

(b) Willingness to Participate in Community Recycling Programs if Supported

The study reveals that more than half of the respondents (66.93%) would be more willing to practice segregation if supported by government or NGOs. This finding supports the result of Adeolu et al. (2014), who emphasized the role of government-backed recycling programs and community participation in improving waste management outcomes.

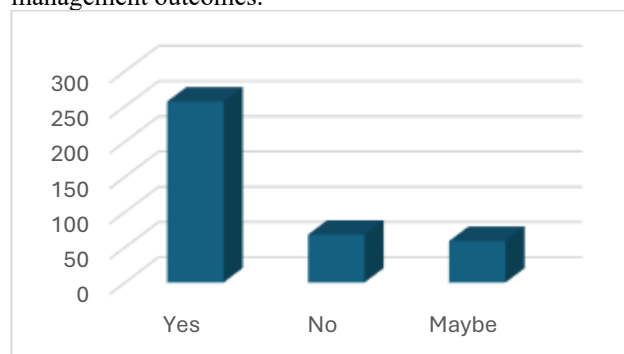


Figure 6: Willingness to participate in a community recycling programs if supported

3.6 Binary Logistic Regression Analysis of Socioeconomic Determinants of Waste Segregation in Kano Metropolis

Table 7: showing binary logistic regression

Predictor Variable	B	S.E	p-value	Odds Ratio (Exp(B))	Interpretation
Gender (Female)	0.84 2	0.311	0.007*	2.32	Females were over 2 times more likely to practice waste segregation than males
Education Level	1.21 4	0.287	0.000*	3.37	Higher education significantly

Occupation (Housewife)	0.69 3	0.295	0.019*	2.00	increased likelihood of waste segregation Housewives were more likely to segregate waste
Age	0.11 8	0.102	0.247	1.13	Age had no significant effect
Household Size	- 0.26 4	0.121	0.029*	0.77	Larger households were less likely to segregate waste
Awareness of Recycling	1.58 7	0.402	0.000*	4.89	Awareness strongly predicted segregation behavior

Dependent Variable: Practice of Waste Segregation
(1 = Yes, 0 = No/Sometimes)

Model Summary

Cox & Snell $R^2 = 0.41$

Nagelkerke $R^2 = 0.56$

Classification Accuracy = 74.3%

Hosmer-Lemeshow Test = $p = 0.421$ (good model fit)

Table 7 shows the binary logistic regression analysis which revealed that education level, awareness of recycling, gender, occupation, and household size significantly influenced waste segregation practices among residents of Kano Metropolis. Education level emerged as the strongest determinant factor influencing waste segregation behavior. Respondents with higher educational attainment were over three times more likely to practice waste segregation compared to respondents with lower educational qualifications. This finding corroborates with the work of Ugwulebo and Okoli (2015), who reported that educational attainment positively correlates with environmental attitudes and responsible waste management practices in Nigeria. Similarly, Saphores et al. (2006) found out that education improves environmental awareness and recycling participation among urban households.

Awareness of recycling was also found to significantly influence segregation behavior. Respondents who were aware of recycling benefits were almost five times more likely to separate their waste properly. This result is consistent with Ajzen's (1991) Theory of Planned Behavior, which emphasizes that awareness and perceived behavioral control strongly influence environmental practices. The finding also corroborates the study of Okechukwu et al. (2018), who observed that environmental sensitization programs significantly improve waste management practices in urban Nigeria.

Furthermore, gender significantly influenced waste segregation practices, with females more likely to participate in waste segregation compared to males. This may be attributed to the traditional role of women in household sanitation and waste handling in Kano society. The finding agrees with Olayiwola et al. (2018), who found that women and housewives play dominant roles in

household environmental sanitation and waste disposal decisions in Nigeria especially in urban centers.

Additionally, occupation was another important determinant factor, as housewives were more likely to engage in waste segregation practices compared to other occupational groups. This result reflects the socio-cultural setting of Kano Metropolis, where women are primarily responsible for household waste management. Conversely, larger household size negatively affected waste segregation practices. Households with larger family sizes may experience difficulties in organizing and separating different categories of waste due to increased waste generation and limited facilities. However, age did not significantly influence waste segregation practices in the study area. This indicates that waste segregation behavior cuts across various age categories within Kano Metropolis.

3.7 Key Informant Interviews and Thematic Analysis on Waste Segregation Practices in Kano Metropolis

This section presents qualitative findings from eight Key Informant Interviews (KIIs) conducted with officials of the Kano State Refuse Management and Sanitation Board (REMASAB), community leaders, and waste scavengers in Kano Metropolis. The interviews were designed to provide deeper explanations for the quantitative findings on public awareness, attitudes, and practices toward waste segregation and recycling.

On the other hand, one of the respondents in response to the question of awareness quoted that "*Many residents in Kano are aware of waste segregation because of radio jingles and sanitation campaigns. However, awareness does not automatically lead to practice because there are inadequate collection bins and recycling centers among the informal settlement.*" (Interview 1). This finding supports Afon (2012), who argued that awareness alone does not necessarily lead to behavioral change unless supported by adequate infrastructure and institutional backing.

However, one of the stakeholders in answering questions related to major challenges facing waste management disclosed that "The major challenge is infrastructure deficit. Most communities do not have designated recycling points. Residents become discouraged when government support is inconsistent." (Interview 2). This observation agrees with Nzeadibe and Ajaero (2010), who identified poor infrastructure and weak institutional support as major barriers to effective waste management in Nigerian cities.

The result of qualitative analysis revealed that "Women are more involved in waste management because they handle domestic activities daily. Most men are outside for work while women are responsible for household sanitation." (Interview 3). This corroborates Olayiwola et al. (2018), who found that women and housewives play dominant roles in household waste management decisions in urban Nigeria.

In response to the question of responsibility of waste management, the result indicated that "People understand cleanliness from religious teachings, but many residents still believe waste management is solely the responsibility of government." (Interview 4). This aligns with Nabegu and Mustapha (2014), who observed that residents in Kano

often depend heavily on government agencies for waste management services.

In another event, the result of KII indicates one respondent utters that "Plastic bottles and polythene are the most common materials we collect because they have market value. Metals and glass are less common because are fewer buyers." (Interview 5). This supports the findings of Ikebude (2017), which revealed that informal recycling activities in Nigeria are mainly concentrated on plastics due to economic value.

In terms of factors motivated the respondents in segregating waste, it is revealed by the result of KII that "Many households separate reusable plastics because they can sell them for money, but they rarely separate food waste or paper." (Interview 6). This finding agrees with Abila and Kantola (2013), who noted that informal recycling in Nigeria is largely driven by economic incentives rather than environmental concerns.

In bringing the solution, the result of KII lamented that "Public enlightenment is still insufficient, especially in densely populated communities. Many people do not know the environmental consequences of dumping refuse in drainages." (Interview 7). This supports Okechukwu et al. (2018), who emphasized the importance of environmental education and sensitization programs in improving waste management behavior.

However, in responding to the question of waste segregation, one of the respondents stated that "Large households generate more waste and usually mix everything together because separating waste requires additional effort and time." (Interview 8). This finding is consistent with studies indicating that household size negatively affects proper waste management practices due to increased waste generation and management difficulties.

3.8 Thematic Analysis

Theme 1: High Awareness but Low Practice

Most participants acknowledged that awareness of waste segregation is relatively high in Kano Metropolis due to media campaigns and sanitation programs. However, practical implementation remains low because of inadequate facilities, poor logistics, and weak institutional support. This supports the quantitative finding where awareness was high but only a minority consistently practiced waste segregation. *Afon (2012) similarly reported that environmental awareness alone does not automatically translate into environmental action without structural support.*

Theme 2: Inadequate Infrastructure and Government Support

Respondents emphasized that lack of recycling bins, irregular waste collection, and limited government intervention discourage waste segregation practices among residents. *This finding agrees with Nzeadibe and Ajaero (2010), who highlighted infrastructural deficiencies as major barriers to sustainable waste management in Nigerian urban centers.*

Theme 3: Gender Influence on Waste Management

The interviews revealed that women and housewives are more actively involved in waste segregation because

they are primarily responsible for household sanitation activities. *This corroborates Olayiwola et al. (2018), who found that women significantly influence household waste management behavior in urban communities.*

Theme 4: Economic Motivation for Recycling

Waste scavengers emphasized that recyclable materials such as plastics and polythene are prioritized because they generate income. Economic benefit therefore remains a major driver of informal recycling activities. *This supports Abila and Kantola (2013), who reported that recycling activities in Nigeria are largely motivated by economic survival and market demand.*

Theme 5: Need for Environmental Education

Participants stressed the need for continuous public sensitization through schools, religious institutions, media campaigns, and community organizations. *This finding supports Okechukwu et al. (2018), who argued that sustained environmental education programs are necessary for improving public participation in waste management.*

The findings of this study revealed that public awareness of waste segregation in Kano Metropolis is relatively high, although actual participation in segregation practices remains inconsistent. This trend is similar to findings from other parts of Nigeria and Sub-Saharan Africa. In Lagos State, Adebola et al. (2021) observed that although residents possessed substantial knowledge of recycling and environmental sanitation, practical implementation remained low due to poor infrastructure, irregular waste collection, and weak institutional enforcement. Similar findings were reported in Abuja by Ibrahim and Hassan (2022), where residents expressed willingness to participate in recycling programs but lacked access to recycling facilities and government support.

3.9 RESULT DISCUSSION

The result showing that women and housewives are more involved in household waste segregation aligns with findings from Ibadan, Oyo State, where female household heads demonstrated greater environmental responsibility in waste handling and recycling activities (Akinyemi et al., 2020). In Port Harcourt, Ezech and Ugwu (2021) also found that women played a dominant role in household sanitation because of their involvement in domestic management and childcare responsibilities.

The present study identified awareness and education as the strongest determinants of waste segregation behavior. This agrees with studies conducted in Ghana and Kenya. Mensah et al. (2021) reported that environmental education significantly influenced recycling participation among urban households in Accra, Ghana. Likewise, Otieno and Were (2023) found that public sensitization campaigns in Nairobi, Kenya, improved residents' willingness to participate in community recycling initiatives.

The finding that plastics and polythene materials constitute the most recycled waste types is consistent with studies across Sub-Saharan Africa. In South Africa, Mhlabeni et al. (2022) observed that plastic waste

dominates recycling streams because of its commercial value and ease of collection by informal waste scavengers. Similar observations were made in Ethiopia by Bekele and Tadesse (2021), who noted that informal waste collectors prioritize plastics and bottles due to market demand and income generation opportunities.

The barriers identified in this study, including inadequate infrastructure, lack of government support, inconvenience, and weak community participation, are common across developing countries. In Uganda, Nankya et al. (2020) reported that poor waste management infrastructure and limited policy implementation negatively affected household recycling practices. Similarly, in Tanzania, Mrema and Mwaseba (2024) identified weak institutional support and insufficient environmental awareness as major obstacles to sustainable urban waste management.

The study further revealed that residents are willing to participate in organized recycling programs if supported by government agencies and non-governmental organizations. This finding corroborates studies conducted in Rwanda and South Africa, where government-community partnerships significantly improved household recycling participation and environmental sustainability (Mukamana et al., 2023; Sithole & Dlamini, 2024).

4. CONCLUSION AND RECOMENDATIONS

4.1 Conclusion

The study highlights the high awareness of waste segregation in Kano Metropolis but reveals a lag in actual practice due to structural and motivational barriers. While awareness levels are commendably high, actual practice is hindered by infrastructural, institutional, and motivational barriers. Gender and education emerged as strong influencers, and there is significant public willingness to participate in organized recycling efforts. Targeted interventions, particularly involving women and supported by institutional frameworks, could significantly enhance waste management practices in the region. On the other hand, the logistic regression model explained approximately 56% of the variation in waste segregation behavior and demonstrated good predictive ability. The findings suggest that increasing environmental education, public awareness campaigns, and provision of waste management infrastructure could significantly improve household waste segregation practices in Kano Metropolis. The qualitative findings complement the quantitative results by providing deeper insights into the social, cultural, economic, and institutional factors influencing waste segregation and recycling practices in Kano Metropolis. The study revealed that while awareness levels are relatively high, practical engagement in waste segregation is constrained by infrastructural limitations, weak institutional support, socio-cultural attitudes, and limited environmental education. Furthermore, economic incentives and gender roles significantly shape recycling behaviors among residents.

4.2 RECOMMENDATIONS

- i. Governments and NGOs should increase public sensitization efforts about the benefits of waste

segregation and recycling through media, community workshops, and school programs.

- ii. Government and stakeholders should invest in accessible waste collection and recycling infrastructure, particularly for non-plastic recyclables like metal and glass.
- iii. Municipal policies must enforce recycling standards and offer incentives for compliance.

REFERENCES

- Abila, B., and Kantola, J. (2013). Municipal Solid Waste Management Problems in Nigeria: Evolving Knowledge Management Solution. *International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering*, 7(6), 303–308.
- Abubakar, A.S., and Bello, N.I. (2023). Effect of locating abattoir to the neighbouring communities in Kano State, Nigeria. *International Journal of Geography and Geography Education (IGGE)*, 48, 187–201. <http://dx.doi.org/10.32003/igge.1161854>
- Adebola, O. O., Akinola, T. A., & Yusuf, M. A. (2021). Urban waste management practices and recycling behavior among households in Lagos State, Nigeria. *Journal of Environmental Management*, 287, 112321. <https://doi.org/10.1016/j.jenvman.2021.112321>
- Adeolu, A. T., Enesi, D. O., and Oyetunde, O. A. (2014). Assessment of Secondary School Students' Knowledge, Attitude and Practice towards Waste Management in Ibadan, Oyo State, Nigeria. *Journal of Research in Environmental Science and Toxicology*, 3(5), 66–73.
- Aderemi, A. O., Oriaku, A. V., Adewumi, G. A., and Otitoloju, A. A. (2011). Assessment of groundwater contamination by leachate near a municipal solid waste landfill. *African Journal of Environmental Science and Technology*, 5(11), 933–940.
- Afon, A. (2012). A survey of operational characteristics, socioeconomic and health effects of scavenging activity in Lagos, Nigeria. *Waste Management & Research*, 30(7), 664–671. <https://doi.org/10.1177/0734242X11413307>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Akinyemi, F. O., Salami, R. O., & Ojo, T. O. (2020). Gender dimensions of household waste management in Ibadan, Nigeria. *African Journal of Environmental Science and Technology*, 14(5), 156–167. <https://doi.org/10.5897/AJEST2020.2865>
- Ali, A. F., Tanko, A. I., & Kovo, A. S. (2017). Solid Waste Management Practice in a Less Developed Urban Setting: A Case Study. *J Environ Stud*, 3(1), 4.
- Ali, A., Khan, A.A. and Ahmed, I. (2011). Determinants of Pakistani Consumers' Green Purchasing Behavior: Some Insights from a developing country. *International Journal of Business and Social Science*, 2(3): 217–226

- Aljaradin, M., Persson, K. M., AND Sood, E. (2015). The role of informal sector in waste management, a case study; Tafila-Jordan. *Resources and Environment*, 5(1), 9-14.
- Bekele, D., & Tadesse, M. (2021). Informal waste recycling and plastic recovery practices in Addis Ababa, Ethiopia. *Waste Management & Research*, 39(8), 1021–1030. <https://doi.org/10.1177/0734242X211012345>
- Dunlap, R.E., Van Liere, K.D., Mertig, A.G. and Jones, R.E. (2000). Measuring Endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3): 425-442.
- Ezeh, C. N., & Ugwu, S. C. (2021). Household waste management and sanitation practices in Port Harcourt Metropolis, Nigeria. *Environmental Quality Management*, 31(2), 45–56. <https://doi.org/10.1002/tqem.21734>
- Flores, M. L. (2021). Program to Improve Public Awareness on Solid Waste Collection in the San Carlos Neighborhood, Huancayo. *Industrial Data*, 24(2), 2.
- Hopewell, J., Dvorak, R., and Kosior, E. (2009). Plastics recycling: challenges and opportunities. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1526), 2115–2126.
- Ibrahim, M. A., & Hassan, U. S. (2022). Public perception and participation in recycling programs in Abuja Municipal Area Council, Nigeria. *Journal of Urban Environmental Studies*, 9(1), 55–70. <https://doi.org/10.1080/27658511.2022.1045567>
- Ikebude, C. F. (2017). Feasibility Study on Solid Waste Management in Port Harcourt Metropolis: Causes, Effect and Possible Solutions. *Nigerian Journal of Technology*, 36(1), 276–281.
- Khalil, M.S., Abdullahi, S.H., Manaf, L., Sharai, A.H. and Nabegu, A.B. (2017). Examining the Moderating Role of Perceived Lack of Facilitating Conditions on Household Recycling Intention in Kano, Nigeria. *Recycling* 2(18)
- Mensah, P., Owusu, E., & Antwi, K. (2021). Environmental education and recycling behavior among urban households in Accra, Ghana. *Sustainability*, 13(14), 7821. <https://doi.org/10.3390/su13147821>
- Mhlaba, S., Ndlovu, P., & Khumalo, T. (2022). Plastic waste recovery and informal recycling systems in South Africa. *Recycling*, 7(6), 88. <https://doi.org/10.3390/recycling7060088>
- Mostafa, M., (2009). Shades of Green: A Psychographic Segmentation of the Green Consumer in Kuwait using Self-organizing Maps. *Expert Systems with Applications*, 36(8): 11030-11038.
- Mrema, G., & Mwaseba, D. (2024). Challenges of urban solid waste management in Tanzania: Implications for sustainability. *Environmental Challenges*, 14, 100821. <https://doi.org/10.1016/j.envc.2024.100821>
- Muhammad, S. and Marzuk, A. (2024). Solid Waste Management Application and Its Dilemma in Kano Metropolis-Nigeria. *American Journal of Environmental Protection* 14(4) DOI: [10.11648/j.ajep](https://doi.org/10.11648/j.ajep)
- Mukamana, J., Uwizeye, A., & Nsabimana, E. (2023). Community participation and sustainable waste recycling practices in Kigali, Rwanda. *Cleaner Waste Systems*, 5, 100087. <https://doi.org/10.1016/j.clwas.2023.100087>
- Mustapha, Y.K. (2017). Environmental and Public Health Impact of Poor solid Waste Disposal in Kano Metropolis Nigeria. *Texila International Journal of Public Health* 5(4)
- Nabegu, A. B., & Mustapha, A. (2014). Enhancing awareness and participation of municipal solid waste management in Kano Metropolis, Nigeria. *World scientific news*, 5.
- Nankya, M., Okello, J., & Ssemenda, R. (2020). Household waste segregation practices in Kampala, Uganda. *International Journal of Environmental Studies*, 77(6), 1012–1025. <https://doi.org/10.1080/00207233.2020.1739392>
- Nzeadibe, T. C., and Ajaero, C. K. (2010). Informal waste recycling and rural livelihood support in Nigeria. *Environment, Development and Sustainability*, 12(6), 917–936.
- Ogbonna, D. N., and Ekweozor, I. K. E. (2017). Urban Domestic Solid Waste Management in Nigeria. *Environment and Pollution*, 6(1), 32–41.
- Ojedokun, O. A., and Balogun, S. K. (2011). Environmental attitude as a mediator of the relationship between self-concept, environmental self-efficacy and responsible environmental behavior among residents of high-density area in Ibadan metropolis, Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 4(3), 62–73.
- Okechukwu, I. S., Eze, C. N., and Ugochukwu, U. E. (2018). Urban Solid Waste Generation and Management in Nigeria. *International Journal of Advanced Research in Science, Engineering and Technology*, 5(8), 6492–6499.
- Olayiwola, L. M., Aluko, O. E., & Oduwaye, L. (2018). Urban household waste management: Issues and strategies for sustainable cities. *Journal of Sustainable Development in Africa*, 20(1), 117–132.
- Otieno, R., & Were, P. (2023). Public awareness and household participation in recycling programs in Nairobi County, Kenya. *Sustainability Analytics and Modeling*, 3, 100018. <https://doi.org/10.1016/j.samod.2023.100018>
- Otitoju, M. A., and Seng, A. J. (2014). Household Willingness to Recycle Waste in Nigeria: A Case Study of Ekiti State. *Environmental Research Journal*, 8(3), 57–63.
- Saphores, J. D. M., Nixon, H., Ogunseitan, O. A., and Shapiro, A. A. (2006). Household willingness to recycle electronic waste: An application to California. *Environment and Behavior*, 38(2), 183–208.
- Sithole, B., & Dlamini, S. (2024). Government-community partnerships and recycling participation in South African municipalities. *Sustainable Futures*, 8, 100215. <https://doi.org/10.1016/j.sfr.2024.100215>
- Ugwulebo, H. O., and Okoli, C. F. (2015). A Study on the Knowledge, Attitude, and Practice of Waste Management among Secondary School Students in Owerri Municipal, Nigeria. *Journal of Environmental Science, Toxicology and Food Technology*, 9(4), 24–28.
- Wilson, D. C., Velis, C., and Cheeseman, C. (2012). Role of informal sector recycling in waste management in developing countries. *Habitat International*, 30(4), 797–808.