AN APPRAISAL OF WASTE DISPOSAL CHALLENGES IN ZOO ROAD HOUSING ESTATE, KANO MUNICIPAL LOCAL GOVERNMENT, KANO STATE, NIGERIA

RESEARCH ARTICLE

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ABSTRACT

The rapid urbanisation of Kano, Nigeria, has led to significant challenges in managing solid waste, particularly in areas like Zoo Road. The area's growing population, fuelled by commercial and industrial activities, has resulted in an unprecedented increase in waste generation, overwhelming existing waste management infrastructure. Streets were littered with refuse, including plastics, organic waste, and construction debris, contribute to environmental degradation, public health risks, and aesthetic decline. This study, on Zoo Road Housing Estate in Kano Municipal Local Government of Kano State, investigates waste management challenges with four objectives: identifying sewage, refuse, and drainage issues; assessing resident satisfaction; evaluating perceived problem severity; and proposing solutions. A quantitative survey design was employed, targeting residents of Zoo Road Housing Estate (population: ~200,000). A sample of 150 respondents was selected using simple random sampling. Data were collected via a structured questionnaire featuring Likert-scale and closed-ended questions. Descriptive statistics (frequency, percentage, mean, standard deviation) were used for analysis. Findings revealed significant issues, with 82.0% noting irregular refuse collection (M=3.22), 80.0% citing blocked drainage (M=3.20), and 76.0% reporting sewage overflow (M=3.08). Dissatisfaction was high, with 86.0% dissatisfied with waste facility availability (M=1.80) and 82.0% with drainage functionality (M=1.88). Problems were perceived as severe (78.0-80.0%, M=3.10-3.18). Recommendations include increasing refuse collection frequency, maintaining sewage and drainage systems, deploying additional waste facilities, and implementing community education campaigns. These findings underscore the need for infrastructural upgrades and community engagement to enhance waste management, offering actionable insights for policymakers to improve environmental quality and urban liveability in Zoo Road.

Methodology

Quantitative survey design using structured questionnaire with 150 residents from Zoo Road Housing Estate

Key Variables

Sewage overflow, refuse collection, drainage blockage, and waste facility availability in residential estate

Main Finding

82% irregular refuse collection, 80% blocked drainage, with high dissatisfaction and severe perceived impacts

Key words: Waste Disposal, Environmental Degradation, Waste Management, Kano

INTRODUCTION

Waste management is a discipline associated with the control of the generation, storage, collection, transfer and transportation, processing, and disposal of waste in a manner that aligns with economic, engineering, conservation, and aesthetic standards, while being responsive to public attitudes. Effective waste management is critical for maintaining environmental sustainability, public health, and urban livability. Solid waste, encompassing a heterogeneous mass of materials discarded from residential, commercial, and industrial activities, poses significant challenges due to its volume and diversity. This includes everything from household refuse to industrial byproducts, each requiring specific handling and disposal strategies.

Historically, sanitation efforts focused primarily on human excreta disposal, often neglecting other solid wastes. This oversight has contributed to public health challenges, particularly in developing nations where defective sanitation systems are linked to diseases such as cholera, typhoid, and malaria (Allaby, 1988, Allaby, 2019). Waste generation is an inevitable by-product of human activities, including domestic, commercial, industrial, and agricultural practices, as well as natural phenomena like erosion, volcanic eruptions, and flooding (American Journal of Surgeons [ACS], 1969). In urban settings such as Kano City, the magnitude of waste can be staggering, with developing areas generating upwards of 18,000 tonnes annually from human activities alone.

01

Global Context

Nigeria currently generates at least 32 million tonnes of solid waste annually, and this number is projected to rise to 107 million tonnes by 2050, driven by rapid urbanisation and population growth.

02

Regional Strategies

Kenya, Rwanda and South Africa have adopted diverse strategies to tackle plastic waste, Rwanda has established a comprehensive waste management system which emphasise recycling and community engagement, South Africa has embraced extended producer responsibility and developed a recycling infrastructure while Kenya has implemented a ban on plastic bags and is making use of artificial intelligence and progress in e-waste management.

03

Nigerian Challenges

Nigeria is delving into circular economy business models for effective management of waste. However, only 30% of the waste generated is efficiently collected and disposed of, mainly because two-thirds of urban households in low-income neighbourhoods lack formal waste management services.

Recent studies highlight the growing complexity of waste management in urban environments. For instance, Hoornweg and Bhada-Tata (2012) estimated that global municipal solid waste generation reached 1.3 billion tonnes per year, with projections of 2.2 billion tonnes by 2025, driven by urbanisation and population growth. In African cities, rapid urban expansion exacerbates waste management challenges, with inadequate infrastructure and limited resources leading to open dumping and environmental degradation (UNEP, 2018).

In Nigeria, studies by Ogwueleka (2019) indicate that urban centres like Kano generate significant waste volumes, often exceeding local authorities' capacity for collection and disposal, resulting in blocked drains, flooding, and health hazards. Furthermore, research by Adeyemi and Olorunfemi (2021) underscores the role of community participation and technological innovation in improving waste management outcomes, emphasising the need for integrated approaches that combine policy, infrastructure, and public awareness. In Kano, the volume of solid waste has overwhelmed urban administrators' capacity to plan for its collection and disposal, leading to streets and drains blocked by refuse, which exacerbates flood disasters. Globally, the interplay between urbanisation, waste generation, and management capacity remains a critical area of study, with implications for sustainable development.

STATEMENT OF THE RESEARCH PROBLEM

The rapid urbanisation of Kano, Nigeria, has led to significant challenges in managing solid waste, particularly in areas like Zoo Road. The area's growing population, fuelled by commercial and industrial activities, has resulted in an unprecedented increase in waste generation, overwhelming existing waste management infrastructure. Streets littered with refuse, including plastics, organic waste, and construction debris, contribute to environmental degradation, public health risks, and aesthetic decline.

Infrastructure Problems

- Inadequate waste collection services
- Malfunctioning sewage systems
- Poor drainage maintenance
- Limited coordination between agencies

Health & Environmental Risks

- Flooding and disease outbreaks
- Cholera and malaria transmission
- Air and water pollution
- Aesthetic decline of urban areas

In Zoo Road, specific issues include inadequate waste collection services, malfunctioning sewage systems, and poor drainage maintenance, which exacerbate flooding and disease outbreaks such as cholera and malaria. The inefficiencies in waste management are compounded by limited coordination between government agencies, insufficient funding, and low community engagement in waste disposal practices. The accumulation of waste in public spaces not only poses environmental hazards, such as air and water pollution, but also undermines sustainable land use and urban planning efforts.

While technological advancements and policy interventions have been proposed, their implementation in Zoo Road remains inconsistent, leaving residents to contend with persistent waste-related challenges. This study seeks to investigate the extent of these problems, assess resident satisfaction with waste management services, and propose actionable solutions for improving waste disposal in Zoo Road.

According to WHO guidelines, inadequate waste management in urban areas increases disease transmission risks by 40-60% (WHO, 2024). Studies in similar Nigerian cities show direct correlations between blocked drainage systems and vector-borne diseases - Lagos experiences 23% higher malaria incidence in areas with poor waste management (Ferronato & Torretta, 2019), while Abuja reports 35% more typhoid cases in neighbourhoods with irregular waste collection (Okin et al., 2024).

THE STUDY AREA

Kano State is one of the thirty-six states of the Federal Republic of Nigeria, including Abuja. The state has forty-four local government areas, numerous large towns, and villages spread over a unique geographical location. Known for its commercial and industrial activities, Kano State's population has grown significantly from 9.4 million in 2006 to an estimated 15.5 million in 2022 (National Bureau of Statistics, 2022), while Kano metropolitan area reached 4.6 million by 2025 (UN Population Division, 2024). This rapid population growth of approximately 64% since 2006 has intensified pressure on urban infrastructure, particularly waste management systems. Business and agriculture are the main occupations. Common crops include groundnuts, millet, guinea corn, and cotton.

Kano Municipal local government is located on 8°31'E and 8°4°E longitude and 12°8'N and 12°28'N latitude. The study area, Zoo Road, is a Kano State owned medium density residential estate for the middle income earners and situated in the Gandun Albasa Quarters, a residential zone area of Kano Municipal, with an estimated population of 200,000.

CONCEPTUAL LITERATURE REVIEW

Concept of Waste

Waste refers to any material, substance, or by-product that is discarded, no longer useful, or deemed unwanted after its primary purpose has been fulfilled. It encompasses a wide range of items, from household garbage to industrial by-products, and can exist in solid, liquid, or gaseous forms. The concept of waste is closely tied to human activities, as it arises from consumption, production, and daily living. Waste can be generated by households, industries, agricultural activities, or commercial establishments, and its improper handling poses significant risks to human health, ecosystems, and the environment. Effective waste management seeks to minimise these impacts through strategies like reduction, reuse, recycling, and safe disposal, aiming to balance human needs with environmental sustainability (United Nations Environment Programme [UNEP], 2015).

The significance of understanding waste lies in its environmental and societal implications. Mismanaged waste can lead to pollution of air, water, and soil, contributing to climate change and biodiversity loss. For instance, organic waste decomposing in landfills releases methane, a potent greenhouse gas, while hazardous waste can contaminate water sources, endangering communities (Hoornweg & Bhada-Tata, 2012). Additionally, waste reflects inefficiencies in resource use, as discarded materials often contain recoverable value through recycling or repurposing. By redefining waste as a potential resource, modern waste management practices aim to create a circular economy, where materials are reused to reduce environmental strain and conserve natural resources (Ellen MacArthur Foundation, 2017).

Types of Waste

Waste can be classified into several categories based on its source, composition, or potential impact. Each type requires specific handling and disposal methods to mitigate its effects on health and the environment. A broad classification includes biodegradable and non-biodegradable. Biodegradable wastes are organic materials such as food leftover, plants and papers that can easily decompose and which microorganisms such as bacteria and fungi help to break down the nutrients into soil which helps to balance the ecosystem to maintain sustainability while non-biodegradable wastes include plastics, glass metal and other poisonous chemicals that cause many harms to the environment with health impacts on human beings, they last for centuries and do not decompose easily (Vaishnavi, 2025).

Sewage

Liquid waste primarily consisting of human excreta, wastewater from households, and sometimes industrial effluents. Transported through sewer systems to treatment facilities.

Municipal Solid Waste

Everyday household and commercial waste such as food scraps, paper, plastics, and textiles. Commonly collected as garbage and sent to landfills or recycling centres.

Hazardous Waste

Wastes that pose significant risks due to their toxic, corrosive, flammable, or reactive properties. Includes batteries, medical waste, and certain chemicals.

E-Waste

Electronic waste consisting of discarded devices like computers, mobile phones, and appliances. Contains hazardous materials like lead and mercury requiring specialised recycling.

PROBLEMS OF INEFFECTIVE WASTE DISPOSAL

Waste disposal, the process of discarding waste materials, presents numerous challenges that impact the environment, public health, and societal well-being. While disposal methods like landfill, incineration, and ocean dumping are commonly used to manage waste, they often lead to significant problems when not properly regulated or managed. These issues stem from the increasing volume of waste, inadequate infrastructure, and lack of sustainable practices, exacerbating environmental degradation and health risks.

Poor waste management over the years has been responsible for causing several diseases and in some cases death (America's Public Health and the World Health Organisation cited in Kwun Omang et al, 2021). "Rapid technological advancement in industry and urbanisation has caused significant waste management issues that are increasingly producing biodegradable and non-biodegradable wastes, threatening the nature as well as the public health" (Vaishnavi, 2025). Below are the key problems associated with waste disposal (United Nations Environment Programme [UNEP], 2015).

Environmental Pollution

Landfills release harmful pollutants into air, soil, and water. Decomposing organic waste generates methane, while incineration releases toxic emissions like dioxins and heavy metals.

Public Health Risks

Poorly managed disposal sites attract pests that spread diseases. Improper waste management creates breeding grounds for disease-carrying vectors like mosquitoes and flies.

Resource Depletion

Waste disposal results in loss of valuable resources that could be recycled. Materials like metals and plastics are buried or burned, contributing to resource scarcity.

Climate Change Contribution

Landfills are major sources of methane emissions, while incineration releases carbon dioxide. These emissions exacerbate climate change and environmental disruptions.

Environmental Pollution: Landfills, a primary disposal method, release harmful pollutants into the air, soil, and water. Decomposing organic waste generates methane, a potent greenhouse gas contributing to climate change, while leakage from landfills can contaminate groundwater, making it unsafe for consumption (Hoornweg & Bhada-Tata, 2012). Similarly, incineration of waste releases toxic emissions, such as dioxins and heavy metals, which pollute the air and pose health risks to nearby communities. Improper disposal practices, like open dumping or ocean dumping, further aggravate the issue by polluting water bodies and harming marine ecosystems (UNEP, 2015).

Public Health Risks: Poorly managed disposal sites, particularly open dumps, attract pests like rats and insects, which spread diseases such as cholera and dengue fever (World Health Organisation [WHO], 2016). Ineffective waste disposal can contaminate water sources and increase the risk of waterborne disease such as cholera, typhoid fever and diarrhoea for those who consumed the contaminated water (Adeniyi & Oni, 2016). Improper waste management is one of the factors leading to breeding grounds for disease-carrying vectors such as mosquitoes, flies and rodents which increase the risk of diseases such as malaria, dengue fever and leptospirosis (Adewoyin, 2017). Hazardous waste, including medical waste and chemicals, if not properly segregated and disposed of, can expose workers and communities to toxic substances, leading to respiratory issues, skin disorders, and long-term illnesses like cancer.

PERCEPTION OF THE MAGNITUDE OF WASTE DISPOSAL PROBLEMS BY RESIDENTS

The perception of waste disposal problems by residents significantly influences community responses, policy implementation, and the effectiveness of waste management systems. Residents' awareness and attitudes toward waste disposal issues are shaped by their daily experiences, environmental conditions, socio-economic factors, and access to information. While some communities **recognise** the severity of waste disposal challenges, others may underestimate the issue due to limited knowledge or inadequate infrastructure, impacting their willingness to participate in sustainable practices (United Nations Environment Programme [UNEP], 2015).

1

Awareness of Environmental and Health Impacts

In many urban areas, residents perceive waste disposal problems as significant due to visible issues like overflowing bins, open dumps, and polluted water bodies. These conditions raise concerns about health risks, such as waterborne diseases and respiratory issues.

2

Socio-Economic Influences on Perception

Higher-income communities often perceive waste disposal problems as manageable due to access to private collection services. Low-income residents may **prioritise** immediate survival needs over waste management.

3

Cultural and Behavioural Factors

Cultural attitudes and habits influence how residents perceive and respond to waste disposal problems. Communities with strong environmental awareness view waste disposal as a collective responsibility.

4

Access to Infrastructure and Services

Where collection services are reliable and facilities accessible, residents are more likely to view waste disposal as manageable. In areas with irregular collection, residents often perceive waste disposal problems as overwhelming.

Awareness of Environmental and Health Impacts: In many urban areas, residents perceive waste disposal problems as significant due to visible issues like overflowing bins, open dumps, and polluted water bodies. These conditions raise concerns about health risks, such as waterborne diseases and respiratory issues from incineration emissions, particularly in densely populated regions (World Health Organization [WHO], 2016). For instance, communities near landfills often report strong awareness of problems like foul odors, pest infestations, and groundwater contamination, prompting demands for better waste management (Hoornweg & Bhada-Tata, 2012). However, in some rural or underserved areas, residents may have lower awareness of long-term environmental impacts, viewing waste disposal as a minor inconvenience rather than a critical issue.

Socio-Economic Influences on Perception: Socio-economic status plays a key role in shaping residents' views on waste disposal. Higher-income communities often perceive waste disposal problems as manageable due to access to private collection services and recycling facilities, leading to greater advocacy for sustainable practices (Ellen MacArthur Foundation, 2017). In contrast, low-income residents, particularly in informal settlements, may **prioritise** immediate survival needs over waste management, perceiving disposal issues as secondary despite living in areas with severe waste accumulation. This discrepancy can hinder community-wide efforts to address disposal challenges effectively.

Influence of Public Awareness Campaigns: Educational initiatives and media coverage play a crucial role in shaping residents' understanding of waste disposal challenges. Campaigns highlighting the environmental consequences of improper disposal, such as plastic pollution in oceans or methane emissions from landfills, can heighten residents' sense of urgency and encourage **behavioural** changes (UNEP, 2015). However, in regions with limited access to such information, residents may underestimate the magnitude of disposal problems, viewing them as isolated rather than systemic issues. Effective communication strategies are thus essential to bridge this gap and foster proactive community involvement especially through residents association and formation of waste cooperative.

FIELD PHOTOGRAPHS

Plate 1: Blocked Drainage by Solid Waste in Zoo Road Estate, Kano, Nigeria
Source: Researcher's field work 2025

Plate 2: Stagnant drain water due to Drainage blockage, Zoo Road Estate, Kano
Source: Researcher's field work 2025

Plate 3: Waste Dump Site fills with uncollected Refuse, Zoo Road Estate, Kano
Source: Researcher's field work 2025

METHODOLOGY

The study employed a quantitative research design, specifically using the survey method. This design is appropriate for gathering large-scale data and provides a structured way of quantifying respondents' views. The target population of the study consists of residents of Zoo Road Housing Estate, Kano which is 200. A total of 150 respondents were selected as the sample size for the study. The sampling technique used was simple random sampling, which ensured that each resident had an equal chance of being selected.

While the sample represents 75% of the estate's population, this high response rate (150/200) provides robust statistical power (>95% confidence level) for the study's objectives. The concentrated geographic focus allows for detailed micro-level analysis, though findings should be interpreted within the context of this specific residential estate rather than broader urban generalisations.

A structured questionnaire based on a 4-point Likert scale with closed-ended questions was utilised as the primary instrument for data collection to enable quantifiable responses. The questionnaire was designed to align with the study's objectives and was divided into sections that captured demographic data, types and severity of waste disposal problems, residents' satisfaction with available services, and their perceptions of the overall waste management situation.

Research Design

Quantitative survey method using structured questionnaire for systematic data collection from residents

Sample Selection

150 respondents from 200,000 population using simple random sampling technique

Data Collection

4-point Likert scale questionnaire covering demographics, waste problems, satisfaction, and perceptions

Analysis Method

Descriptive statistics using frequency counts, percentages, mean scores, and standard deviation

Data collection was through physical administration of the questionnaire. The data collected from the questionnaires were analysed using descriptive statistics. The analysis involved organising the responses into tables and summarising them using frequency counts and simple percentages to illustrate the distribution of answers. Additionally, mean scores were calculated to determine the average perception of respondents on various waste disposal issues, while standard deviation was used to assess the variability in responses.

DATA ANALYSIS AND PRESENTATION

Table 1: Demographic Characteristics of Respondents

S/N	Variable	Category	Frequency	Percentage (%)
1.	**Gender**	Male	84	56.0
		Female	64	42.7
		Other	2	1.3
2.	**Age**	Below 20	12	8.0
		20-30	48	32.0
		31-40	45	30.0
		41-50	30	20.0
		Above 50	15	10.0
3.	**Length of Residency**	Less than 1 year	18	12.0
		1-5 years	54	36.0
		6-10 years	45	30.0
		Over 10 years	33	22.0
4.	**Type of Residence**	Rented	72	48.0
		Owned	60	40.0
		Shared	15	10.0
		Other	3	2.0

Source: Field Survey, 2025

Table 1 indicates that the majority of respondents were male (56.0%) and aged 20-40 (62.0% combined), reflecting a diverse adult population. Most had resided in the area for 1-10 years (66.0%), with 48.0% in rented accommodations. This demographic profile suggests a representative sample of residents with sufficient experience to comment on waste disposal issues, providing a robust basis for analysing problems, satisfaction, and proposed solutions.

Table 2: Problems of Waste Disposal

S/N	Statement	SA	A	D	SD	Mean	SD
1	Sewage systems frequently overflow or malfunction	60 (40.0%)	54 (36.0%)	24 (16.0%)	12 (8.0%)	3.08	0.92
2	Refuse collection services are irregular or inadequate	66 (44.0%)	57 (38.0%)	21 (14.0%)	6 (4.0%)	3.22	0.83
3	Drainage systems are often blocked, causing flooding	69 (46.0%)	51 (34.0%)	21 (14.0%)	9 (6.0%)	3.20	0.89
4	Lack of proper waste disposal facilities (e.g., bins, dumpsites)	63 (42.0%)	54 (36.0%)	24 (16.0%)	9 (6.0%)	3.14	0.89

Source: Field Survey, 2025

Table 2 shows that a majority of respondents agreed or strongly agreed that waste disposal problems are prevalent, with 76.0% citing sewage overflow (M=3.08, SD=0.92), 82.0% noting irregular refuse collection (M=3.22, SD=0.83), 80.0% reporting blocked drainage systems (M=3.20, SD=0.89), and 78.0% highlighting a lack of facilities (M=3.14, SD=0.89). The high mean scores (3.08-3.22) and moderate standard deviations (0.83-0.92) indicate consensus on the severity of these issues. These findings underscore significant waste management challenges, particularly in refuse collection and drainage, necessitating targeted interventions.

Table 3: Satisfaction with Waste Disposal Services and Facilities

S/N	Statement	VS	S	D	VD	Mean	SD
1	Satisfaction with frequency of refuse collection services	6 (4.0%)	24 (16.0%)	69 (46.0%)	51 (34.0%)	1.90	0.80
2	Satisfaction with maintenance of sewage systems	9 (6.0%)	27 (18.0%)	66 (44.0%)	48 (32.0%)	1.98	0.85
3	Satisfaction with condition and functionality of drainage systems	6 (4.0%)	21 (14.0%)	72 (48.0%)	51 (34.0%)	1.88	0.79
4	Satisfaction with availability of waste disposal facilities	3 (2.0%)	18 (12.0%)	75 (50.0%)	54 (36.0%)	1.80	0.73

Source: Field Survey, 2025

Table 3 reveals widespread dissatisfaction with waste disposal services, with 80.0% dissatisfied or very dissatisfied with refuse collection frequency (M=1.90, SD=0.80), 76.0% with sewage system maintenance (M=1.98, SD=0.85), 82.0% with drainage functionality (M=1.88, SD=0.79), and 86.0% with facility availability (M=1.80, SD=0.73). The low mean scores (1.80–1.98) and consistent standard deviations (0.73–0.85) reflect strong consensus on inadequate services. These results highlight a significant gap between resident expectations and current waste management provisions, particularly in facility availability and drainage maintenance.

Table 4: Magnitude of Waste Disposal Problems

S/N	Statement	VS	S	M	NS	Mean	SD
1	Sewage overflow or malfunction as a problem	54 (36.0%)	57 (38.0%)	27 (18.0%)	12 (8.0%)	3.02	0.91
2	Inadequate or irregular refuse collection problem	60 (40.0%)	60 (40.0%)	24 (16.0%)	6 (4.0%)	3.16	0.83
3	Blocked or poorly maintained drainage systems as problem	66 (44.0%)	54 (36.0%)	21 (14.0%)	9 (6.0%)	3.18	0.89
4	Lack of waste disposal facilities as a problem	57 (38.0%)	60 (40.0%)	24 (16.0%)	9 (6.0%)	3.10	0.87

Source: Field Survey, 2025

Table 4 indicates that residents perceive waste disposal problems as severe, with 74.0% rating sewage overflow as very severe or severe (M=3.02, SD=0.91), 80.0% for refuse collection (M=3.16, SD=0.83), 80.0% for drainage issues (M=3.18, SD=0.89), and 78.0% for lack of facilities (M=3.10, SD=0.87). High mean scores (3.02–3.18) and moderate standard deviations (0.83–0.91) suggest widespread concern. These findings confirm the significant perceived impact of waste management issues, particularly in refuse and drainage systems, on the community.

Table 5: Recommendations for Improving Waste Disposal

S/N	Statement	SA	A	D	SD	Mean	SD
1	Increasing frequency of refuse collection	72 (48.0%)	60 (40.0%)	15 (10.0%)	3 (2.0%)	3.34	0.74
2	Regular maintenance of sewage and drainage systems	75 (50.0%)	57 (38.0%)	12 (8.0%)	6 (4.0%)	3.34	0.80
3	Providing more waste disposal facilities	69 (46.0%)	63 (42.0%)	15 (10.0%)	3 (2.0%)	3.32	0.74
4	Community education on proper waste disposal	66 (44.0%)	66 (44.0%)	12 (8.0%)	6 (4.0%)	3.28	0.78

Source: Field Survey, 2025

Table 5 demonstrates strong support for proposed solutions, with 88.0% agreeing or strongly agreeing that increasing refuse collection frequency (M=3.34, SD=0.74), regular maintenance of sewage and drainage (M=3.34, SD=0.80), providing more facilities (M=3.32, SD=0.74), and community education (M=3.28, SD=0.78) would improve waste management. High mean scores (3.28–3.34) and low standard deviations (0.74–0.80) indicate consensus. These results highlight resident support for practical interventions to address waste disposal challenges, emphasising maintenance and education.

DISCUSSION OF FINDINGS

The findings provide comprehensive insights into waste disposal problems, aligning with the research objectives. The demographic profile (Table 1) shows a diverse resident sample, ensuring varied perspectives on waste management issues. Table 2 confirms significant issues, with 82.0% citing irregular refuse collection and 80.0% noting blocked drainage systems (M=3.20–3.22). These align with studies like Adeyemi, Aina, and Achadu, (2020), who noted inadequate waste collection in Nigerian urban areas, and Olukanni, Pius-Imue, and Joseph (2020), who highlighted drainage blockages causing flooding. The prevalence of sewage overflow (76.0%) reflects infrastructural deficits, underscoring the need for systemic upgrades.

Table 3 reveals high dissatisfaction (80.0–86.0%) with refuse collection, sewage maintenance, drainage functionality, and facility availability (M=1.80–1.98). This corroborates Nwankwo and Okeke (2021), who found low resident satisfaction due to poor service delivery in Nigerian cities, emphasising the gap between expectations and current provisions. Table 4 shows that 78.0–80.0% perceive refuse, drainage, and facility issues as severe (M=3.10–3.18), consistent with Ogwueleka (2019), who noted severe waste management challenges impacting urban quality of life. Sewage issues (74.0%) were slightly less severe but still significant, suggesting varied problem intensity across waste types.

Key Research Findings

82% irregular refuse collection, 80% blocked drainage, 86% dissatisfied with facility availability. Strong consensus on problem severity (M=3.10–3.22) across all waste management dimensions.

Alignment with Literature

Findings corroborate existing studies on Nigerian urban waste challenges, particularly Adeyemi et al. (2020) on inadequate collection and Olukanni et al. (2020) on drainage blockages.

Community Support for Solutions

88% support for increased collection frequency, maintenance, and education campaigns (M=3.28–3.34), indicating strong resident willingness to engage in improvement efforts.

Table 5 supports frequent refuse collection, system maintenance, more facilities, and education (88.0% agreement, M=3.28–3.34), aligning with global literature advocating integrated waste management (Wilson, 2015). The findings highlight systemic waste management deficiencies, impacting health, environment, and aesthetics, as noted in qualitative responses. High dissatisfaction and perceived severity, suggest urgent need for infrastructural investment and policy reform. Support for maintenance and education indicates community willingness to engage in solutions, offering a pathway for stakeholders collaboration. The study's focus on a specific area provides localised insights, filling a gap in context-specific waste management research in northern Nigeria.

This data affirm that waste disposal problems are prevalent, with significant dissatisfaction and severe perceived impacts. Proposed solutions, particularly increased collection frequency and maintenance, are strongly supported, offering actionable strategies for improvement.

These findings align with broader Nigerian urban waste challenges. Lagos State, despite having more advanced infrastructure, still experiences 40% irregular collection rates (World Bank, 2024), while Abuja reports similar drainage blockage issues affecting 65% of residential areas (Ezeudu & Ezeudu, 2023). International benchmarks suggest that effective urban waste management requires collection frequencies of 2–3 times weekly and drainage maintenance every 6 months (UNEP Global Waste Management Outlook, 2024). Zoo Road's current performance falls significantly below these standards, with collection occurring only weekly and drainage maintenance being reactive rather than preventive.

CONCLUSION OF THE STUDY

The study confirms that waste disposal in Zoo Road Housing Estate, Kano, is **characterised** by significant challenges, including irregular refuse collection, blocked drainage systems, and frequent sewage overflows, which severely impact on environmental quality, public health, and resident satisfaction. High dissatisfaction (80.0-86.0%) with waste management services reflects inadequate infrastructure and service delivery, while the perceived severity of problems (74.0-80.0%) underscores their detrimental effects on quality of life, including health risks like malaria and aesthetic decline.

Strong resident support for solutions like frequent refuse collection, system maintenance, and community education (88.0%) indicates a pathway for reform through collaborative efforts. These findings align with the study's objectives, highlighting the urgent need for infrastructural upgrades, policy interventions, and community engagement to foster sustainable waste management practices in Zoo Road, contributing to improved urban livability and environmental sustainability.

Based on comparative **analysis** with successful interventions in Lagos and Abuja, this study recommends: (1) implementing twice-weekly collection schedules as demonstrated effective in Lagos's Victoria Island (reducing complaints by 67%), (2) establishing community-based drainage maintenance programmes similar to Abuja's pilot project (achieving 45% reduction in blockages), and (3) introducing waste segregation at source, which has proven to reduce overall waste volume by 30-40% in other Nigerian cities (World Bank, 2024). These evidence-based interventions could significantly improve Zoo Road's waste management outcomes within 12-18 months.

01

Increase Refuse Collection Frequency

The Refuse Management and Sanitation Board should increase the frequency of refuse collection to at least twice weekly

02

Infrastructure Maintenance

The Kano State Housing Corporation should invest in regular maintenance of sewage and drainage systems

03

Deploy Additional Facilities

The Ministry of Environment should deploy additional waste disposal facilities, suchs as communal bins and designated dumpsites

04

Community Education and Cooperatives

The Kano State Urban Planning and Development Authority with relevant agencies should initiate community education campaigns and formation of waste cooperatives within residents associations

05

Government-Public Partnership

There should be government interaction with the populace on disposal of non-biodegradable wastes and establishment of community waste cooperatives to encourage participatory approaches such as waste separation and modern recycling facilities

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CONFLICTS OF INTEREST

The author declares no conflict of interest

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