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Environmental Justice and Inequality in Municipal Solid Waste Service Delivery in Owerri Municipality, Nigeria

Okorie, Adaure Janet; *Iyama, William Azuka & Gobo, Akuro Ephraim

Institute of Geosciences and Environmental Management, Rivers State University, Port Harcourt

***Corresponding Author**

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ABSTRACT

This study examined environmental justice and inequality in municipal solid waste service delivery across different housing typologies in Owerri Municipality, Nigeria. Using a mixed-methods cross-sectional design, primary data were collected from 300 households across formal, mixed, and slum settlements through structured questionnaires, field observations, and Key Informant Interviews with municipal waste officials. The findings revealed significant disparities in waste management services across residential categories, as 100% of residents in formal settlements reported access to municipal waste collection services compared to 0% in slum settlements, while 88% of formal residents received daily waste collection services. Similarly, 94.6% of households in formal areas used covered plastic waste bins, whereas 74% of slum residents relied on sack or nylon bags for waste storage and 20% had no storage facilities at all. Due to the absence of formal waste collection services, 65% of slum residents practiced open dumping while 35% depended on open burning as their primary waste disposal method. Despite these conditions, respondents across all housing typologies demonstrated high environmental awareness, indicating that poor waste disposal practices are primarily driven by structural exclusion rather than ignorance. The study therefore concludes that municipal solid waste management challenges in Owerri Municipality are deeply rooted in socio-economic inequality, infrastructural neglect, and environmental injustice, thereby requiring inclusive, decentralized, and pro-poor waste management strategies capable of ensuring equitable environmental service delivery across all urban communities.

Keywords: Owerri, Infrastructure Exclusion, Environmental Justice, Owerri Municipality, Slum Settlements, Service Equity.

INTRODUCTION

Rapid urbanization continues to reshape the spatial, demographic, and environmental structure of cities in developing countries, particularly in sub-Saharan Africa, where infrastructure development has not kept pace with population growth. One of the most critical consequences of this imbalance is the increasing pressure on municipal solid waste management systems, which are already constrained by limited institutional capacity, inadequate financing, and weak enforcement mechanisms. As urban populations expand and consumption patterns shift toward greater use of packaged goods, plastics, and other non-biodegradable materials, the volume and complexity of solid waste generated within urban environments have increased substantially. This growing waste burden has transformed municipal solid waste management from a purely technical service into a central issue of urban governance, environmental sustainability, and public health (Kaza et al., 2018; Sanuth et al., 2025).

In many developing cities, the inability of waste management institutions to respond effectively to rising waste generation has resulted in widespread reliance on informal and environmentally harmful disposal practices. Open dumping, uncontrolled landfilling, roadside disposal, and open burning remain dominant methods of waste handling in several urban areas, contributing significantly to environmental degradation. These practices lead to soil and groundwater contamination, air pollution, blocked drainage systems, and increased vulnerability to flooding, especially during rainy seasons. Although recycling and resource recovery initiatives are gradually emerging in parts of urban Africa, their coverage remains limited and insufficient to address the scale of the

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problem (Kehinde et al., 2020; Kadafa, 2017). In this context, municipal solid waste management challenges are not only environmental concerns but also indicators of systemic governance weaknesses and infrastructural inequality.

In Nigeria, these challenges are particularly pronounced due to rapid urban expansion, population pressure, and uneven development of infrastructure across cities. Municipal authorities often struggle to match waste collection capacity with the increasing volume of waste generated in residential, commercial, and institutional areas, resulting in persistent accumulation of refuse in public spaces and residential neighborhoods (Ogunola et al., 2018). More importantly, the distribution of waste management services is not uniform across urban space, as access to regular collection and proper disposal systems is often determined by socio-economic status and housing typology. Planned residential estates tend to receive relatively better services compared to informal settlements, where poor accessibility, poverty, and weak institutional presence limit effective waste service delivery. This uneven distribution highlights an emerging environmental justice concern, where exposure to environmental risks is closely linked to social and spatial inequality.

Owerri Municipality, the administrative capital of Imo State, provides a clear illustration of these dynamics within a medium-sized and rapidly urbanizing Nigerian city. The municipality comprises a mixture of planned residential estates, mixed-use neighborhoods, and densely populated informal settlements, each characterized by varying levels of infrastructure development and service accessibility. Waste generated from households, markets, institutions, and commercial activities continues to increase, placing considerable strain on existing waste management systems (Uzowuru et al., 2025). However, the effectiveness of waste collection and disposal services varies significantly across housing typologies, with informal and high-density areas often experiencing irregular or absent services. This disparity results in environmental health risks such as blocked drainage channels, localized flooding, disease outbreaks, and widespread environmental pollution. Understanding these spatial inequalities is therefore essential for framing municipal solid waste management not only as an environmental challenge but also as a matter of environmental justice and equitable urban governance.

The aim of this study is to examine the impact of environmental justice and inequality in municipal solid waste service delivery in Owerri Municipality, Nigeria. Specifically, the study seeks to examine variations in waste collection service frequency across different housing typologies in Owerri Municipality; determine the relationship between waste service delivery disparities and household waste disposal practices across different housing typologies and assess the environmental impacts associated with unequal municipal waste management service provision in Owerri Municipality.

METHODOLOGY

The Study Area

The study was conducted in Owerri Municipality, Imo State, Nigeria, due to its rapid urban growth and diverse residential patterns comprising formal housing estates, mixed residential neighborhoods, and informal settlements. For comparative analysis, the municipality was stratified into three housing typologies represented by Amakohia (slum settlement), Eziobodo (mixed residential area), and Rotobi Layout (formal housing estate). These locations were purposively selected to reflect the socio-economic and spatial heterogeneity of the municipality and to examine variations in waste management practices, infrastructure accessibility, and municipal service delivery across different settlement categories.

Data Collection Method

The study adopted a mixed-methods cross-sectional design integrating quantitative and qualitative approaches. Primary data were collected through structured household questionnaires administered to 300 randomly selected households across the three residential categories, alongside direct field observations conducted at public spaces such as drainage channels, markets, and waste collection points. Semi-structured Key Informant Interviews (KIIs) were also conducted with municipal waste management officials to obtain institutional perspectives on waste collection systems, operational challenges, and policy implementation. Quantitative data were analyzed using descriptive statistics, while qualitative data were examined through thematic content analysis to support

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interpretation of the findings. Purposive sampling was used because of the availability, accessibility and risk potentials of the study population in the study area.

RESULTS

Socio-Demographic Characteristics of Respondents

Table 1 showed that in Formal Settlements, 75.8% of respondents have tertiary education, compared to only 25% in Slum Settlements. Conversely, 75% of slum residents have secondary education as their highest level. There is a stark wealth gap. 40% of Formal residents earn above ₦200,000 monthly, whereas 85% of Slum residents earn below ₦50,000. Slum settlements have larger households, with 60% having 4-6 members and 25% having 79 members, indicating higher population density per unit. A critical infrastructural finding is that 100% of roads in Formal areas are "Paved and motorable," while 100% of roads in Slum areas are "Narrow/inaccessible to vehicles". The data confirms that slum residents are economically marginalized and physically isolated by poor infrastructure. The high density in slums (large families in small spaces) combined with low income suggests a high vulnerability to sanitation crises, while the lack of motorable roads serves as a physical barrier to municipal service delivery.

Table 1: Demographic Statistics

S/N	Variable	Category	Formal Settlement (n; %)	Mixed Settlement (n; %)	Slum Settlement (n; %)
1.	Gender	Male	76 (63.3%)	78 (65%)	35 (58.3%)
		Female	44 (36.7%)	42 (34%)	25 (41.7%)
2.	Age group	Below 20	12 (10%)	24 (20%)	3 (5%)
		21 – 30	49 (40.8%)	60 (50%)	26 (43.3%)
		31 – 40	59 (49.2%)	12 (10%)	22 (36.7%)
		41 – 50	-	24 (20%)	9 (15%)
3.	Highest level of education attained	Primary	-	-	-
		Secondary	29 (24.2%)	41 (34.2%)	45 (75%)
		Tertiary	91 (75.8%)	79 (65.8%)	15 (25%)
4.	Average monthly household income	Below 50,000	12 (10%)	54 (45%)	51 (85%)
		50,000-100,000	36 (30%)	12 (10%)	9 (15%)
		101,000-200,000	24 (20%)	12 (10%)	-
		>200,000	48 (40%)	42 (35%)	-
5.	Household size (number of persons)	1-3	49 (40.8%)	66 (55%)	9 (15%)
		4-6	60 (50%)	25 (20.8%)	36 (60%)
		7-9	11 (9.2%)	23 (19.2%)	15 (25%)

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		>9	-	(5.5%)	-
8.	Total Sample population		120 (40%)	120 (40%)	60 (20%)
9.	Access road condition	Paved and motorable	120 (100%)	-	-
		Unpaved but accessible	-	120 (100%)	-
		Narrow/inaccessible to vehicles	-	-	60 (100%)

Source: Field Survey

Spatial Polarization of Municipal Waste Collection and Service Frequency

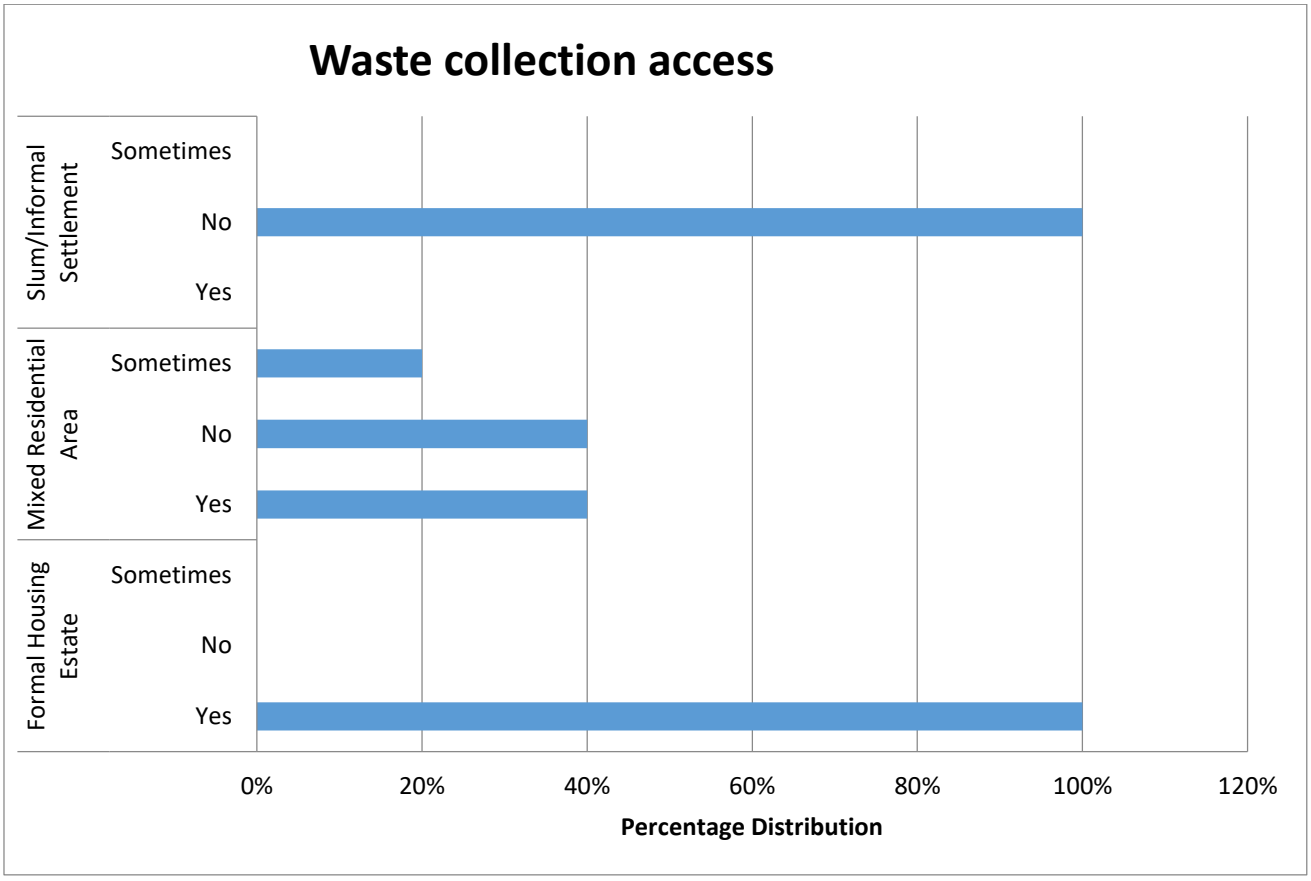

Figure 1: Waste Collection Access

Figure 1 presents an absolute disparity in access, as 100% of formal residents reported having access to waste collection services, while 100% of slum residents reported having no access. This complete separation confirms that waste collection access is determined primarily by infrastructural conditions and settlement status rather than demand for services.

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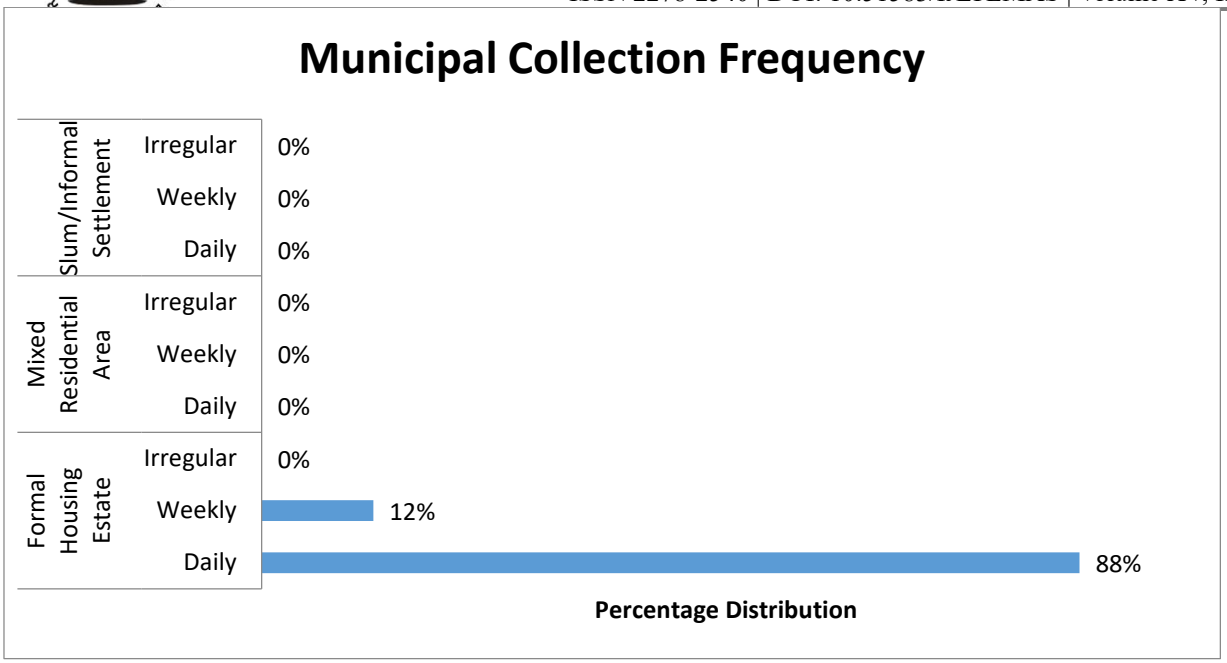

Figure 2: Spatial Polarization of Municipal Waste Collection and Service Frequency

Figure 2 shows that 88% of households in formal areas receive daily waste collection, whereas slum and mixed areas record 0% regular collection frequency, indicating a complete absence of consistent service. This uneven distribution explains differences in environmental cleanliness, as regular collection prevents waste accumulation while irregular or absent collection leads to prolonged exposure of waste in residential environments.

Causal Linkages Between Service Disparities and Household Disposal Practices

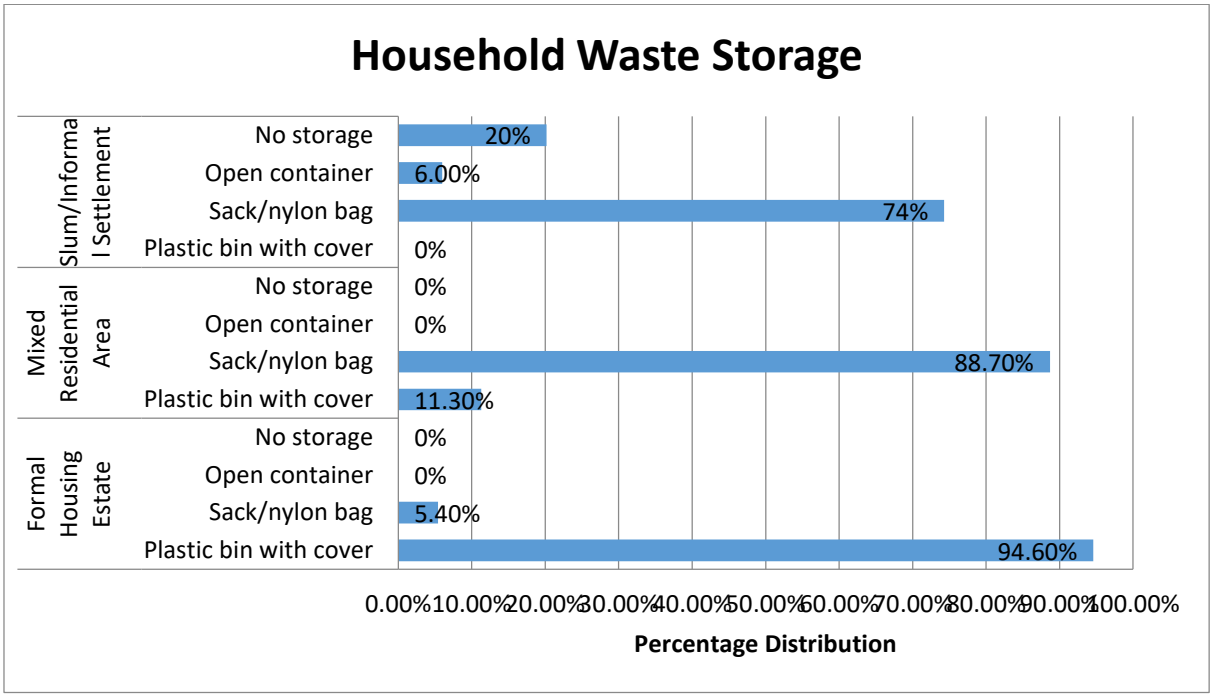

Figure 3:Causal Linkages Between Service Disparities and Household Disposal Practices

Figure 3 demonstrates significant inequality in waste storage practices, with 94.60% of households in formal areas using covered plastic bins, compared to 0% in slum settlements, where 74% use sack or nylon bags and 20% have no storage facility at all. The absence of proper storage among a considerable proportion of residents increases the likelihood of waste scattering, pest infestation, and environmental contamination before disposal occurs.

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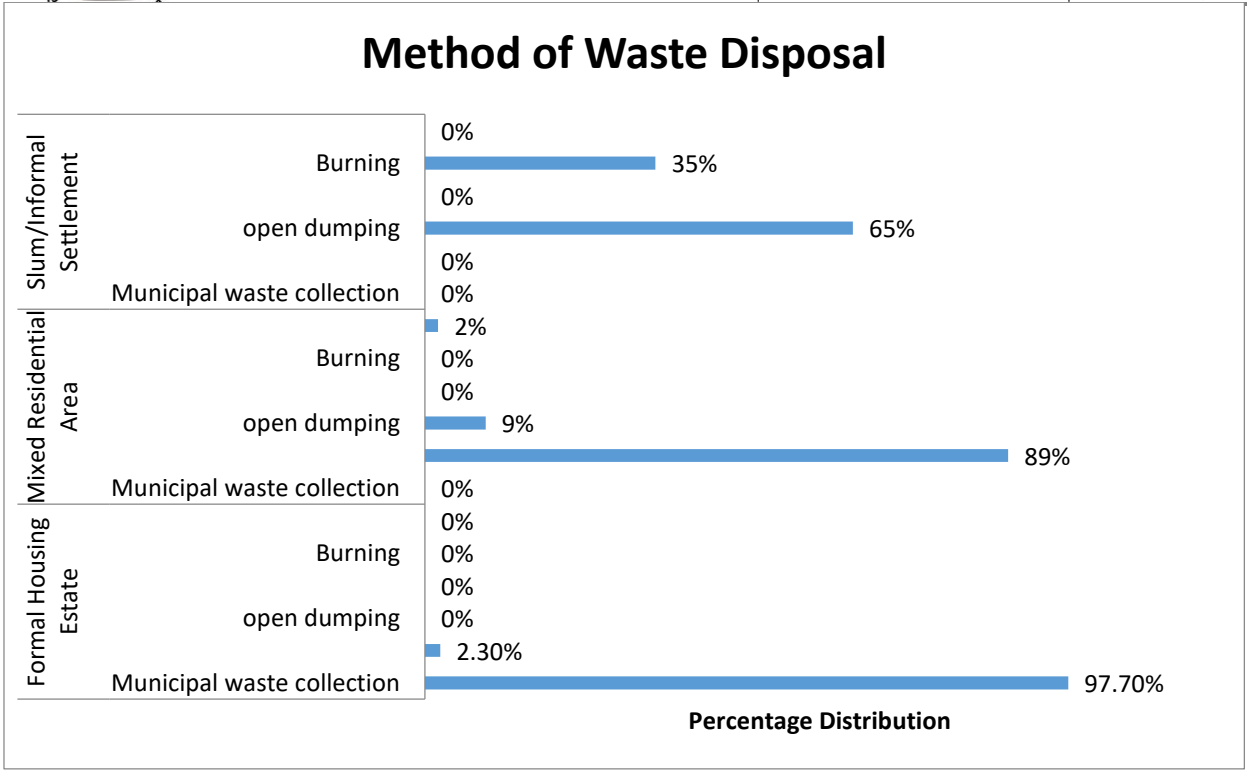

Figure 4: Localized Environmental Degradation and Public Health Exposure Risks

Figure 4 indicates that 97.70% of formal residents rely on municipal waste collection, while 0% of slum residents have access to this service, resulting in 65% practicing open dumping and 35% practicing waste burning. These percentages demonstrate that environmentally harmful disposal methods dominate where formal collection services are absent, suggesting that disposal behavior is largely determined by service availability rather than environmental awareness.

Table 2: Community Awareness and Attitudes

S/N	Variable	Category	Formal Settlement (n; %)	Mixed Settlement (n; %)	Slum Settlement (n; %)
1.	Improper waste disposal affects human health	Agree	120 (100%)	120 (100%)	60 (100%)
		Disagree	0 (0%)	0 (0%)	0 (0%)
2.	Waste management is the responsibility of both government and residents	Agree	120 (100%)	120 (100%)	60 (100%)
		Disagree	0 (0%)	0 (0%)	0 (0%)
3.	Public awareness can improve waste management practices	Agree	120 (100%)	120 (100%)	60 (100%)

Table 2 showed that across all housing types (Slum, Mixed, Formal), 100% of respondents agreed that "Improper waste disposal affects health," "Management is a shared responsibility," and "Public awareness can improve practices". The problem is not attitudinal. Slum residents are fully aware of the dangers and their responsibilities; they simply lack the infrastructure to act on this awareness.

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Localized Environmental Degradation and Public Health Exposure Risks

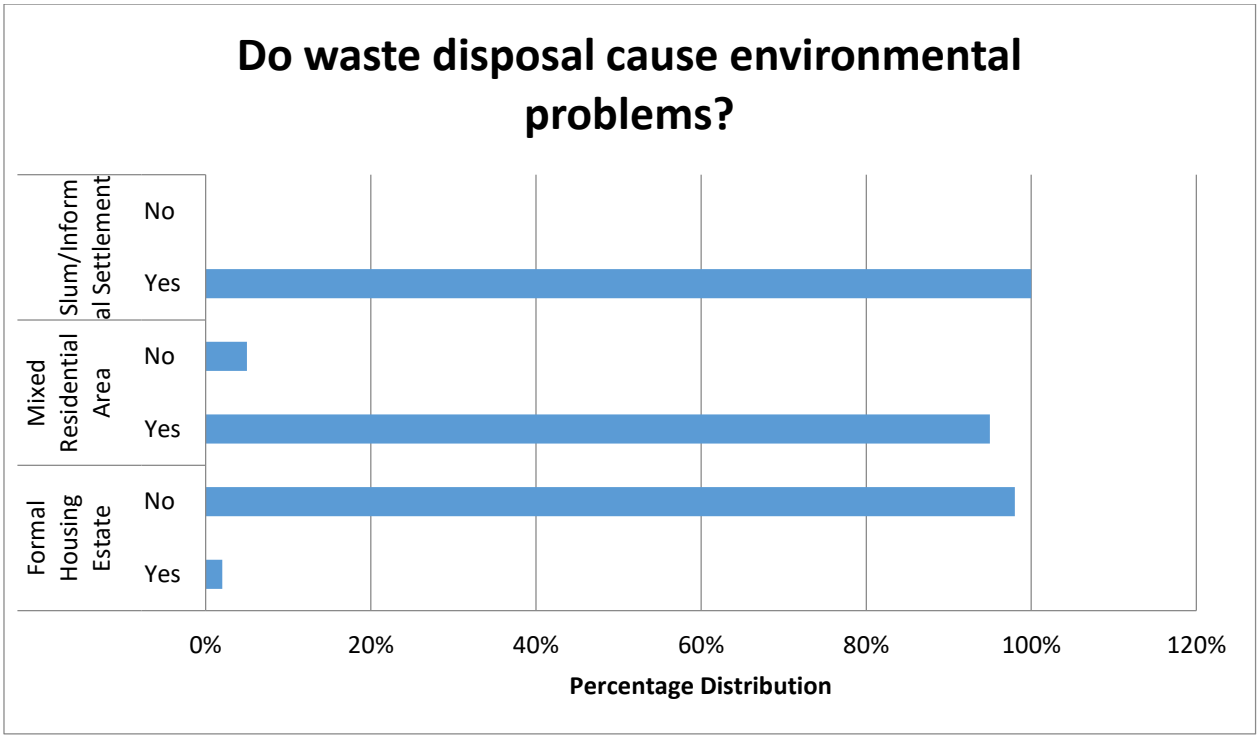

Figure 5: Environmental problems linked to waste disposal

Figure 5 shows that 100% of slum residents acknowledged environmental problems associated with waste disposal, while the majority of formal residents reported no such issues. This difference reflects the direct environmental consequences of inadequate waste services, as unmanaged waste becomes highly visible through flooding, odor, and environmental degradation.

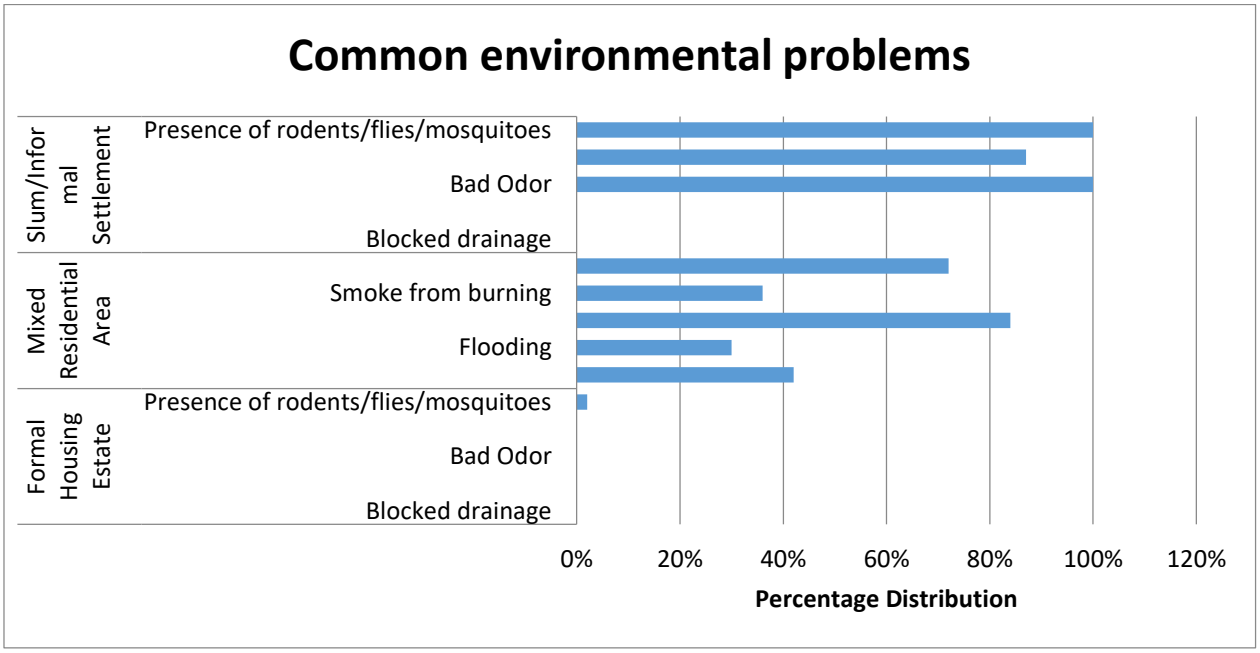

Figure 6: Common environmental problems

Figure 6 indicates that 100% of slum residents reported the presence of rodents, flies, and mosquitoes, as well as 100% reporting bad odor, with smoke from burning also commonly experienced. These percentages demonstrate that poor waste management directly contributes to vector proliferation and air pollution, creating unhealthy living conditions.

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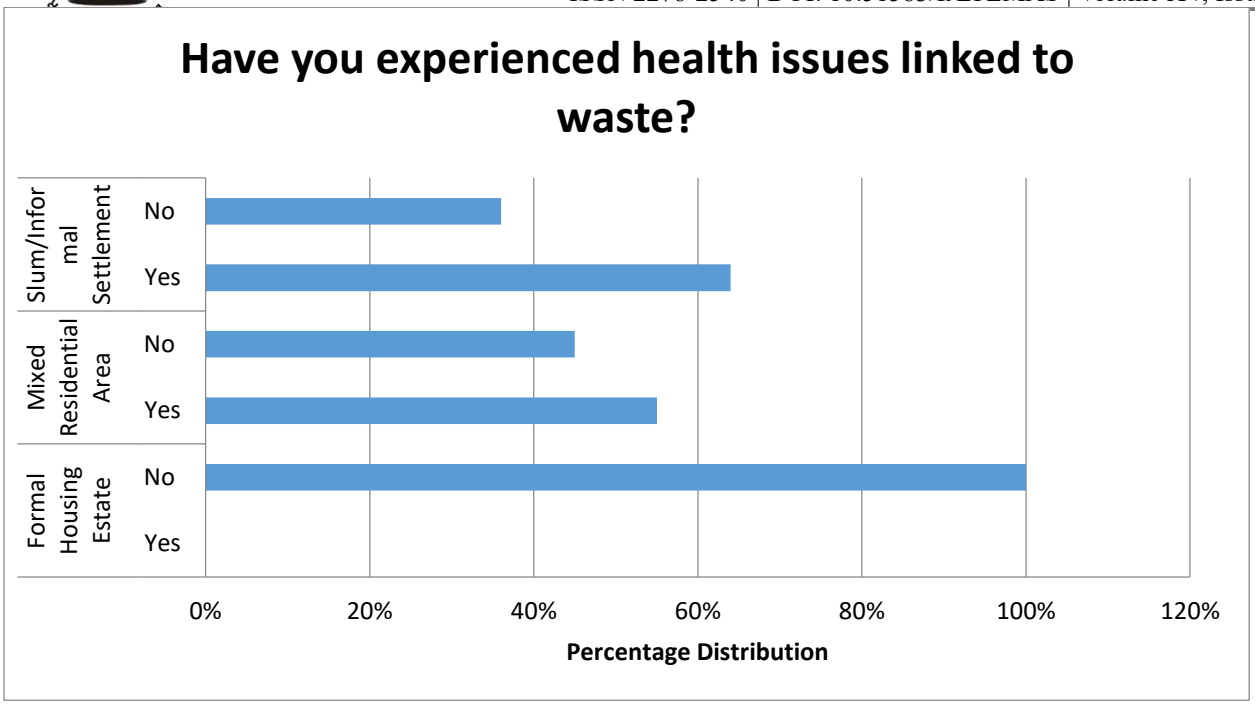

Figure 7: Health issues linked to waste

Figure 7 reveals that approximately 65% of residents in slum areas reported experiencing waste-related health problems, while 100% of formal residents reported no health issues linked to waste disposal. This stark contrast establishes a clear relationship between inadequate waste management services and adverse public health outcomes.

DISCUSSION

The structural, spatial, and socioeconomic dynamics of municipal solid waste management (MSWM) in Owerri Municipality reveal a deeply entrenched pattern of environmental injustice that is sharply divided along housing typology lines. The empirical evidence from this study indicates a clear socioeconomic stratification in which educational attainment, income levels, and household density jointly determine both exposure to environmental risks and access to municipal services. Formal settlements, such as the Rotobi Layout, represent relatively affluent enclaves where 75.8% of residents have attained tertiary education and 40% earn above ₦200,000 monthly. In stark contrast, informal settlements such as Amakohia reflect severe deprivation, with 75% of residents having only secondary education and 85% surviving on less than ₦50,000 monthly. This aligns with broader urban inequality patterns documented in Nigerian cities where environmental services tend to correlate with socio-economic status (Agbesola, 2013; Ugorji et al., 2020).

This socioeconomic divide is further reinforced by variations in household composition, particularly domestic density, which has direct implications for waste generation and management capacity. In slum settlements, 60% of households comprise 4-6 members, while 25% contain 7-9 persons within constrained residential spaces, thereby intensifying per-unit-area waste generation. At the same time, these households lack the financial capacity to adopt private waste mitigation strategies, increasing their exposure to environmental risks. This evidence directly informs the first objective of the study, which is to examine variations in waste collection service frequency across different housing typologies in Owerri Municipality. The findings suggest that waste collection frequency is significantly higher in formal residential estates due to better accessibility, structured planning, and stronger institutional presence, whereas informal settlements remain systematically underserved (Kaza et al., 2018; Ogunola et al., 2018).

The study further demonstrates that disparities in waste service delivery significantly shape household waste disposal practices across different housing typologies. The physical inaccessibility of slum settlements, particularly due to unpaved and narrow road networks, prevents the operation of conventional waste collection vehicles, effectively excluding these areas from municipal service coverage. Consequently, while formal

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neighborhoods enjoy near-universal waste collection services ranging from 97.70% to 100%, with 88% receiving daily collection and 94.60% using covered plastic bins, slum communities experience a complete absence of organized waste collection services (0%). This structural exclusion forces residents into unsafe disposal practices, with 65% engaging in open dumping and 35% relying on open burning, while 74% depend on porous sacks and 20% lack proper storage facilities. These findings directly address the second objective, which examines the relationship between waste service delivery disparities and household waste disposal practices across different housing typologies, reinforcing the argument that disposal behavior is structurally induced rather than driven by ignorance or apathy (Cronin, 2012; Dawi et al., 2020).

Finally, the environmental consequences of unequal municipal solid waste service provision are severe and disproportionately concentrated in informal settlements, thereby underscoring the environmental justice implications of the study. The absence of formal waste collection systems in slum areas has resulted in widespread environmental degradation, including blocked drainage channels, flooding, and accumulation of refuse in open spaces. All slum residents (100%) report persistent rodent, fly, and mosquito infestations, foul odors, and smoke from burning waste, while approximately 65% have suffered from waste-related illnesses such as malaria, respiratory infections, and gastrointestinal diseases. In contrast, such conditions are virtually absent in formal settlements, where 0% of respondents report comparable health burdens. These outcomes fulfill the third objective, which is to assess the environmental impacts associated with unequal municipal waste management service provision in Owerri Municipality, and they are consistent with established literature linking poor waste governance to public health risks in urban Africa (Kadafa, 2017; NESREA, 2025; UN-Habitat, 2022).

CONCLUSION

The study concludes that municipal solid waste management in Owerri Municipality is characterized by deep spatial and socio-economic inequalities that strongly influence access to environmental services, patterns of waste disposal, and exposure to environmental health risks across different housing typologies. Formal residential areas benefit from efficient and regular waste collection services due to better infrastructure, stronger institutional coverage, and higher household income levels, while informal settlements remain systematically excluded because of poor road accessibility, weak governance structures, and economic marginalization. This exclusion compels residents in slum communities to depend on unsafe disposal practices such as open dumping and burning, not because of ignorance or lack of environmental awareness, but because of the absence of accessible and affordable alternatives. The resulting environmental conditions in these communities, including blocked drainage systems, persistent foul odors, vector infestations, flooding, smoke pollution, and widespread waste-related illnesses, clearly demonstrate the environmental injustice embedded within the municipality's waste management system. Overall, the findings emphasize that effective municipal solid waste management in rapidly urbanizing Nigerian cities cannot be achieved through behavioral campaigns alone, but requires deliberate investment in equitable infrastructure, inclusive urban governance, decentralized collection systems, and pro-poor environmental policies that address the structural drivers of service inequality.

Based on the findings and conclusions of this study, the following recommendations are made to improve waste management service equity and environmental justice in Owerri:

i) The municipality should adopt smaller and more flexible waste collection systems such as tricycles, wheelbarrows, and community-based collection teams that can operate effectively in areas where waste trucks cannot access due to poor road networks.

ii) Government authorities should prioritize the upgrading of infrastructure in informal settlements, especially by constructing and widening access roads to ensure that waste collection vehicles can reach these communities.

iii) The informal waste sector should be formally recognized and integrated into the official waste management system, as this would help extend service coverage to underserved areas while improving efficiency and livelihoods.

iv) A subsidized waste management system should be introduced to support low-income households, particularly those that cannot afford private waste collection services, through pro-poor financing mechanisms

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or reduced service charges.

v) Communal waste storage facilities, such as covered bins placed at strategic points within informal settlements, should be provided to replace unsafe household storage methods and reduce uncontrolled waste scattering and disease risks.

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