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SPECIAL ISSUE: CELEBRATING 20 YEARS OF GEOGRAPHY IN KADUNA STATE UNIVERSITY - ADVANCES AND FRONTIERS IN GEOGRAPHY

Assessment of The Effectiveness of The Yobe State Environmental Protection Agency in Municipal Solid Waste Management in Damaturu Metropolis

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ABSTRACT

This study examined the effectiveness of the Yobe State Environmental Protection Agency (YOSEPA) in municipal solid waste management within Damaturu Metropolis, Yobe State. Using a descriptive survey design, data were collected from 350 households across six major wards through structured questionnaires and analyzed using descriptive statistics and the Kruskal-Wallis test in SPSS version 27. The study population was based on an estimated 20,500 households, with a sample determined using the Krejcie and Morgan formula. Findings revealed that 73% of respondents reported visible solid waste dumps within their neighborhoods, mainly along roadsides (43%) and drainages (25%), indicating persistent indiscriminate dumping. Waste collection was primarily undertaken by YOSEPA operatives (47%), complemented by community initiatives (34%) and private companies (19%). Only 34% of respondents used waste bins, while 36% disposed of waste in open spaces. Although 81% indicated that streets were swept and drainages cleared, this activity occurred mostly on a monthly basis (74%), which is inadequate for a rapidly growing city. Composting (39%) and recycling (24%) were common waste management techniques, albeit informal. The Kruskal-Wallis test ($H = 78.83$, $p < 0.001$) revealed significant differences in public perception of YOSEPA's performance, with stronger ratings in environmental and health interventions but lower confidence in administrative efficiency. The study concludes that solid waste management in Damaturu remains moderately effective and recommends strengthening YOSEPA's administrative capacity, regular waste collection, and community participation to achieve sustainable waste management.

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1 Introduction

Rapid urbanization, population growth, and lifestyle changes are increasing municipal solid waste (MSW) generation worldwide, placing growing pressure on local governments to provide timely and sustainable waste services (Zhang, 2024). Global estimates indicate that waste generation is rising sharply in low- and middle-income countries, where infrastructure and financing gaps frequently limit effective collection, transport, and disposal; without substantial operational and policy reforms, MSW volumes are projected to increase markedly in the coming decades (World Bank, 2025; Zhang, 2024). These structural pressures have direct implications for human health, urban livability, and environmental sustainability because unmanaged waste creates breeding grounds for vectors, contributes to air and water pollution, and obstructs drainage systems, increasing flood risk and disease transmission (World Health Organization, 2023; Raphela et al., 2024).

In Nigeria, the MSW challenge is manifest in both megacities and secondary towns. Studies across Nigerian states report persistent shortfalls in collection coverage, irregular collection schedules, informal dumping, and widespread reliance on open dumps and burning when formal services are absent or unreliable (Etim et al., 2024; Adedara, 2023). Those service shortfalls are compounded by socio-cultural factors, funding constraints, weak enforcement of sanitation laws, and fragmented institutional arrangements that dilute accountability for service delivery (Akintayo et al., 2023; Eshiett & Eshiett, 2024). At the national policy level, recent regulatory moves, including measures to curb single-use plastics and support recycling, demonstrate political attention to circularity and waste diversion, but implementation challenges remain at the state and local levels (Reuters, 2024; World Bank, 2025).

Secondary cities such as Damaturu (the capital of Yobe State) face MSW problems that are distinct from those in larger metropolises. Damaturu's population growth, changing consumption patterns, and limited municipal budgets have created a waste landscape characterized by visible roadside and drainage dumping, intermittent collection, and a mix of public, private, and community-led evacuation arrangements (Adamu et al., 2023). Local assessments of Damaturu identify weak on-site containment, inadequate transfer and transport capacity, and frequent drainage blockages during the rainy season, all symptomatic of operational gaps in municipal sanitation systems (Adamu et al., 2023). These local mani-

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festations echo broader regional findings that inadequate containment and infrequent sweeping/clearing are key drivers of drainage clogging and vector proliferation (Fayomi et al., 2024; Raphela et al., 2024).

State environmental protection agencies (such as the Yobe State Environmental Protection Agency, YOSEPA) are central to addressing these layered problems because they carry legal mandates for sanitation oversight, enforcement, awareness raising, and coordination of service provision. In many Nigerian states, however, such agencies are under-resourced, face institutional overlaps with local governments, and must increasingly rely on partnerships with private contractors or community groups to extend coverage (Eshiett & Eshiett, 2024; Adedara, 2023). Where agencies successfully combine regulatory functions with operational capacity building, documented impacts include improved collection coverage, expanded recycling/diversion, and measurable reductions in open dumping; conversely, where agencies lack capacity, visible dumping and informal disposal practices persist (World Bank, 2025; Zhang, 2024). This study, therefore, assesses the effectiveness of YOSEPA in municipal solid waste management in Damaturu Metropolis.

2 Materials and methods

2.1 Study area

The research was conducted in Damaturu metropolitan, the capital city of Yobe State, Nigeria. The city is situated between latitude 11º 39' 55"N and 11º 47' 01"N, and longitude 11º 55' 04"E and 12º 01' 47"E (Figure 1). Damaturu Local Government is one of seventeen local government areas in the state, with its headquarters located in the state capital, Damaturu. The Local Government Area spans 2,366 square kilometers. To the north, it is bordered by Tarmuwa Local Government, to the south by Gujba Local Government Area, and to the west by Fune Local Government Area of Yobe State. To the east, it is bordered by the Kaga Local Government Area of Borno State.

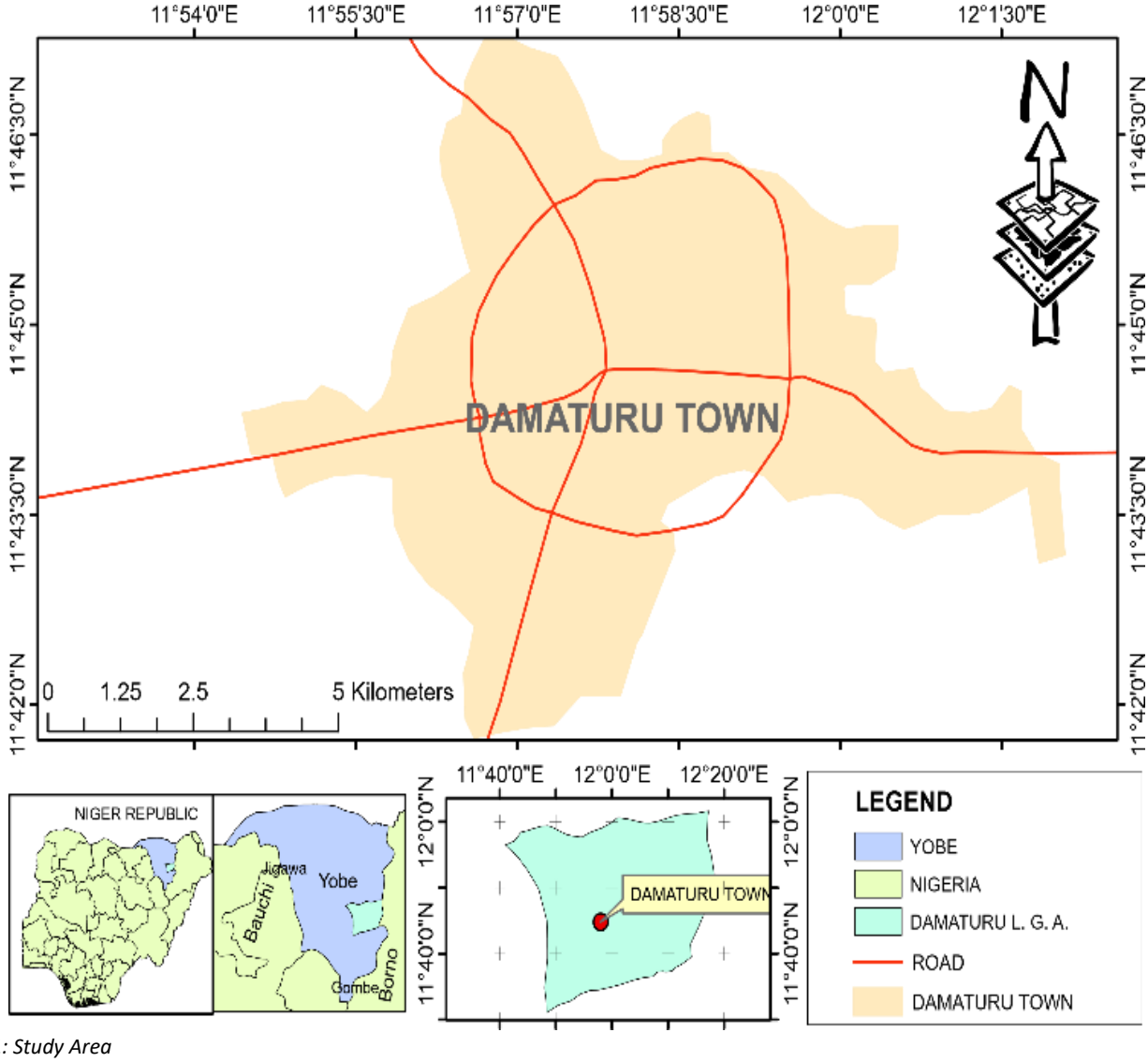

Figure 1: Study Area
Source: Adapted from the administrative map of Yobe State (2025)

2.2 Research Design

This study adopted a descriptive survey design, which is appropriate for assessing the effectiveness of environmental agencies in solid waste management because it enables the collection of quantitative data from a representative population (Ajilore et al., 2024). The design allows for the description of existing conditions, public perceptions, and behavioral patterns concerning solid waste management practices in the Damaturu metropolis. According to Adamu et al. (2023), the descriptive survey design is essential in environmental studies where the goal is to identify trends and patterns in waste generation and management behavior among households.

2.3 Population of the Study

The target population comprised households within the six major geo-political wards of Damaturu metropolis, namely: Bindigari/Fawari, Damaturu Central, Kukareta/Warsala, Maisandari/Waziri Ibrahim Estate, Njiwaji/Gwange, and Nayinawa. According to the National Population Commission (2023) and Global Data Lab (2024), the average household size in Yobe State is approximately 8.3 persons per household, with Damaturu having an estimated 20,500 households. Given the rapid urbanization and population growth in the metropolis, households were considered the most appropriate unit of analysis for assessing waste management effectiveness, as domestic sources contribute significantly to municipal solid waste generation (Raphela et al., 2024).

2.4 Sample Size

The sample size was determined using the Krejcie and Morgan (1970) formula for a finite population, assuming a 95% confidence level, 5% margin of error, and an estimated population of 20,500 households. Based on this calculation, a sample of 358 respondents was selected. This size aligns with the recommended sample for environmental management surveys within Nigerian urban areas (Usman & Okafor, 2023).

2.5 Sampling Technique

A multi-stage sampling technique was employed. First, six wards were randomly selected from the eleven geo-political wards in Damaturu. Second, households were proportionately selected based on population density data obtained from the National Population Commission (2023). Within each selected household, an adult respondent (18 years and above) was chosen using accidental (convenience) sampling, as applied in similar municipal solid waste studies in Nigeria (Ajilore et al., 2024; Adamu et al., 2023).

2.6 Data Collection

Data were obtained from primary and secondary sources. Primary data were collected using a structured questionnaire that captured information on respondents' waste disposal methods, perceptions of YOSEPA's performance, and the impacts of solid waste in their area. Secondary data were obtained from the Yobe State Environmental Protection Agency (YOSEPA) annual reports, the National Population Commission, and relevant academic literature. This dual-source approach enhanced the reliability and validity of the data collected (Raphela et al., 2024).

2.7 Method of Analysis

The data were analyzed using descriptive statistics (frequencies, percentages, mean, and standard deviation) and inferential statistics (the Kruskal–Wallis test) with IBM SPSS Statistics version 27. The Kruskal–Wallis test was used to determine whether there were statistically significant differences in public perception of YOSEPA's effectiveness in municipal solid waste management across different demographic groups. This analytical approach has been widely used in environmental perception studies due to its robustness with ordinal and non-parametric data (Ajilore et al., 2024; Usman & Okafor, 2023).

3 Results and Discussion

3.1 Sex of the Respondents

Fig. 2 shows the distribution of the sex of the respondents across the three educational zones in Yobe State.

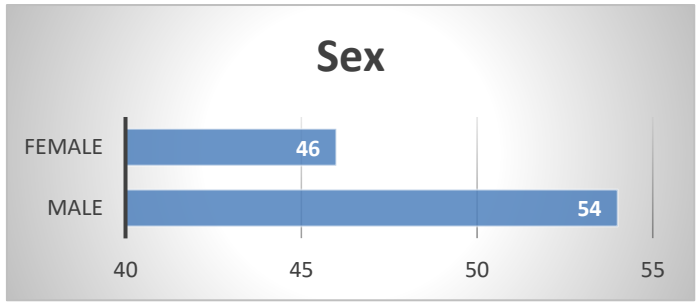

Figure 2: Distribution of Respondents by Sex

From Fig. 2, 54% of the total sample were Male, while 46% of the total sample were Female. The distribution of respondents by gender reveals a gender balance within the study, although there are slightly more male respondents than female respondents. This balance is important for ensuring that the study captures a variety of perspectives and experiences, especially when the research topic may have gender-specific implications. It's worth noting that gender balance in research is essential to avoid potential gender bias in the findings. It ensures that the study's results can be generalized to both male and female populations, making the conclusions more robust and applicable to a broader range of individuals.

3.2 Age of the Respondents

Fig. 3 shows the various age groups of the respondents.

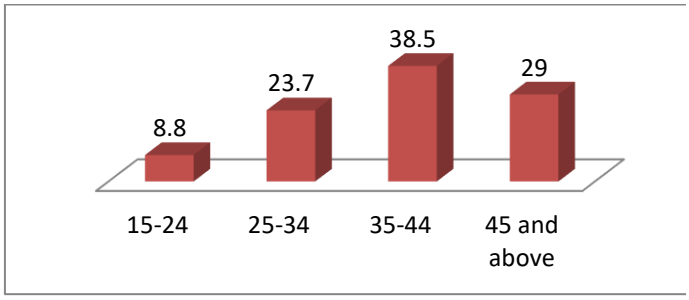

Figure 3: Distribution of Respondents' Age

Fig. 3 revealed that 8.8% respondents fall into the age group 15-24, 23.7% respondents belong to the age group 25-34, 38.5% respondents fall within the age group 35-44, and 29.0% respondents were aged 45 and above. The diversity in the age distribution of respondents is a strength of the study, as it captures a broad spectrum of perspectives from different age groups. This diversity is essential, particularly if your research aims to understand how various age groups perceive or experience the subject matter.

The majority of the respondents fall into the 35-44 age group, which suggests that this age group is well-represented in the study. However, it's also important to note that there is a reasonable representation of younger and older age groups, enhancing the study's ability to draw comprehensive conclusions.

3.3 Highest educational qualification

Fig. 4 shows the highest educational qualifications of the respondents.

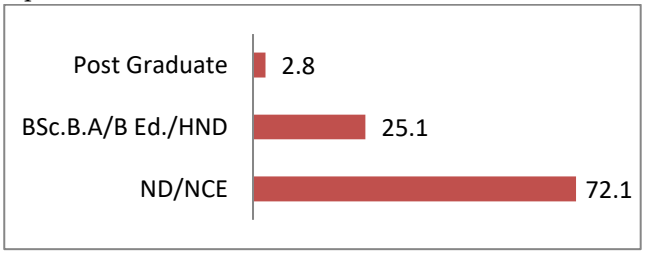

Figure 4: Distribution of Respondents' Highest Educational Qualification

From Fig. 4, 72.1% respondents have ND/NCE (National Diploma or Nigeria Certificate in Education) as their highest educational qualification, 25.1% respondents hold higher qualifications, such as BSc, B.A., B.Ed., or HND (Bachelor's degree, Higher National Diploma), and 2.8% respondents have achieved post-graduate qualifications. The educational diversity in the sample is important for understanding how individuals with different levels of education perceive or respond to the research variables. The findings revealed that the majority of respondents hold ND/NCE qualifications.

3.4 Waste Disposal

The survey of 350 households in Damaturu (Table 1) revealed that 257 respondents (73%) reported the presence of solid waste dumps in their immediate environs (mean = 1.27, SD = 0.44).

Table 1: Presence of solid waste dumps

	Frequency	%	Mean	SD
Yes	257	73	1.27	0.44
No	93	27		
Total	**350**	**100**		

This high prevalence suggests that visible waste-dump sites remain common across the metropolis. This finding aligns with studies in sub-Saharan Africa showing that limited municipal collection capacity leads to persistent visible dumping in urban areas (Adamu et al. 2023. The relatively low dispersion (SD 0.44) indicates that the majority of respondents share this perception. The implication is that while YOSEPA may conduct collection and disposal operations, these services are insufficient to eliminate visible dumping. Strengthening collection coverage and timely removal is necessary.

According to Babanyara and Bogoro (2011), the need for individual on-site solid waste storage facilities in every household is important because the waste disposed of in open dumps and roadside and open spaces in general are usually the ones that overflow and litter the place, constituting a nuisance to the public and jeopardizing evacuation efforts. For instance, there were many reported cases of fire outbreaks caused by refuse burning within or near residential buildings. Also, according to Nshimirimana (2004), when household waste disposal practices are known, it would be easier to introduce measures to reduce the amount of waste generated by the affected community.

3.5 Dumpsites

Regarding location (Table 2), 151 respondents (43%) identified dumps on or by roadsides/walkways, 87 (25%) inside drainages, 59 (17%) far from buildings, and 53 (15%) near buildings. The mean of 2.22 (SD = 1.24) reflects that dumping clusters in high-visibility public areas (roadsides) and problematic infrastructure zones (drainages). The clustering of dumps in high-visibility public areas and drainage channels is concerning. Communities with limited access to formal disposal points often shift to roadside or drainage areas, increasing the risk of flooding and public health hazards (Raphela et al., 2024; Adamu et al., 2023). Targeted interventions by YOSEPA should prioritize high-risk dumping zones, particularly drainage corridors and main thoroughfares. This can be attributed to a government policy, the policy encourages households and businesses to dump their

solid wastes by the roadside for collection/evacuation by YOSEPA or any of its private affiliated waste companies, but because the collection/evacuation is not carried out as at when due, the waste has turned roadsides, especially into illegal dumps.

Table 2: Location of solid waste dumps

	Frequency	%	Mean	SD
On/by the roadside/walkways	151	43	2.22	1.24
Far from buildings	59	17		
Near the buildings	53	15		
Inside drainages	87	25		
Total	**350**	**100**		

3.6 Indiscriminate dumping of waste

The effects of indiscriminate dumping of waste are examined. The result is shown in Table 3.

Table 3: Effects of indiscriminate dumping

	Frequency	%	Mean	SD
Harbouring disease-causing vectors such as flies, mosquitoes, and rats	119	34	2.40	1.21
Smells badly	66	19		
Obstructs movement/traffic	70	20		
Blocks drainages	95	27		
Total	**350**	**100**		

Respondents identified several consequences (Table 3), harbouring disease vectors (34%), blocking drainages (27%), obstructing movement (20%), and odour nuisance (19%) (mean = 2.40, SD = 1.21). The pattern shows that health and infrastructure risks are salient. In Nigeria specifically, studies show that open dumps near drains exacerbate flooding and contamination risks. The prominence of health and infrastructure concerns aligns with WHO guidelines linking improper waste disposal to vector proliferation, flooding, and water contamination (World Health Organization, 2023). These findings underscore the need for operational strategies targeting both public health protection and infrastructure maintenance.

The findings are also similar to the findings of Ogwuche (2013), who stated that open dumps serve as habitation for rats, snakes, and other dangerous reptiles and animals, in addition to the emission of offensive odour. According to Nshimirimana (2004), rats and other vermin are attracted to food waste found in dumped residential or business trash, and illegal dumping demotivates residents, reducing their sense of ownership and control over their surroundings because illegal dumping sites can become magnets for crime and forms of urban blight, such as abandoned automobiles and graffiti.

3.7 Solid waste evacuation/collection

The various methods used by residents in the collection and evacuation of solid waste were examined. The result is shown in Table 4.

Table 4: Solid waste evacuation/collection

	Frequency	%	Mean	SD
YOSEPA operatives	164	47	1.87	0.89
Private waste evacuation company	67	19		
Community effort/initiative	119	34		
Total	**350**	**100**		

The distribution of collection/evacuation responsibility shows (Table 4), 164 (47%) by YOSEPA operatives; 119 (34%) by community effort/initiative; and 67 (19%) by private waste evacuation companies (mean = 1.87, SD = 0.89). The mix suggests partial coverage by the municipal agency supplemented by community efforts and private contractors.

The finding reveals that most of the solid waste evacuation work in the study area was undertaken by YOSEPA. This, of course, is one of YOSEPA'S functions as enshrined in the edict section 9(5). Section 10(1) of the YOSEPA edict grants the agency the power to enter into a contract with any person for the purpose of executing its responsibilities and functions. Similar patterns are reported in Sub-Saharan Africa, where municipalities rely on mixed models to reach wider areas (Adedara, 2023; Adamu et al., 2023). YOSEPA could enhance effectiveness by formalizing community efforts and monitoring private contractor operations.

3.8 Household disposal practices

The various practices used by households in waste disposal were examined. The result is shown in Table 5.

Table 5: Methods of waste disposal

	Frequency	%	Mean	SD
Inside Dust bins/Containers	119	34	3.08	1.74
Buried by Household	35	10		
Burnt by Household	21	6		
Public approved Dumps/Dump site	49	14		
Road side and in open dumps near houses	126	36		
Total	**350**	**100**		

The calculated mean of 3.08 (SD = 1.74) signals that disposal practices lean toward less formal/controlled methods (codes toward higher values). This pattern reflects partial service coverage and heterogeneous disposal behaviors. Similar mixed practices are documented in other Nigerian cities, where open dumping, burning, and informal disposal persist alongside formal collection (Adedara, 2023; Fakunle, 2024). For YOSEPA, interventions must include expanded formal collection, improved container access, and behavior change initiatives.

3.9 Sweeping of streets and clearing of drainage

The study examined residents' perception of street sweeping and clearance of drainage channels. The result is shown in Table 6.

Table 6: Streets swept and drainages cleared

	Frequency	%	Mean	SD
Yes	285	81	1. 19	0.39
No	65	19		
Total	**350**	**100**		

A majority (285 respondents, 81%) (Table 6) reported that streets are swept and drainages cleared (mean = 1.19, SD = 0.39). While this indicates that cleaning operations are visible, frequency data suggest that operations may not be sufficient to prevent waste accumulation and drain blockages (Fakunle, 2024). Effective service requires both presence and operational regularity.

The study further examined the frequency with which the streets are swept. The result is shown in Table 7.

Table 7: Frequency of streets swept and drainages cleared

	Frequency	Percent	Mean	SD
Daily	7	2	2.72	0.49
Weekly	85	24		
Monthly	258	74		
Total	**350**	**100**		

Regarding frequency (Table 7), 7 (2%) reported daily sweeping, 85 (24%) weekly, and 258 (74%) monthly (mean = 2.72, SD = 0.49). Monthly cleaning predominates, which may not adequately prevent debris accumulation, vector proliferation, or drain blockage (Raphela et al., 2024; Fakunle, 2024). YOSEPA should consider weekly cleaning schedules in high-waste or flood-prone areas to improve service effectiveness.

3.10 Waste management techniques

The study examined the various techniques used by residents in waste management. The result is shown in Table 8.

Table 8: Waste management technique(s)

	Frequency	%	Mean	SD
Composting	137	39	2.22	1.20
Recycling	85	24		
Burning/Incineration	41	12		
Burying waste in pits	87	25		
Total	**350**	**100**		

Household techniques (Table 8) included composting (137, 39%), recycling (85, 24%), burying (87, 25%), and burning (41, 12%) (mean = 2.22, SD = 1.20). The relatively high uptake of composting (39%) is encouraging and aligns with national policy direction in Nigeria for organics diversion and recycling markets (Reuters, 2024; Fakunle, 2024). Recycling (24%) also reflects growing interest in valorising waste materials. However, burying (25%) and burning (12%) remain non-optimal practices. The heterogeneity (SD = 1.20) again highlights differing capacities and behaviours across households. YOSEPA can leverage the positive practices (composting/recycling) via source-segregation campaigns, community compost hubs, and private sector linkages, while phasing down burying/burning.

3.11 Adequacy of solid waste management

Figure 5 shows the distribution of the respondents on whether solid waste is managed properly in their area or not.

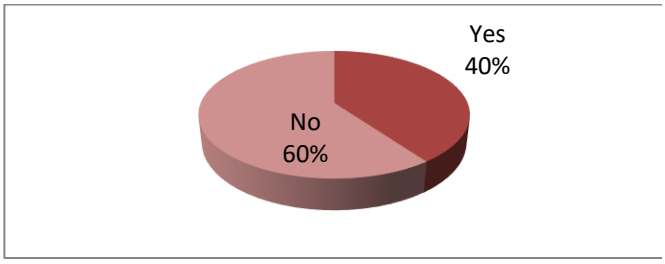

Figure 5: Solid waste management

Figure 5 shows the distribution of the respondents on whether solid waste is managed properly in their area or not. 60% of the total respondents are of the opinion that solid waste is not managed properly in their area, while 40% agreed that solid waste is managed properly in their area. The findings revealed that the majority of the respondents are of the opinion that solid waste is not managed properly in their area.

3.12 Differences in public perception of the Yobe State Environmental Protection Agency (YOSEPA)

Table 9 presents the summary of the Kruskal–Wallis test evaluating differences in public perception of the Yobe State Environmental Protection Agency (YOSEPA) across key operational dimensions of municipal solid waste management (MSWM) in Damaturu Metropolis.

Table 9: Summary of the Kruskal-Wallis Test for the Perception of the Public on the Role of YOSEPA in Municipal Solid Waste Management

Factors	Frequency	Mean Rank
Administrative and organizational arrangement.	350	505.70
Solid waste evacuation/collection and transfer/transportation services.	350	712.70
Waste prevention and control, such as minimization, recycling, energy/resource recovery, and safe disposal facilities,	350	733.20
Addressing health and safety issues in the Damaturu metropolis.	350	737.05
Addressing environmental issues in the Damaturu metropolis	350	743.43
Provision of income and employment opportunities	350	701.30

Degrees of freedom = 4 Significance value (p) < 0.001 Chi-square value of (H) = 78.83

From Table 9, the test yielded a Chi-square (H) value of 78.83 with a p-value < 0.001, indicating a statistically significant difference in how respondents perceived YOSEPA's performance across the measured factors. This implies that residents do not perceive YOSEPA's functions as equally effective in all areas of waste management. Respondents rated YOSEPA's effectiveness highest in "addressing environmental issues" (Mean Rank = 743.43) and "addressing health and safety issues" (Mean Rank = 737.05). This suggests that the agency's visible environmental sanitation campaigns, periodic street cleaning, and public health sensitization efforts are recognized by the populace.

Comparable studies across sub-Saharan Africa have reported similar outcomes where local environmental agencies perform relatively well in public sanitation and awareness campaigns but struggle in operational service delivery (Raphela et al., 2023). For example, Raphela et al. (2024) in South Africa found that municipalities often prioritize public hygiene messaging during environmental crises, leading to heightened public awareness even when waste collection remains inconsistent. Similarly, Adamu et al. (2023) reported that in northern Nigerian cities, waste agencies are perceived as active in sensitization but ineffective in continuous waste evacuation.

The mean rank for "solid waste evacuation/collection and transfer/transportation services" (712.70) indicates moderate satisfaction. While YOSEPA is recognized for playing a central role in waste evacuation, as also reflected in Table 4 (47% of respondents attributed collection to YOSEPA) residents still experience irregular service intervals and partial coverage.

Adedara (2023) and Fayomi et al. (2024) emphasize that irregular waste evacuation remains a major weakness in Nigerian municipal systems, primarily due to limited logistics, aging fleet, and funding constraints. These challenges are echoed in Damaturu, where the dependence on government resources and limited private participation reduce service reliability. The lowest mean rank (505.70) was recorded for "administrative and organizational arrangement," indicating the public's low confidence in YOSEPA's internal efficiency, planning, and accountability. Respondents perceive bureaucracy, slow decision-making, and limited public engagement as key issues.

These perceptions align with wider findings across Nigeria's state environmental protection agencies, where institutional weaknesses such as poor inter-agency coordination, inadequate monitoring of private

contractors, and insufficient staff training hamper performance (Eshiett & Eshiett, 2024; Ojo & Ibrahim, 2023). Strengthening administrative systems through digital monitoring tools, clear performance metrics, and community feedback loops could enhance both transparency and service responsiveness (World Bank, 2025).

Interestingly, the factor "provision of income and employment opportunities" scored moderately (Mean Rank = 701.30), indicating that residents recognize YOSEPA's limited but present contribution to job creation through street-sweeping contracts, waste collection units, and private contractor partnerships. Recent sustainability frameworks emphasize circular-economy-driven employment in waste recycling and resource recovery as a major opportunity for state agencies (Zhang, 2024; Reuters, 2024). YOSEPA could leverage this by supporting youth entrepreneurship in recycling and composting.

The significant differences across factors ($p < 0.001$) underscore that YOSEPA's performance is multidimensional stronger in environmental visibility and weaker in administrative efficiency and waste logistics. The findings reinforce global observations that effective MSWM requires a balance between technical capacity and governance quality (Raphela et al., 2024).

4 Conclusion

The findings of this study revealed that municipal solid waste management in Damaturu Metropolis is only moderately effective, despite the presence of the Yobe State Environmental Protection Agency (YOSEPA). The results indicated that 73% of respondents reported visible solid waste dumps around their neighbourhoods, reflecting persistent problems of indiscriminate dumping and weak enforcement of sanitation regulations. The majority of these dumps were located along roadsides (43%) and inside drainages (25%), confirming that waste disposal practices continue to pose public health and environmental hazards.

Waste disposal methods remained largely inappropriate, with a substantial proportion of residents (36%) still resorting to open dumping near houses, while only 34% disposed of waste in designated containers. This pattern demonstrates a limited behavioural adherence to formal waste management practices and underscores deficiencies in the provision of waste bins and collection infrastructure. The study further found that YOSEPA operatives account for 47% of waste evacuation, with private companies (19%) and community efforts (34%) supplementing the system. This mixed-service model suggests a shared but uncoordinated approach to waste collection.

The presence of multiple actors without effective regulation can lead to duplication of effort and inefficient waste evacuation. Although 81% of streets were reportedly swept and drainages cleared, the frequency was overwhelmingly monthly (74%), which is inadequate for a fast-growing urban area like Damaturu, where waste accumulates rapidly.

Regarding waste management techniques, composting (39%), recycling (24%), and incineration (12%) are practiced to some extent, but these remain informal and poorly structured. The dominance of low-technology disposal methods indicates that YOSEPA's waste management system is still in its formative stage and requires modernization through the adoption of sustainable, circular waste economy principles. The study concludes that YOSEPA has made progress in establishing basic waste collection and sweeping routines, but the agency's effectiveness is constrained by inadequate funding, poor community participation, weak enforcement mechanisms, and limited public awareness. Sustainable solid waste management in Damaturu will require stronger institutional coordination, regular collection, and greater emphasis on waste reduction, reuse, and recycling.

5 Recommendations

Based on the findings, the following recommendations are proposed:

i. The agency should receive improved funding, equipment, and logistics to enhance its capacity for routine waste collection and street sweeping. Recruitment and training of field operatives should be prioritized to ensure more efficient coverage of the metropolis.

ii. The current monthly collection schedule is insufficient. YOSEPA should adopt weekly or bi-weekly evacuation schedules, especially in densely populated areas, to reduce roadside and drainage waste accumulation.

iii. Regular community sensitization campaigns through radio, schools, and religious centers should be conducted to promote proper waste handling and discourage indiscriminate dumping. Community-based monitoring groups could assist in identifying illegal dump sites.

iv. Collaboration with private waste management firms should be formalized under clearly defined contracts and regulatory oversight. This will encourage efficiency, innovation, and

accountability in waste management operations.

v. Government should install covered dustbins and container stations at strategic points to encourage proper disposal and prevent roadside littering. These facilities should be regularly emptied and maintained.

vi. YOSEPA should integrate recycling initiatives and composting into the city's waste management plan. Establishing recycling centers and incentivizing waste sorting at source can reduce landfill volume and create job opportunities.

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