

# Assessment of Waste Disposal and Collection Systems of Urban Slum Residents in Ibadan Metropolis, Ibadan, Nigeria

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**Abstract** Waste management has received global attention both in academic discourse and in practice. However, with much emphasis on urban centers, but much more regrettably, with inadequate attention to waste management of urban slum residents. This observed gap has created paucity of data for waste policy makers and researchers, a situation responsible for the failure municipal authorities to effectively and efficiently manage the waste problems of slum dwellers. Hence, this study strives to assess waste collection and disposal systems of slums residents in Ibadan city. Purposive, multi-stage and random sampling techniques were used for the study. Purposive sampling was used in selecting Ibadan North among the six urban local government areas in the metropolis. Multi-stage sampling was used in identifying four wards with relatively homogenous slums in the core areas of the Local government. Three slum localities were randomly selected across the four identified wards. The 1991 census figure for the sampled localities was projected to 2010 at 3.2% growth rate adopted for urban centers, which amounted to 132,639. Using an average household size of six for high residential areas, the estimated housing stock in these areas was 22,106. About 1.3% of the estimated housing stock in these areas was used as the sample size, this give a sample size of 300. Thus, 300 household heads were randomly surveyed across the selected slum areas. Both descriptive and inferential statistics (ANOVA and Pearson Product moment correlation) were employed for the analysis. The study revealed that urban slums dwellers in Ibadan city were mainly low-income earners, as two-thirds (69.3%) respondents earn below N10, 000 (\$27.78). A one way ANOVA was used in testing for variation in waste disposal methods adopted by slum dwellers across the selected areas. The results revealed that burning was slightly significantly varied across selected slums ( $F [1,298] = 2.99, p= 0.09$ ); while dumping in rivers with ( $F [1,298] = 0.01, p= 0.92$ ) and use of designated bins ( $F [1,298] = 0.14, p= 0.70$ ) respectively do not significantly vary across the selected slum areas. The study posited that urban environmental problems and inadequate infrastructural development, especially of waste disposal facilities and collection systems are the bane of waste management in urban slums. The study therefore concludes that upgrading and formalization of slums and squatter settlement coupled with provision of infrastructural facilities and public enlightenment and development control are measures needed to effectively tackle waste collection and disposal systems in developing countries.

**Keywords:** Waste Management, waste disposal system, waste collection systems, frequency of waste disposal, urban slums

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## 1. Introduction

Waste management has been a very topical issue globally and in many cities in Sub-Saharan Africa. This is because as urbanization increases, so also is the increase in the volume of waste generated in urban centers. Despite, the surge in volume of waste generated in these cities, much regrettably, is the inability of the municipal authorities in developing countries to effectively and efficiently manage the menace. Municipal waste management involves

the collection, keeping, transportation, treatment and disposal of waste material in ways that protect both humans and environment and preserve local aesthetics. It is an organized and systematically channeling of waste through practically, economically and technically suitable retrieval and disposal channels that enshrined public safety [1]. Waste has been conceptualized differently the literature. However, it can be viewed as any unavoidable material resulting from domestic activity or industrial operation, for which there is no economic demand and which must be disposed [2].

The problem of waste management differs significantly across places and much more importantly in the characteristics

of waste generated in these places. These differences can be in terms of the volume of the waste generated, types of waste, waste collection systems, disposal systems and its transportation. All the above processes can be largely influenced by the prevailing technology and behaviors of citizens in these places. According to the World Bank [3] the volume of waste generated in developed nations exceeds that of the developing nations, for instance, the United States generated 526,200 tons/capita/ day with over 95% collection rate compares to Nepal that generates 0.5kg/capita/day with less than 40% collection rate. Similarly, as observed by Akinwale [4] the volume of waste generated in third world cities grows exponentially, beyond the abilities of municipal authorities to effectively and efficiently managing them. Thus, the prominent problem with waste is its management in these cities.

Many reasons have been given for poor waste management in cities in the developing countries. First, the surge in urbanization as against available economic and human resources, second, poor land use planning, resulting in the development of slums, squalor settlements and poor street network thus making collection, transportation and disposal of waste difficult. These problems, exempt majority of the populace from being planned for, thus, leading to an overstretched pressure on urban infrastructure [5,6].

Lastly, waste management systems requires huge capital outlay, which is often above the average working budget for many municipal authorities in developing nations than their counterparts in the developed nations. Thus, influencing the returns from investment in waste management across places and regions. For instance, both US and Japan had achieved and maintain above 90% success rate in their waste collection system World Bank [3]. Contrary to cities in developing nations, that have only achieved a little above average waste collection rate, for example, 43% in Lagos, (Nigeria), 50% in Cairo, (Egypt), 50%, in Yangon in (Myanmar), 40%, in Mumbai in (India), 33% in Karachi, (Pakistan) and 42% in Dares Salam, (Tanzania), are collected [7,8]. It is expected that waste collection system is largely influence by its disposal and transportation system. Thus, poor waste collection system in African cities is a reflection of its disposal and transportation system.

Furthermore, as averred by Ludwig et al [9], the problem of waste management in third world cities are complex and bedeviled with myriads of challenges, ranging from, low level of economic growth, inefficient waste management staff, wasteful technology and changes in consumption patterns of citizens. In a similar vein, the World Bank observed that paucity of data on waste generated at the local levels is the dominant factor accounting for inefficiency in waste management in the developing nations [10,11]. These situations effective planning for waste management cumbersome. More specifically, waste management in slums, squalor and other informal settlements poses greater challenges for waste management authorities because paucity of data of waste management, social status of residents, attitudes of residents and most probably due to the logistics required in managing waste management at this level. Despite, these perceived challenges there have been relatively in-depth study on waste management in this areas. Most

studies on waste management in developing countries often focus on the urban centers and also treat the metropolis as a single entity neglecting differences across rural places, peri-urban and slums. For instance, Ola's study [12] on informal waste patronage in Ibadan, treat the metropolis as a single entity without regards for variation in waste patronage across urban slums in the city, which often than not would depict a distinctive pattern from waste patronage in the urban centers. Thus, an over-generalization of waste problems and a general neglect of waste management of urban slum residents.

This study therefore sought to assess waste disposal management systems of urban slum residents with a view in understanding the peculiarities in these areas and providing a holistic approach to waste disposals and management of urban slum residents

## 2. Data and Methods

### 2.1. The Study Area

Ibadan city is located between longitude 2° 50' and 3° 20' E and Latitude 7° 20' and 7° 50'N. It is the third largest metropolitan area in the country, after Lagos and Kano. Ibadan North Local Government Area is the most urbanized in the city and also the seat of government administration. It was established in 1991 from the defunct Ibadan Municipal Local Government. It has a spatial extent of longitude 3°52' and 3°56'E and latitude 7°23' and 7°27'N. Relatively, it is bounded in the West by Ido and Ibadan North West Local Governments, in the East, it was bounded by Lagelu, Egbeda and Ibadan South East Local Government respectively and Akinyele in the North. The local government has about twelve wards and forty-one localities and by the 2006 Census Population, its figure stood at 306,795 from 302,272 in 1991. Areal expansion, from 163km in 1991 to 420km in 2006.

The study specifically focuses on four wards in the Local Government Area. The wards contains the largest slums areas within the old core of the Ibadan city. The housing pattern across these areas are noted for old and dilapidated structures, made of mud and/or plastered with cement. Many of these structure were constructed during the pre-industrial era with relatively new structures. The residents are indigenes and lives a communal lifestyle. Initially, they were farmers during the pre-industrial era but due to urbanization, many have switched to trading in foodstuffs at the traditional markets scattered around the metropolis. The areas have constricted street network, poor infrastructural facilities, poor layout plans, and low level of environmental quality and low-socio-economic status of residents [13]. Table 1 revealed the dominant slums and squatter settlements in these areas based on reconnaissance survey carried out before the field work exercise.

Table 1. Selected Slum Areas

Wards	Urban Slums
1	Agbadagudu, Beere and Kannike
2	Inalende, Oke Oloro and Oniyanrin
3	Adeoyo, Oke Aremu and Yemetu
4	Idi Omo, Ituaba, and Oje

Source: Authors' Compilation from Field Study, 2020.

## 2.2. The Study Parameters and Methods

The required data for this study were obtained from primary and secondary sources. Secondary data were sourced from relevant literature, journals, dissertations, internet pages and file downloads. Primary data were sourced using a set of well pretested and structured questionnaires. Survey research design was adopted. Purposive, multi-stage and random sampling method was adopted. Purposive sampling method was used in selecting Ibadan North, out of the six urban local governments in Ibadan metropolis. Ibadan North Local government was purposively selected because it is the most urbanized and contains the largest slums areas in the metropolis. Multistage sampling system was used to select wards that contains slums areas with relatively homogeneous groups of people and are in the old core of the city. Thus, four wards fit perfectly into this group and were selected. Next, in each ward identified, homogeneous groups with high presence of the process of slum proliferation and urban sprawl was rampant were identified. Randomly, three of these homogeneous slum areas were selected across the four wards. Number of sampled respondents were based on the projected population for these localities based on the 1991 Population figure for the sampled slums area projected to 2010 using 3.2% growth rate adopted in the country. Using an average household size of 6 per household based on its high density, the number of housing structure in these areas is estimated to be 22,106. 1.3% of this was used as the sample size, which amounted to 300 households. Structured questionnaires were administered randomly on household heads across these selected areas. The structured questionnaire contains information on locational characteristics, socioeconomic characteristics of respondents, volume of waste generated in the study area, attitudes towards waste disposal system, factors influencing poor waste management in the area, perceptions on residents on how the waste problem can be managed.

Both descriptive and inferential statistics were used to analyze the data at  $p \geq 0.05$ . Descriptive statistics used includes frequencies and percentage, tables, charts, pictures and cross-tabulation while inferential statistics used ANOVA and Chi-Square were used in testing the hypotheses.

**Table 2. Selected Localities across Wards in the Study Area**

Wards	Slum areas	Population	Sampled questionnaire
1	Agbadagudu, Beere and Oke Aare	17972	40
2	Inalende, Oke Oloro, Oniyanrin	17272	38
3	Adeoyo, Oke Aremu and Yemetu	61683	140
4	Idi Omo, Ituaba and Oje	35712	82
N		132639	300

Source: Authors' Analysis, 2020.

## 3. Results and Discussion

The research findings were presented and discussed under various sub-headings below. Unless otherwise stated, the tables and plates presented in this section emanated from the field survey carried out in 2020.

### 3.1. Socioeconomic Characteristics of Sampled Urban Slum Dwellers

Analysis of respondents' sex revealed that more than two-thirds (69.3%) were females while about one third (30.7%) were males (Table 3). The dominance of females might necessarily be their availability at the time of research and their concerns for households' sanitation. More than half (55%) of the respondents were between 41-50years and about one-fifth (21%) were above 50 years, about 17% were between ages 21-30 years while 7% of respondents were between the age bracket 31-40, which happens to be the least distribution of the age cohort (Table 3). It can be implied that residents in these urban slums are middle-aged. The marital status of respondents revealed that the majority (81%) of the respondents were married and only 19% were single (Table 3). There is often a correlation between age and marital status, it is expected that the majority of the older population should be married. Hence, the higher number of married respondents affirms that the average population is aging. For respondents' religious status, the study revealed that 52% were Christians while 48% were Muslims. Thus, a slight dominance of Christians among residents in Ibadan slums. On the educational status of respondents in the slums, it was observed that majority (70%) had primary education as the highest level of educational attainment, one fifth (20%) had secondary education and about one-tenth (10%) of sampled respondents do not have any formal education. It is believed that the educational attainment of residents will influence their attitudes towards waste. Thus, it can be implied that the educational status of urban slum dwellers will influence their waste disposal systems. Ethnicity status of respondents revealed that 98% of respondents were Yoruba and slightly only 2% were Hausas. The dominance of the Yoruba ethnic group is large because these communities reflected a typical traditional Yoruba city. The little share of Hausas reflects the long term trading relationship between the Yoruba communities in Ibadan and the Hausa- Fulani traders. The Hausas are mainly foodstuff traders. Analysis of respondents occupational structure revealed two dominant groups, traders and artisans; more than two thirds (61%) of respondents were traders, many of which operated at the popular traditional markets (Oje, Beere, etc.) Which are near the slums, about one third were artisans, 3% were skilled personnel and about 1% were engaged in farming. Analysis of respondents' household size revealed that about half (49.3%) of the respondents have a household size between six and ten, 44% has a size between 1 and 5 and about 6.7% has a household size between 11 and 15. High household size implies that the higher the household, the higher the volume of waste generated. Respondents' ownership structure revealed that the majority (86%) of the household structures were family houses and 14% were renters. The prominent family house structure also aligns with the previous discussion that these areas are the traditional core areas of the city. The structures were compound houses made of mud, while some have been cemented and moderately repaired, about 14% were renters. Those close to the roads have shops and stalls rented by traders. Lastly, the income structure of residents was analyzed, The

study revealed that more than two thirds (69.3%) of sampled respondents earn less than ₦10,000, about 16% earn between ₦10,000 and ₦14,999, about 7% of respondents earn between ₦20,000 and ₦29,000. From the foregoing analysis, it can be concluded that as number of respondents falls as income increases and as income increases, which implies that majority of respondents in the slum areas are low-income earners. Using the CBN exchange rate of January 22nd, 2020, which equates 1USD to ₦360. It can be averred that the residents in these areas are low-income earners. Income-levels of

residents will influence the patronage of waste collectors and waste disposal methods. It can be assumed that low-income earners will not want a premium for waste collection and disposal. Thus, would likely not patronize the government waste collection agencies but would resort to other illegal means or easily available method of collection and disposal whether legal or illegal. The present exchange rate of 1 US dollar to naira as at January 22nd, 2020 was ₦360 at CBN official rate. Hence, a resident with ₦10, 000 income has an equivalent of 27.78 USD.

Table 3. Socioeconomic Characteristics of Ibadan Urban Slums Resident

S/N	Socioeconomic Variables	Respondents	Percent
<b>GENDER</b>			
1	Male	92	30.7
	Female	208	69.3
	<b>Total</b>	300	100
<b>AGE</b>			
2	21-30 years	51	17.0
	31-40 years	165	55.0
	41-50 years	21	7.0
	Above 50	63	21.0
	<b>Total</b>	300	100
<b>MARITAL STATUS</b>			
3	Single	57	19.0
	Married	243	81.0
	<b>Total</b>	300	100
<b>RELIGION</b>			
4	Christianity	156	52.0
	Islam	144	48.0
	<b>Total</b>	300	100
<b>EDUCATION</b>			
5	No formal Education	30	10.0
	Primary Education	210	70.0
	Secondary Education	60	20.0
	<b>Total</b>	300	100
<b>ETHNICITY</b>			
6	Yoruba	294	98
	Hausa	6	2.0
	<b>Total</b>	300	100
<b>OCCUPATION</b>			
7	Trader	183	61.0
	Farming	3	1.0
	Artisan	105	35.0
	Skilled Personnel	9	3.0
	<b>Total</b>	300	100.0
<b>HOUSEHOLD SIZE</b>			
8	1-5	132	44
	6-10	148	49.3
	11-15	20	6.7
	<b>Total</b>	300	100
<b>OWNERSHIP STRUCTURE</b>			
9	Renter	42	14
	Family house	258	86
	<b>Total</b>	300	100
<b>AVERAGE MONTHLY INCOME</b>			
10	Less than ₦10,000	208	69.3
	₦10,000 - ₦14,999	48	16
	₦15,000 - ₦19,999	11	3.7
	₦20,000 - ₦29,000	21	7
	₦30,000 - ₦39,999	6	2
	Above 40,000	6	2
<b>Total</b>	300	100	

Source: Authors' Analysis, 2020.

### 3.2. Type of Waste Generated in Urban Slums in Ibadan City

Analysis in Table 4 reveals the type of waste generated in slums in Ibadan city. The study revealed that slums in ward three generate about 46.6% of plastic waste, about one-third (27.3%) was generated in slum areas in ward 4, while slum areas in ward 1 and 4 generate a similar amount of plastic waste (13.6% and 12.5%). For Solid waste, more than half (52.8%) were generated in slums in ward three, 21.1% solid was generated in sampled households in ward 4, while a sampled household in ward two, accounted for 12.7%. Share of organic waste/dead animals was observed, about 46.7% was observed in ward three, ward four accounted for about one-third (27.8%), slum areas in ward one accounted for 13.3% and ward one accounted for 12.2%. The notable area for ceramics, glass, and metallic waste is ward three which accounted for more than half (58.2%) of this waste. Other types of waste such as e-waste accounted for the least share and were found mainly in two areas, ward three and one. Also, the study revealed that solid waste accounted for the largest waste component in

these areas, as it accounted for more than half (56%) of the total waste components sampled in the areas under investigation.

### 3.3. Volume of Waste Generation by Respondents in Ibadan Urban Slums

Analysis in Table 5 shows a summary of the descriptive statistics of the volume of waste generated per slums across the four core wards. It was revealed that slums dwellers in ward 2 had the highest average waste measure (4.33kg), yet notably, it has the least share of sampled participants, followed closely by the average volume of waste generated by slum dwellers in ward 3 and 4, while slum dwellers in ward 1 generated the least. The volume of waste generated was measured with the aid of a hand-held weighing scale used to measure respondents' waste during the field exercise. The implication of the results is that volume of waste cannot be directly attributed to population size alone but other factors such as attitudes and behaviors of residents in waste generation and disposal methods adopted.

**Table 4. Waste generated across Urban Slums in Ibadan city**

Types of waste	Slums in Ward 1	%	Slums in Ward 2	%	Slums in Ward 3	%	Slums in Ward 4	%	Total	%
Plastic	12	13.6	11	12.5	41	46.6	24	27.3	88	15.3
Solid waste	43	13.4	41	12.7	170	52.8	68	21.1	322	56.0
Organic waste, dead animals	12	13.3	11	12.2	42	46.7	25	27.8	90	15.7
Ceramics, glass and metal	9	13.4	9	13.4	39	58.2	10	14.9	67	11.7
Others	2	25.0	Nil	-	6	75.0	Nil	-	8	1.3
N	78	13.6	72	12.5	298	51.8	127	22.1	575	100.0

Source: Authors' Analysis, 2020.

**Table 5. Summary of descriptive statistics of volume of weights generated in Urban Slums across Wards**

Wards	Mean waste in kg	Std.	N
1	3.26	1.80	40
2	4.33	2.54	38
3	3.98	1.82	140
4	3.71	1.64	82
N	15.28		300

Source: Authors' Analysis, 2020.

**Table 6. Correlation between volumes of Waste generated across the four Urban Slum Wards**

	Ward 1	Ward 2	Ward 3	Ward 4
Ward 1	Pearson Correlation	1	-.104	-.237
	Sig. (2-tailed)		.534	.141
	N		38	40
Ward 2	Pearson Correlation		1	.007
	Sig. (2-tailed)			.966
	N		38	38
Ward 3	Pearson Correlation			1
	Sig. (2-tailed)			
	N		140	82
Ward 4	Pearson Correlation			
	Sig. (2-tailed)			1

Source: Authors' Analysis, 2020.



### 3.4. Hypothesis Testing

#### Hypothesis One

H<sub>0</sub>: There is no significant relationship between volumes of waste generated across urban slums in Ibadan city

H<sub>1</sub>: There is a significant relationship between volumes of wastes generated across urban slums in Ibadan city.

Hypothesis one was examined the relationship between volumes of waste generated across urban slums in Ibadan city. Pearson Product Moment correlation was used for the test at a 95% confidence interval and the results presented in Table 6. There is a weak negative (-0.104, -0.237, -0.123) relationship between volumes of wastes generated in Ward 1 and 2, 3 and 4 respectively but they were not significant. There is a weak positive relationship (0.007) between volumes of waste generated in Wards 2 and 3 but not significant. A positive relationship exists between the volume of waste generated between wards 2 and 4. Also, there is a weak positive relationship (0.193) between volumes of waste generated between ward 3 and 4.

### 3.5. Variation in Waste Disposal Systems across Urban Slums

#### 3.5.1. Respondents Waste Storage Systems in Urban Slums

Table 7 revealed waste storage systems used by respondents in the areas under investigation. Across these slums, used plastics was the dominant waste storage system used as it accounted for 43% of waste storage systems used, followed by sacks which accounted for 37% for waste storage systems, bins accounted for 18% of waste storage systems used while basket accounted for the least distribution. Although, variation exist based on sampled respondents across wards, yet, it can be observed that this differential is insignificant. Thus, it can be implied that residents prominently used plastics and sacks as waste storage systems. The result implies that the waste storage systems adopted in these areas are not innovative means, hence the likelihood of frequency in the waste disposal and poor environmental quality of the neighborhood, thus, negating waste management efforts in these areas.

#### 3.5.2. Respondents Adopted Waste Disposal Systems across Wards

The analysis of respondents' means of waste disposal was detailed in Table 8. The dominant means of disposal was dumping into nearby streams/drainage as it accounted for 85% distribution. In ward three, dumping in

streams/drainage accounted for 46.7%, while in ward four it accounted for about one-third (27.5%) with distribution in ward one and two having 13.3% and 12.5 % respectively. Burning came next as it is utilized by one-tenth (10%) of sampled respondents. However, major burning activities were observed in slums areas in ward three that accounted for two-thirds (66.7%) across the slums while slums ward three accounted for about one- third (26.7%) of burning activities, areas in ward one and two have accounted for 3.3% respectively. Designated bins were placed in some strategic places for waste disposal in these areas. It was observed that 3% of respondents use this means. Also, about 44.4% of it was utilized in ward three and about one-third (33.3%) in ward four while 1.1% utilization was observed in ward one and two respectively. It was observed that cart pusher was only available in ward three and it accounted for 2% of the total respondents. Plates 1 and 2 show how dumping of waste into river channels and drainage have blocked the free flow of water. A possible reason for the perennial flooding in these places annually.

#### 3.5.3. Test of Hypothesis

This section tests the second hypothesis formulated for the study.

#### Hypothesis Two

H<sub>0</sub>: There is no significant variation in waste disposal methods used across urban slums in the area

H<sub>1</sub>: There is significant variation in waste disposal methods used across urban slums in the area.

The hypothesis was tested using ANOVA analysis and the result presented in Table 8 below.

Cart pusher was only found in ward three, thus, the ANOVA test was not carried out.

The ANOVA result revealed for burning as a method of waste disposal was slightly significant,  $F(1, 298) = 2.99$ ,  $p = 0.09$ , thus there is a slightly statistically significant variation in burning as a waste disposal method across the selected slums in Ibadan city. For dumping in rivers across the selected areas, the ANOVA results revealed an  $F(1, 298) = 0.01$ ,  $p = 0.92$ , which is not significant at our confidence value of 95%, thus, there is no significant variation in the use of dumping in river channels and drainage in urban slums under investigation. Lastly, the use of designated bins as a method reveals an ANOVA result of  $F(1, 298) = 0.14$ ,  $p = 0.70$ , which is not significant at  $p = 0.05$ , thus, we conclude that there is no significant variation in the use of designated waste bins across selected slum areas.

Table 7. Waste Storage Systems used across Urban Slums Ibadan city

Waste Storage system	Ward 1	%	Ward 2	%	Ward 3	%	Ward 4	%	Total	%
Dustbin	7	13.0	9	16.7	27	50.0	11	20.3	54	18.0
Used plastics	18	14.0	17	13.2	63	48.8	31	24.0	129	43.0
Basket	2	33.3	4	66.7	Nil	-	Nil	-	6	2.0
Sack	15	13.5	14	12.6	52	46.7	30	27.2	111	37.0
Total	42	14.0	44	14.7	142	47.3	72	24.0	300	100.0

Source: Authors' Analysis, 2020.

Table 8. Types of Waste Disposal Methods used by Respondents across Slums

Waste Disposal Methods	Ward 1	%	Ward 2	%	Ward 3	%	Ward 4	%	Total	%
Cart pusher	Nil	-	Nil	-	6	100	Nil	-	6	2.0
Burning	1	3.3	1	3.3	20	66.7	8	26.7	30	10.0
Dumping into nearby streams/ drainage	34	13.3	32	12.5	119	46.7	70	27.5	255	85.0
Designated Waste bins	1	1.1	1	1.1	4	44.4	3	33.3	9	3.0
N	36	12.0	34	11.3	147	49.0	83	27.7	300	100

Source: Authors' Analysis, 2020.

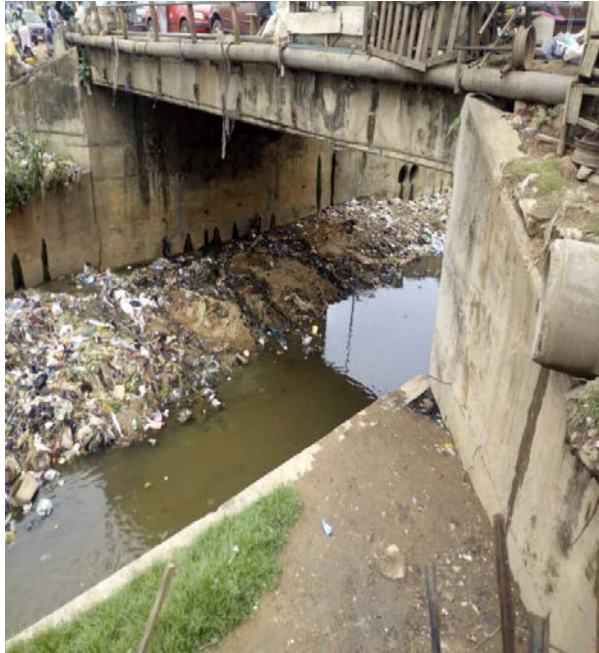


Plate 1. Showing Waste blocking Drainage and Stream Channels in the Areas under investigation. Source: Authors' Analysis, 2020

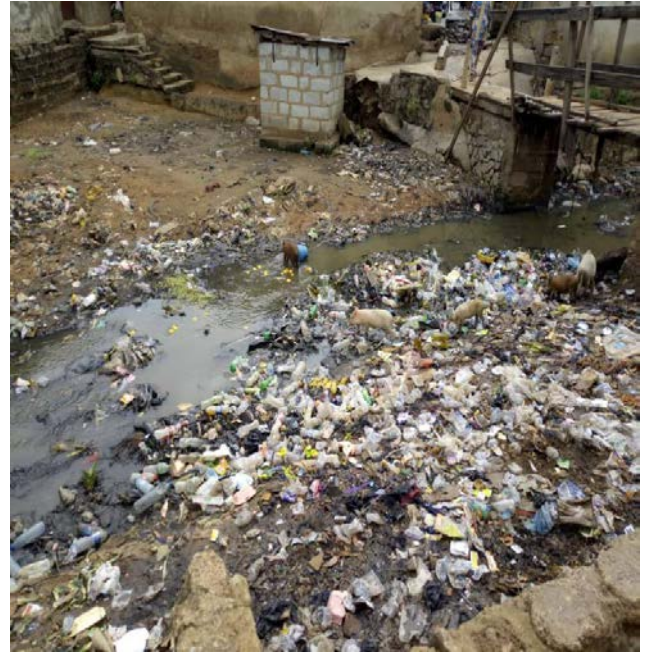


Plate 2. Showing Waste blocking Drainage and Stream Channels in the Areas under investigation. Source: Authors' Analysis, 2020

Table 9. Variation in Disposal Methods across Urban Slums

Disposal method	Sum of squares	Df	Mean square	F	Sig.	Remarks
<b>Burning</b>						S
Between Groups	2.739	1	2.739	2.991	.085	
Within Groups	272.941	298	.916			
N	275.680	299				
<b>Dumping in rivers, drainage, etc.</b>						NS
Between Groups	.009	1	.009	.010	.920	
Within Groups	275.671	298	.925			
N	275.680	299				
<b>Designated Bins</b>						NS
Between Groups	.134	1	.134	.144	.704	
Within Groups	275.546	298	.925			
N	275.680	299				

S: Significant; NS: Not Significant  
Source: Authors' Analysis, 2020.

### 3.5.4. Respondents Frequency of Waste Disposal Systems

Information, as shown in Table 10, revealed that the majority of residents (73%) disposes of their waste weekly while more than one-fifth (23%) disposes of their waste twice a week. Hence, both weekly and twice-weekly are

the dominant frequency of waste disposal. Furthermore, ward three accounted for about half (49.3%) of respondents who dispose their waste weekly while ward two takes the least share with about 15.1% of respondents. The implication of the results is grave considering that majority dump these waste in drains, drainage channels,

streams and rivers nearby their residences as revealed in the previous analysis (See Table 7 and Plate 1 and Plate 2), thus, this act would lead to blockage of drainages, streams, canals and indirectly influence the poor environmental quality, negative impacts on the health of residents especially the vulnerable the elderly, children and pregnant women and nursing mothers. Also, it can be inferred that the weekly rate of waste disposal is largely influenced by the fact that residents do not pay for the waste nor uses any available government means, for instance, the designated waste bins.

### 3.6. Factors Influencing Poor Waste Disposal and Collection Systems in Ibadan Urban Slums

Residents weighted Opinions Index was used in measuring residents' perceptions of waste disposal and collection in their areas. Residents' opinions on factors influencing poor waste disposal and collection system were assessed using the Likert Scale. Each factor was measured using a two-scale Likert Scale (1961) rating of Agree or Disagree. Each rating was assigned a scale of 2 or 1 respectively in order of relevance. The summation of the weighted value [SMV] was obtained by adding the products of the numbers of responses to each of the factors and the weight attached to each rating. The mean score of the weighted opinion was derived by dividing the total number summation of weighted value by the total number of respondents. The highest factor was inadequate waste disposal facilities, next was lack of approved disposal area, poor layout of streets, and lastly infrequent collection rate. The result indicated the major problem with waste management in these areas relates to disposal which are inadequate waste disposal facilities and lack of approved waste disposal area as against the collection system.

### 3.7. Respondents Perception on Effects of Poor Waste Collection and Disposal Systems in Ibadan Urban Slums

Table 12 provided information on urban slum respondents on the effects of poor waste collection and disposal systems in their neighborhoods. It was revealed that blockage of drainages, rivers channels, and gutters accounted for about half (50%) of the negative impacts of poor waste collection and disposal, about 23% accounted for pollution and influencing flooding respectively. This result implies that drainage, river channels, and gutters are blocked which indirectly affects environmental quality, exacerbates flood risk, and also negative impacts on the health of residents.

### 3.8. Awareness of Health Risks Associated with Poor Waste Collection and Disposal Systems

Lastly, this part of the study assesses respondents' awareness of the health risks of poor waste collection and disposal methods in their neighborhoods. It was revealed that majority of respondents (85.4%) in ward 4 were aware of health risks associated with poor waste collection and disposal systems, two-thirds (65%) in ward 2, and more than half (58.6%) in ward 3 and (52.6%) in ward 3 respectively are aware. Broadly speaking, two-thirds (66.0%) of all sampled respondents were aware of the health risks of poor waste collection and disposal systems (Table 13). These results indicate that majority of respondents are largely aware of the health risks associated with poor waste collection and disposal systems. However, despite the level of awareness of the health risks of respondents, it was observed that the waste collection and disposal system is endemic in these areas.

Table 10. Frequency of Waste Disposal in Urban Slums

Frequency of Waste	Ward 1	%	Ward 2	%	Ward 3	%	Ward 4	%	Total	%
Daily	Nil	-	2	33.3	3	50.0	1	16.6	6	2.0
Twice weekly	7	10.1	6	8.7	36	52.2	20	29.0	69	23.0
Weekly	34	15.5	33	15.1	108	49.3	44	20.1	219	73.0
Fortnightly	Nil	-	1	16.7	3	50.0	2	33.3	6	2.0
N	43	14.3	41	13.7	149	49.7	67	22.3	300	100.0

Source: Authors' Analysis, 2020.

Table 11. Residents Differentials on factors influencing poor Waste Collection and Disposal Systems in Ibadan Urban Slums

Factors	Ward 1		Ward 2		Ward 3		Ward 4		SMV	Mean scores	Rank
	A	D	A	D	A	D	A	D			
Infrequent collection rate	30	10	32	6	98	22	60	22	506	1.7	5 <sup>th</sup>
Inadequate waste disposal facilities	38	2	30	8	119	21	73	9	560	1.9	1 <sup>st</sup>
Poor layout of streets	34	6	32	6	92	48	70	12	528	1.8	4 <sup>th</sup>
Lack of approved waste disposal area	32	8	34	4	111	29	78	4	555	1.9	2 <sup>nd</sup>
Inadequate personnel for waste collection	29	11	32	6	120	20	72	10	553	1.8	3 <sup>rd</sup>

NB: A: Agree, D: Disagree.

Source: Author's Analysis, 2020.



**Table 12. Respondents Perception of Problem of poor Waste collection and Disposal Systems in Ibadan Urban Slums**

Effects	Ward 1	%	Ward 2	%	Ward 3	%	Ward 4	%	Total	%
<b>Pollution</b>	9	13.1	7	10.1	29	42.0	24	34.8	69	23.0
<b>Environmental Quality and Aesthetic</b>	2	16.7	2	16.7	6	49.9	2	16.7	12	4.0
<b>Blockage of Drainages, Gutters</b>	20	13.3	18	12.0	70	46.7	42	28.0	150	50.0
<b>Influencing Flooding</b>	8	11.6	8	11.6	28	40.6	25	36.2	69	23.0

Source: Authors' Analysis, 2020.

**Table 13. Respondents Health Risks Awareness of Poor Waste collection and Disposal Systems**

Awareness	Ward 1	%	Ward 2	%	Ward 3	%	Ward 4	%	Total	%
<b>Yes</b>	26	65.0	20	52.6	82	58.6	70	85.4	198	66.0
<b>No</b>	14	35.0	18	47.4	58	41.4	12	14.6	102	34.0
<b>N</b>	40	100.0	38	100.0	140	100.0	82	100.0	300	100.0

Source: Authors' Analysis, 2020.

#### 4. Implication of the Study

Findings from this study revealed that the dominant waste management problems in these places relate to its poor collection and disposal systems. The peculiarities of these areas to land use planning and urban dynamics pose grave environmental and magnify waste problems. More specifically, these slums are noted for overcrowding in squalid housing conditions, inadequate basic infrastructure and social services such as lack of access route and sewage facilities, the high process of filtration and urban sprawl and homogeneous groups of low social economic status, this might be the reason affecting presence and patronage of the Oyo State Waste Management Authority in strategizing for effective waste collection in these areas. Thus, waste management in these areas is first an environmental problem. It is therefore recommended that the first policy measures should be the upgrading of these slums, formalization of the squatter settlements, and provision of basic infrastructure, this would help improve the livability of these slum areas and reduce health risks.

Another policy implication is the fallout between the volume of waste generated by residents and waste storage disposal methods adopted in these areas and also the frequency of waste disposal. The perceived lack of innovative waste storage disposal methods will influence the frequency of disposal of waste and collection rate through municipal authorities. Thus, innovative means of waste storage for residents should be encouraged. This would help store waste in ways that can promote environmental quality, the health of residents, and the physical aesthetic of households and manage the frequency of waste collection.

The dumping of waste in river channels, drainage, streams, and gutters, which is prominent in the areas under investigation is a clear manifestation that these areas are not well serviced with basic infrastructural facilities including waste infrastructure. Hence, qualitative shortage reflected in inner-city decay, urban sprawl, etc. coupled with a quantitative shortage with lack of infrastructural facilities might be the motivation for residents dumping their waste in rivers and unhygienic means. As revealed from this study based on scientifically obtained information from residents' perception on factors

influencing poor waste collection and disposal systems in their areas. Notably, they averred that inadequate waste disposal facilities, lack of approved waste disposal area, and inadequate personnel for waste collection are the main factors influencing poor waste collection and disposal methods in their areas. Hence, there is an urgent need to balance urban growth with infrastructural development which should include provision waste disposal facilities and an approved waste collection site or effective waste collection system in these areas.

#### 5. Conclusion

This study x-ray waste collection and disposal systems in urban slums in Ibadan city. The fundamental problem of waste collection and disposal systems in urban slums and squatter settlements is an offshoot of environmental problems that emanated from the gradual deterioration of cities due to rapid growth and the attendant inability of infrastructural facilities to meet the rate of city growth. Hence, it is a manifestation of the failure of infrastructural development to meet with urban growth. For instance, the dumping of waste in drainage, streams, and canals in the study area is large because of the lack of waste disposal facilities and the cut-off of these people from the government waste recognized agency for waste collection systems. Thus, the government must improve infrastructural facilities and upgrade the slum areas in the city. Also, residents have to be educated and enlightened on the environmental and health impacts of dumping waste into river channels, streams and drainage, especially in local languages (since these groups are homogeneous) through radio jingles and community broadcast programs on one hand and the development control unit of the local planning authority and environmental health officers to enforce residents discourage the ongoing practice of dumping refuse in rivers, channels, or adoption of any unsafe methods. The study concludes that addressing waste collection and disposal systems in urban slums irrespective of city or country should begin from upgrading and formalization of these slums and settlements, adequate provision of infrastructural facilities, education, and enlightenment of residents about the health risks of

poor waste collection and disposal systems and effective control through local planning officials (development control unit) and environmental health officers.

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