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## Waste Management and Its Impact on the Environment

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### ABSTRACT

Globally, Man's activities generate waste, and this waste has to be managed as it affects the environment. The management of waste has become an area of major concern in the world and Nigeria inclusive. This paper assesses the impact of domestic waste management on the environment of Zaria, Kaduna state, Nigeria. This study was carried out through observation and the administration of structured questionnaire. A set of 200 questionnaires were randomly administered to cover parts of Angwan Aladu, (Samaru), Chikaji, Dogon Bauchi, Jushin Waje/Chiki and Kwangila Motor Park. Forty (40) questionnaires per location. These locations are more densely populated and are likely to be areas with dense waste. The data collected are analyzed in descriptive manner using ANOVA method to test the hypothesis presented in statistical tables among others. The impact of waste management in the study area includes pollution of; air, land and water and the health hazards of the populace. Parts of the recommendations include; the need to employ more professional sanitation managers by Kaduna state government and the relevant private agencies. There should be adequate sensitization of the general public about the hazards of improper waste management on human health and the environment. There is also the need for modern and efficient waste management methods like, burning of waste in incinerators, land filling, recycling of waste. Kaduna state government should not just enact sanitation edit, but must ensure effective implementation, monitoring and management of waste both at the state and local government level so as to achieve a clean environment in the study area.

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### INTRODUCTION

Waste is generated as agricultural household and industrial activities bringing about human development socially and technologically. Waste is any material that has no use for consumption or production and therefore need to be disposed of, as it is worthless or unwanted materials (UNDS

2005; Jennifer and James 2010; Madaki 2015).

Ogu (2000) established that increase in waste is the consequences of rapid rate of urbanization in most cities making the authorities face the challenges of managing the waste. In fact, in Nigeria an average resident encounter several tons of waste annually, accruing from households,



industries or institutions (Efe, 2013). The impact of waste is subjective as it affects public health and the environment. The health impacts of waste include diseases like Malaria fever, typhoid and other infections. The other issues are unsanitary neighbourhood, infected water, mosquitoes, flies, maggots, cockroaches, poor drainage systems, and inaccessibility of roads and flooding (Areola, 1978; Awosika, French, Nicholls and Ibe 1992; Agunwamba, 1998; Ishoka, 2008 and Loms, 2010).

Makinde (2000) and Kabir (2008) believe that the word "waste" is subjective and it is seen to be a thing that is risky to public health and the environment. It is something that has been generated as long as man globally keeps carrying out his daily activities. As waste is recycled, it serves as a source of income. Therefore waste is any substance whether gaseous or liquid that is of no direct value to its producer and need be disposed of. They can be hazardous or non-hazardous to the health of man and the environment (Ita 2000; USEPA, 2003 and THERRA, 2006).

According to William, Mary and Barbara (2005) define waste management as the collection, transportation, treatment, processing, recycling or disposal of waste materials so as to reduce the negative effects on human health and the environment. There are serious environmental and health problems associated with solid, liquid, gaseous waste and its effluents in Nigeria (Adetosoye, Willinge and Award 1976, Litchfield 1980, Oboegbulem and Muogbo 1981, Elder *et al* 2000, Callaway *et al* 2004, Abiade Paul *et al* 2006).

Akinwale (2005) is also of the opinion that the management of waste has become one of the important areas of concern in Nigeria as the country is gradually losing the battle of attaining a

clean healthy environment for their citizens. This is evident with the accumulation of dumpsite, competing with some major roads and drainages in urban centres.

Most human habitations in the world generate waste at an alarming rate with dense population. In fact, according to Ishoka 2000 the waste generated is beyond what various governments can handle, Nigeria inclusive. Specifically waste are greatly generated in Nigerian urban centres, for instance, Kano municipal generated 377, 126 tons of waste in 2007 and at the same time 19000 metric tons was generated in urban centres of Osun state (Ojo, 2008; Afolabi and Adamu 2008).

Although the disposal of waste and its management in most developing regions of the world are a serious challenge because they lack proper waste disposal and management culture and technology (Efe, 2013). Efe (2013) research on waste disposal problems and management in Ughelli, Nigeria, also observed that heaps and illegal dumpsites sound in either side of the road, the people had lukewarm attitude towards environmental sanitation and the roads and streets have littered with solid wastes and the main causes seen as poor administrative waste management and the lack of technology for waste recycling.

Some industries do not manage their waste properly thereby heaping their waste indiscriminately within their premises and along roads and gutters, breeding insects like cockroaches, flies, maggots, mosquitoes and lizards to the health of people, blockage of drainage and the environment largely (Agunwamba 1998; Ishoka, 2008; Awosika, French, Nicholls and Ibe, 1992).

Globally, the management of waste is capital intensive, in fact, it has been said that Lagos state government allocate about a quarter of her expenditure or funds to waste management. This is still



not adequate as the population of the state is put at almost 20 million people with an average individual generating an average waste of 115kg daily; this notwithstanding that waste is managed in Lagos state by both public and private agencies (Lagos environmental sanitation Law, 1983).

### **Research Questions**

The research questions are as follows

1. What types of wastes are disposed in urban Zaria, Kaduna state?
2. What is the major management methods used in the study area?
3. Does the type of waste affect human health and the environment in the study area?
4. Is there any correlation between level of education and waste management methods used in the area of study?
5. What are the feasible ways for managing wastes to its barest minimum in the study area?

### **Hypothesis**

**Ho<sub>1</sub>**-Is there any significant relationship between the waste management methods used in the study area and the educational background of the respondents?

### **METHODOLOGY**

The methodology adopted in the research work includes field survey and observation of primary data source through the administration of questionnaires and the used of secondary data source to review relevant literature. A set of 200 structured questionnaires based on the research objectives, questions and hypotheses were randomly administered purposively to assess waste management in designated study area in Zaria. These designated areas are Angwan Aladu (Samaru) Chikaji, Jushi waje kwangila motor parks site Sabon Dogon Bauchi residential area. 40 questionnaires were administered

randomly in these five (5) designated areas. These questionnaires were analyzed using sample descriptive statistical tools like ANOVA, frequency tables and percentages. The results observed gave descriptive and inferential analysis.

### **The Study Area**

Zaria the study area is one of the urban centres in Kaduna state; in fact, it is second to Kaduna city, the state capital. It is located between latitude 11° 01"N and 11° 12"N, longitude 7° 36"E and 7° 45" E (Yakubu 2008, Loms 2010). Zaria is also located within the tropical continental climatic zone with five months of rainfall beginning from May to September or October at times and the dry season for seven to eight months beginning from October to May of every year. Harmattan is experienced within the dry season likewise is the hot season (Akunlola, 2014).

The study area is a heterogeneously populated part of Kaduna state with almost two million people based on the 2006 census projection and it is next to the population of Kaduna the state capital. Majority of the population are Hausas, Fulani's, Ibos, katafs and Yoruba's. Zaria is also part of the Hausa plain in the Northern part of Nigeria (Ibid).

Zaria has a lot of institutions like Ahmadu Bello University Zaria, Federal College of Education Zaria, Nigerian college of Aviation Technology, Nuhu Bamalli Polytechnic to name but a few secondary, primary school and public and private markets, motor parks and other faculties and infrastructures. Zaria is densely populated settlements which have areas with high generation of waste. Its economic activities include teaching, buying and selling, farming among others. Trading as one of the major activities in Zaria range from petty trading to large scale in Samaru,



Sabon Gari, Tudun Wada, Kasuwan (markets) Dan-Magaji.

characteristic of the respondents, the methods of waste management, the impact of waste management in the study area among other things

**RESULT AND DISCUSSION**

This aspect of the paper presentation deals with the socio-economic

**Table.1:** Socio economic characteristics of respondents.

Sex	Respondents	Percentage
Females	90	45
Males	110	55
<b>Total</b>	<b>200</b>	<b>100</b>
Age group	Respondents	Percentage
15 – 19 years	5	2.5
20 – 24 years	10	5.9
25 – 29 years	20	10.0
30 – 34 years	35	17.5
35 – 39 years	40	20.0
40 – 44 years	20	10.0
45 – 49 years	10	5.0
50 – 54 years	20	15.0
55 – 59 year	20	10.0
60 years and above	10	5.0
<b>Total</b>	<b>200</b>	<b>100</b>
Educational background	Respondents	Percentage
Illiterate(Non-formal Education)	3	1.5
Primary school leaver	5	2.5
Secondary school leaver	10	5.0
NCE leaver	50	25.0
Polytechnic leaver	47	23.5
University Graduate	85	42.5
<b>Total</b>	<b>200</b>	<b>100</b>

Source: Field Survey, 2019

The socio-economic characteristics of the respondents are shown in table 1 above, as the Table shows that 55% of the respondents are males and the females constitutes 45% of the respondents. 20% of the respondents are within the age group of 35 to 39 years of age, while 17.5% of the respondents are within the age group of 30-34years of age. The age group within the

least percentage 2.5% and those with are 15 to 19 years.

For their educational background the respondents with the highest percentage of 42.5% are the university graduates. This is followed with those with the Nigerian Certificate in education 25.0% while those without formal education that is illiterates have the least 1.5%



**Table 2:** Methods of waste management system adopted in the study area.

S/N	Methods adopted in the study area	Frequency	Percentage
a.	Open burning	116	58.0
b	Dumping into water channels	10	5.0
c	Sanitary landfills	20	10.0
d	Incineration	25	12.0
e	Composting	20	10.0
f	Ploughing in fields	2	1.0
g	Hay feeding	2	1.0
h	Grinding and discharging into sewers	2	1.0
i	Salvaging	4	2.0
j	Fermentation and biological digestion	2	1.0
	Total	200	100.0

Source: Field Survey, 2019

Table 2 above identify ten (10) methods of waste management systems as; open burning, composting, dumping into water channel, fermentation and biological digestion, grinding and discharging into sewers, Hay feeding, incineration, ploughing in fields, salvaging and sanitary landfilling. The most common methods used by the respondents is open burning (58.0%) while the least methods utilized are fermentation and biological digestion and

ploughing, hay feeding, grinding and discharging into sewers fields with 1.0% each. In comparison to the study of urban Accra by Ramatta *et al* (2014) who confirmed that waste is managed by providing contractors with the use of community bins, ploughing in fields and the waste is at times deposited into drainage channels, streets, thereby resulting in environmental pollution creating risk to public health.

**Table 3:** Testing the Null Hypothesis on Waste Management Methods versus Educational Status.

S/N	METHODS OF WASTE MANAGEMENT	EDUCATIONAL STATUS OF RESPONDENTS							
		ILLITRATE (NON-FORMAL)	PRIMARY	SECONDARY	NCE LEAVER	POLYTECHNIC	UNIVERSITY	TOTAL	Percentage %
1	OPEN BURNING	1	2	5	20	17	5	50	25
2	SANITARY LANDHILLS	1	1	2	12	8	40	64	32
3	DUMPING IN WATER CHANNEL	1	2	2	10	11	15	41	20.5
4	USE OF INCINERATOR	0	0	0	0	2	5	7	3.5
5	COMPOSITION	0	0	1	0	4	13	23	11.5
6	PLOUGHING IN FIELD	0	0	0	5	3	4	10	5
7	HAY FEEDING	0	0	0	3	1	2	3	1.5
8	GRINDING & DISCAHRGING INTO SEWERIES	0	0	0	1	1	1	2	1
9	FERMENTATION & BIOLOGICAL DIGESTION	0	0	0	1	0	0	0	0
10	SALVAGING	0	0	0	0	0	0	0	0
		3	5	10	50	47	85	200	100

Source: Field Survey, 201



Using the data to test the null hypothesis that “there is no significant relationship between educational status and waste management methods used in the study area”.

Where Ho: M1= M2= M3 .....M6o

N=60 & df<sub>A</sub>= 60-1= 59

There are 10 groups. Hence t = 10 & df<sub>B</sub> =10-1= 9

Therefore, df<sub>W</sub> =df<sub>A</sub>-df<sub>B</sub> = 59-9 = 50

∴ G=2

$$\text{that is } \frac{G^2}{N} = \frac{(2)^2}{60} = 0.033$$

$$SS_T = \epsilon \epsilon \times \frac{2}{15} = \frac{G}{N} = 0.279 = 0.279 - 0.033 = 0.246$$

$$SS_B = \epsilon \frac{Si^2}{ni} - \frac{G^2}{N} = \text{where } N = 6 = 0.1503 = 0.1503 - 0.033 = 0.117$$

Therefore  $SS_W = SS_T - SS_B = 0.246 - 0.117 = 0.129$

Table 4: The ANOVA Summary Table

SOURCE	SS	Df	MS	F
Between samples (SB)	0.117	9	0.013	4.33
Within Samples (SW)	0.129	50	0.003	
<b>Total (All)</b>	<b>0.246</b>	<b>59</b>		

F = ratio for Df (9, 50) is 2.04 from the F- distribution table in Razaq Bello Research methods and statistical analysis (2000) appendix D. Since 4.33 is greater than 2.04; that is the calculated value for F-ratio is greater than the table (T) value by 2.29.

The null hypothesis is hereby rejected, which means there is a significant relation between educational background of respondents and waste management Method(s) used in Urban Zaria. From the observed management methods used by the sampled respondents who are dominantly (98.5%) literate throughout the study area, only three (3) non-formal

(illiterate) and the primary school leavers use the open burning, sanitary landfills and water channel dumping methods which are detrimental to both the environment and human health (Loms, 2010).

Furthermore, only respondents with polytechnic and university certification used the less hazardous and more efficient methods of incinerating, hay feeding, grinding and discharging into sewerages. This could be the reason for high (77.5%) used of the poor management methods because the open burning method, the used of sanitary land-fills and channel dumping methods are all used by the respondents.

Table 5: The Impact of Waste on Man and the Environment in the study area

	The impact of waste on man and the environment in the study	Frequency	Percentage
a.	Stench of bad odour outbreak of disease, attraction of flies and breeding ground for mosquitos	112	56.0
b.	Pollution of air, land and water	48	24.0
c.	Manure	30	15.0
d.	Flooding	10	5.0
	<b>Total</b>	<b>200</b>	<b>100</b>



Table 5 shows the impact of waste management on the environment in the study area, which includes; the stench of bad odour, the outbreak of diseases, attraction of flies and breeding ground for mosquitoes, flooding during rainy season, pollution of air, land and water and manure.

56.0% is for bad odour/ diseases, followed by 24.0% and the least is flooding with 5%. This is very relevant to the work of Ramatta *et al* (2014) in urban Accra where the indiscriminate dumping of refuse causes pollution and diseases outbreak among others.

**Table 6:** The Major Socio Economic Impact of Indiscriminate Waste disposal in the Area.

S/N	The socio- economic impact of indiscriminate waste	Frequency	Percentage
a.	Huge probe traffic along streets	58	29.0
b.	Increase in turbidity of market and substance of the area	34	17.0
c,	Decrease in patronage of business	50	25.0
d.	Increase of residence which leads to reduction in their productivity	28	14.0
e.	Other impacts specify smelly	30	15.0
	<b>Total</b>	<b>200</b>	<b>100.0</b>

Source: Field Survey, 2019

Table 6 highlights the socio-economic impact of indiscriminate waste disposal in the area. These impacts include huge probe traffic along streets, increase instability of market and substance of the area, decrease patronage of business in the affected areas, increase of residence which

leads to reduction in their productivity among others. The greatest socio-economic impact is the huge probe traffic along the streets with 29.0% while the least 14.0% is the increase of residence which leads to reduction in their productivity.

**Table 7.** Reasons for the improper management of waste in the study area

S/N	Reason for improper management of waste in the study area	Frequency	Percentage
a.	Absence of waste management service	40	20.0
b.	Ignorance and lack of gross enforcement units	68	34.0
c,	Lack of valuing the importance of the environment	36	18.0
d.	Irresponsible behavior of residents.	23	11.5
e.	Population increase	14	7.0
f.	Lack of sensitization programme to ensue good sanitation	19	9.5
	<b>Total</b>	<b>200</b>	<b>100.0</b>

Source: Field Survey, 2019

Table 5 identifies the reasons for lack of proper waste management in the study area which are numerous but the most prominent among them is ignorance and lack of law enforcement units (34.0%), while the least reason is increase in

population with 7.0%. Other reasons include the absence of waste management services, lack of valuing the importance of the environment, irresponsible behavior of residents and the lack of sensitization programme to ensure good sanitation



**Table 8:** Challenges encountered in waste management in the study area

S/N	The challenges	Frequency	Percentage
a.	Inadequate funds	52	26.0
b.	Conflicts and disagreement on who is responsible for the management of waste	22	11.0
c, d.	Lack of personnel and capacity to monitor and regulate sanitary officers.	126	63.0
	<b>Total</b>	<b>200</b>	<b>100.0</b>

Source: Field Survey, 2019

The challenges encountered in the management of waste in the study area are enumerated in table 6 as inadequacy of funds, lack of personnel and capacity to monitor and regulate the activities of sanitation officers and conflicts and disagreement on who is responsible for waste management in the study area. The highest challenges of waste management in the study area is the lack of personnel and capacity to monitor and regulate the activities of sanitary activities (63%) and the least 11.0% is conflicts and disagreement on who is responsible for waste management.

#### RECOMMENDATIONS

From the observations made the following recommendations are suggested.

1. With the inadequacy of professional sanitation officers there is the need to train new ones and retrain the older ones for the enormous task of waste management by both Kaduna state government and private agencies in the study area.
2. There is the need to create awareness of proper management of the environment so that the citizens will change from the careless attitude of depositing waste along roads believing that it is the duty of the government to keep the environment clean. The

awareness should include the health benefit of a clean environment.

3. There is need for modern and efficient waste management method like recycling waste, land filling, the burning of waste in incinerators. Some of the waste products can be recycled to useful materials such as fertilizers.
4. It is not just right for state government to establish an environment sanitation edict; there should be an effective monitoring and control of waste disposal by the Environmental Protection Agencies both at state and local government levels in Kaduna state.
5. There is also the need for Kaduna state government to make more funds available for waste management in the state so as to achieve good sanitation that is conducive for human habitation

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