

# Solid Waste Characterisation in Commercial Settings in Nigeria: A Case Study of Kantin Kwari Market in Kano Metropolis

<sup>1</sup>Nura Garba Mahmud, <sup>\*</sup><sup>1</sup>Ahmed Fate Ali and <sup>2</sup>Auwal Haruna Ismail

<sup>1</sup>Department of Environmental Management,  
Bayero University,  
Kano, Nigeria

<sup>2</sup>Department of Geography,  
Aminu Kano College of Islamic and Legal Studies,  
Kano, Nigeria

Email: ahmadpate@yahoo.co.uk

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## Abstract

*Kwari market is one of the biggest textile markets in Nigeria and sub-Saharan Africa. A lot of waste is generated daily from this market by the traders as well as the customers of the market. This research is aimed at studying the characterization and quantity of solid waste generated in the market. The methodological approaches employed for primary data collection were questionnaires and separation/weighing of the waste. Secondary data were also used in the research to fill the gap where primary data were not available. Availability and systematic sampling techniques were used to select the samples of the study. Simple statistics was used to process the data which were presented in tables, plates and explanations. The study reveals the composition of solid waste generated in the market with plastic waste having the highest quantity (135.58kg) followed by food remains (118.68kg), polythene (102.85kg), paper (62.99kg), polystyrene (58.56kg) and textile (46.08kg). These indicate high potentials of resource recovery from the waste generated. It is, therefore, recommended that stakeholders should be encouraged to practice waste segregation at source and increase reuse and recycling as much as possible. This could be achieved through public awareness and enlightenment campaigns on the importance of resource recovery in solid waste management in the market.*

**Keywords:** Solid waste, characterization, Kantin Kwari, Kano, Nigeria

## INTRODUCTION

People have been migrating from rural to urban areas in quest for a better living standard because of economic expansion in low-income countries (Lichter & Brown, 2011; Wagedie, 2018). As a result, the increase in the number of people living in cities of low-income countries increase the challenges that governments, urban planners, non-governmental service providers, and city dwellers face (Baqui, 2009). Low collection rates worsen the changing nature of solid waste from less organic matter to more plastics, paper, glass, packing materials, metal and other items (Solomon, 2011). Across continental Africa, thousands of tons of solid wastes are generated daily. Generation rates are reported to be around 0.5 kg per person per day, with some cases reaching as high as 0.8 kg per person

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*\*Author for Correspondence*

per day in a few cities (Dhokhikah & Trihadiningrum, 2012). Only a limited percentage of these solid wastes are disposed of correctly in approved landfills. The remainder is either discarded in open areas without treatment or left in public dumpsters with no one to properly dispose of them (Pradhan, 2009). These lead to pollution of surface and ground water resources, thereby posing serious public health risks (Kaoje *et al.*, 2019).

To address these challenges, effective waste management procedures are required for economic development, particularly in low-income nations (Zerbock, 2003). However, any effort towards effective waste management requires adequate information on characteristics of the solid waste and its sources. Information on the types and quantities of waste materials (food waste, paper, textile, glass, etc) in the waste stream is influenced by a variety of factors, including eating habits, cultural traditions, socioeconomics and climatic conditions. It differs not only from one city to another, but also within each city. Solid waste characterization aids in determining the amount of waste generated in a specific location at a specific time of the year and identifies generational trends as well as influencing factors. With that information, proper solid waste management can be pursued (Gawaika, 2004).

In Nigeria, many cities are dotted with piles of solid waste, the majority of which is combined with human and animal excrement, impeding access routes, drainage, and rivers. This popular practice is unsustainable and contributes to a wide range of health and environmental problems. While such concerns are easily generalized, tackling them require site-specific approach due to major differences in the quantity and diversity of waste generated in different places. This indiscriminate disposal is unsustainable and adds to Nigeria's already-existing environmental and public-health problems (Raimi *et al.*, 2017; Ali *et al.*, 2017). Flooding, the transfer and spread of preventable diseases and the destruction of places' visual attractiveness are only a few of them (Osonwa *et al.*, 2016). The situation in Kano is like many other cities across Nigeria and sub-Saharan Africa, in which waste collection services are poor or non-existent for many urban dwellers. As such, many tonnes of wastes are left uncollected on streets, drainages and open spaces. These create a breeding ground for disease-carrying pests and generating a plethora of other health and infrastructure problems (Nabegu 2008). Kwari market is one of the biggest textile markets in Nigeria and sub-Saharan Africa. A lot of waste is generated daily from this market by both the traders and the customers. To manage the solid waste effectively, there is need for adequate information about the quantity of waste generated and its composition. This research is, therefore, aimed at categorization and quantification of the solid waste generated in the market.

## **METHODOLOGY**

### **The Study Area**

This study was conducted in Kwari Market in the metropolitan city of Kano, Nigeria. The market is bordered by Fagge residential area from the north, Singa market from the east, Ibrahim Taiwo Road from the west and Kofar Mata residential area from the south. It is one of Africa's largest textile markets. Various types of clothing materials are available at the market. It is located at the centre of Kano metropolis, which is a city of over 5 million people and a population growth rate of 3% (REF). For decades, Kano metropolis has been one of the most important commercial and industrial nerve centres in Nigeria, attracting millions of people from all across the country and beyond (Nabegu, 2010).

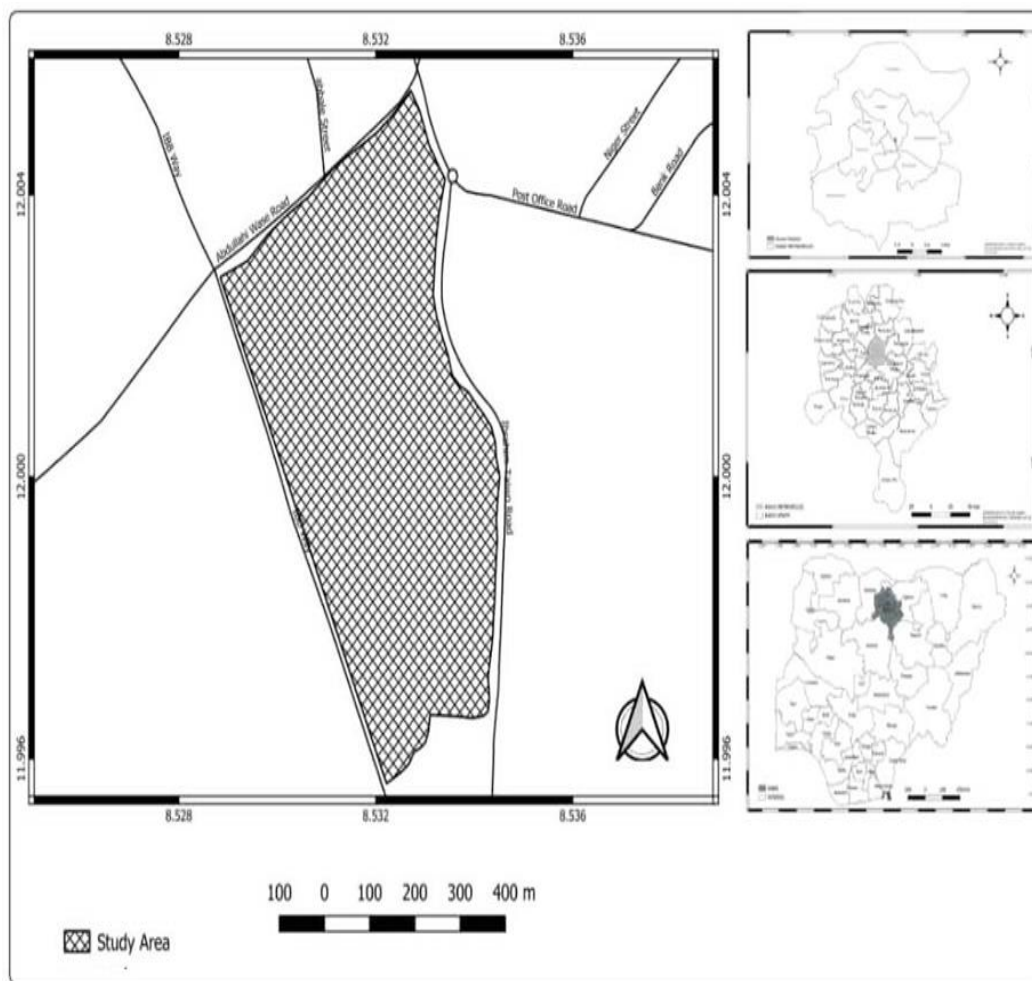


Figure 1: Map of the Study Area

### Sampling and Data Collection

According to the Kano state Kantin Kwari Management Board, there are a total of 10,157 shops in the market with about 30471 traders. The market is divided into groups A-J in which each group contains particular number of shops. In Table 1, the total number of shops from the market as well as the number of traders from each section are outlined. The number of questionnaires that were administered and the number of interviews conducted from each section of the market were all shown using the Yamane (1967) formula of sampling size. Also, the number of dustbins sampled for separation and weighing was shown.

Open and close type of questionnaire were used to collect information from the traders that generate the waste in the market using the availability method of sampling. This helps to identify the types of waste generated by each trader within the market. Also separation and weighing of the dustbins in the market was conducted to understand the characteristics and quantity of each category of waste generated from different locations within the market. A systematic method of sampling was adopted whereby a number of dustbins from each section of the market were selected with a fixed interval. The contents of each dustbin were analyzed and separated. A measuring scale was used to weigh each category to ascertain the weight (in kilograms) of each component.

**Table 1: Sampling size**

S/N	Groups	No. of Shops	No. of Trade	No. of Interviews	No. of Questionnaire	No. of Bins Sampled
1	A	1479	4437	5	62	10
2	B	1356	4068	4	51	9
3	C	1023	3069	3	41	6
4	D	815	2445	2	33	4
5	E	552	1656	2	17	3
6	F	1253	3759	3	43	7
7	G	904	2712	2	34	6
8	H	1379	4137	5	52	9
9	I	658	1974	2	19	3
10	J	738	2214	2	30	3
<b>Total</b>		<b>10157</b>	<b>30471</b>	<b>30</b>	<b>382</b>	<b>60</b>

## RESULTS AND DISCUSSIONS

### Demographic Characteristics of Traders in Kantin Kwari Market

Table 2 presents the demographic information of the respondents in the market. These data was collected to understand the characteristics of the waste generators because there might be a relationship between the gender, age, marital status and level of education of the traders on one hand, and the quantity and characteristics of the waste generated.

**Table 2: Demographic characteristics of the respondents**

Response	No. of Respondents	Percentage (%)
Sex		
Male	309	91.96
Female	27	8.03
<b>Total</b>	<b>336</b>	<b>100</b>
Marital Status		
Single	104	30.95
Married	232	69.04
<b>Total</b>	<b>336</b>	<b>100</b>
Age		
18-below	74	22.02
19-25	84	25
26-30	81	24.1
31-above	97	28.86
<b>Total</b>	<b>336</b>	<b>100</b>
Level Of Education		
Secondary	132	39.29
NCE/Diploma	113	33.63
Degree	75	22.32
Others	16	4.76
<b>TOTAL</b>	<b>336</b>	<b>100</b>

As presented in Table 2, the market is grossly male dominated as about 92% of the respondents are male. Only about 31% (104 respondents) are single while the remaining 232 (about 69%) are all married. This shows that majority of the traders in the market are married. This corroborates the findings of Iwena (2008) that one of the characteristics of low-income countries is early marriage especially among those engaged in primary production. In terms of age, 22.02% are 18years or below, 84 of them representing 25% are 19-25 years, 81 of them that represent 24.10% are 26-30 years, while the remaining 97, which represent 28.86% are 31

years and above. This means that most of the traders are within the age group of 31 years and above. This age group is the most productive in every country of the world (Abubakar, 2021). Regarding education, 132 of the respondents representing 39.28% have secondary school certificate, 113 that represent 33.63% have NCE/Diploma, 75 of them, which represent 22.32% are degree holders while the remaining 16, which represent 4.76% have primary education, Islamic education and so forth. Therefore, it can be stated that most of the traders did not go far in their studies.

**Waste Generated in Kantin Kwari Market**

To establish the compositional characteristics of the waste generated in the market, the study sought information from the traders that generate the waste. Table 3 presents the information about the waste generated in the market:

**Table 3: Waste generated by the respondents**

Response	No of Respondents	Percentage (%)
Paper	48	14.28
Plastic	84	25
Polythene	137	40.77
Others	67	19.94
<b>Total</b>	<b>336</b>	<b>100</b>

The result shows that 48 of the respondents, which represent 14.28% generate papers as their main waste, 84 of them, representing 25% generate plastics, 137 of the respondents that represent 40.77% generate polythene while the remaining 67 of the respondents, which represent 19.94% generate other type of waste like food remains, fabric, glasses and so forth. This means that generally, polythene is the most generated type of solid waste from Kantin Kwari market and paper is the least type of solid waste generated as can be seen in Plate 1. This corroborates the findings of Churchill (1998) that solid waste generated in markets include mainly, polythene bags, plastics, and waste from food wrapping, bottle, junks, and tins among others. This is because most of the traders use polythene for packaging of products and their cargo usually comes in plastic containers and sacks. Other wastes generated include food remains, dust, glasses, fabric and others.



**Plate 1: Segregation of waste generated in the market**



**Quantity of Waste Generated at Kantin Kwari Market**

Sixty (60) dustbins were sampled in the market to estimate the general quantity of waste generated in the market. The market was grouped into 10 groups (A-J) in which samples of dustbin were taken from each group using systematic sampling. It was found that plastic have the highest quantity followed by polythene, textile and food waste. This shows that most of the traders deal with a lot of plastic related materials that form a large part of their waste.

**Table 4:** Total quantity of waste generated in Kantin Kwari market

Group	Plastic (Kg)	Polythene (Kg)	Paper (Kg)	Food (Kg)	Polystyrene (Kg)	Textile (Kg)
A	14.41	20.97	5.37	33.59	8.78	5.89
B	22.84	17.65	6.39	27.07	8.80	5.63
C	12.20	5.97	3.36	11.80	5.18	3.49
D	11.52	6.32	7.32	7.55	4.74	4.46
E	10.38	6.79	3.64	5.41	3.10	3.33
F	16.35	10.64	9.49	7.30	7.47	6.18
G	15.32	12.61	8.52	7.72	6.96	5.72
H	20.74	12.46	10.88	11.23	8.21	7.09
I	4.02	3.58	2.54	2.56	2.14	1.37
J	7.80	5.86	5.48	4.45	3.18	2.92
<b>Total</b>	<b>135.58</b>	<b>102.85</b>	<b>62.99</b>	<b>118.68</b>	<b>58.56</b>	<b>46.08</b>

Table 4 shows the quantity of each category of waste generated from group A to J at Kantin Kwari market. It can be observed that plastic have the highest quantity among the solid waste generated with 135.58kg from the 10 groups or sections of the market. This may be due to the fact that most goods that are brought into the market come in plastic containers. Food remains has the second highest average constituting 118.68kg. Polythene constitutes an average of 102.85kg of the total solid waste generated. This could be because polythene bags are used for packaging and packing products throughout the market. It was also observed that textile materials was the least generated waste category with an average of 46.08kg. Polystyrene makes up an average of 58.56kg (it is generated mainly from disposable food containers). This contradicts the work of Churchill (1998) that 80% of market wastes are biodegradable and can easily be managed.



**Plate 4.2:** Weighing of waste generated in the market

### Conclusion and Recommendation

Based on the findings of this research, it is concluded that majority of the traders in Kantin Kwari market are males and most of them are married. Also, a large percentage of the traders are within the age group of 31 years and above with majority of them having secondary certificate. This shows that most of the traders did not go far in their studies. The dominant types of waste generated in the market are mainly of plastics and food wastes. This shows that most of the traders in the market deal with plastic related materials, which forms a large portion of their waste. It is, therefore, recommended that stakeholders should be encouraged to practice waste segregation at source and increase reuse and recycling as much as possible. This could be achieved through public awareness and enlightenment campaigns on the importance of resource recovery in solid waste management in the market.

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