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# **Waste Management System in low Income Communities within Katsina Central Senatorial Zone: Challenges and Opportunities**

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## **ABSTRACT**

This study explored waste management system in low-income communities within Katsina Central senatorial district while striving to identify challenges and opportunities in waste collection and management. Analysis of the study was made based six hundred and eighty-four (684) questionnaires that were returned (representing 83.41% of the questionnaire administered) which is more convenient and provide direct opportunity for the study to contact the respondents. Composition of waste within the study area includes; Food waste, Ash and Unburnt wood, Plastic wastes, Paper card, Waste from textile materials, Glasses, Metals and Garden wastes. Result from Chi-square hypothesis test revealed that plastic wastes, paper card and metallic wastes yields relatively higher income which has significant impact on the lives of the respondents within the study area. It is therefore recommended that authorities should device means of waste disposal which is environmentally friendly. It is also recommended that means of value addition to waste through the transformation of plastic wastes and paper cards into useful, innovative and ecofriendly material through recycling via simple technologies that will reduce the negative impact of waste while creating more job opportunities to low income households.

**Keywords:** Waste Management, Waste Disposal, Low income Communities, Opportunities, Katsina Central.

## **INTRODUCTION**

There has been a significant increase in the generation of leftovers arising from human and animal activities that are discarded and considered to be spoiled or rejected and could no longer be used for their original purposes (solid waste) and could not be put to other uses as they have lost their original utilities, this could be gaseous, unwanted liquid substances which emanates from residential, industrial, commercial, institutional, medical or Agricultural waste which largely depend on the structures existing within the settlements. These wastes are usually considered as harmful and hazardous, leading spread of diseases, flooding and loss of lives which call for effective and efficient waste management.

In Nigeria, the amount solid waste was generated in every household within the low income communities was estimated at 0.49kg per day, this has accounted for about 90% of the municipal solid waste generated (see Solomon, 2009). Increase in population within the low income areas in Nigeria have triggered the subsequent increase in municipal solid waste which was also estimated at 40, 959 tons per day in 2012 and this according to Hoornweg et-al (2012) is predicted to rise to 101, 307 tons per day. Despite the increase of solid waste, many settlements in Africa are faced with the major challenge of insufficient collection of waste and inappropriate final disposal of waste (Grova and Singh, 2014), this led to increase in fiscal burden to both public authorities and private individuals as these wastes are mostly disposed in open dumps, deposited in vacant land or burnt in residences which generated significant pollution problems, in addition to the risks of human health and environmental hazards especially within low income communities that lack appropriate waste management system and which are gradually becoming threats to human life as it causes environmental contamination and which requires effective solid management system that is becoming an important and integral service for urban and semi-urban settlers and have, in recent years, attracted the attention of successive public authorities towards achieving sustainable economic growth and development.

To mitigate the relative impact of environmentally hazardous objects and substances that pollutes the environment within the low income settlements, some of the waste could be used could be transformed and be put to other uses which could stimulate the income of the settlers and serve as a means of earning livelihood especially within the low income communities. In recent years, several studies were conducted to ascertain the numerous ways through which solid waste could be transformed and become useful to human lives and which will stimulate income streams of the low income populace. These studies include; Henry et-al (2006), Namerow (2009), Ticoli (2012) and Zaboori and Ghani (2017), these studies were sensitive to the possibilities of solid waste becoming a source of earning a source of livelihood within low income communities, though, collection and disposal of environmental waste in low income communities have the challenges of insufficient financial resources needed for the effective management of waste, proper organization and multidimensionality of the composition of waste poses a serious threat to the effective management of waste, hence, the need for thinking outside the usual box and identifying different spheres through which environmental waste could form an opportunity for the low income populace to generate income and earn a means of livelihood. It is against this background that this study intends to identify waste management system within Katsina central senatorial district with the keen interest in exploring the possible means through which environmental waste could provide a means of generating income among populace within low income communities within the study area.

### **Objectives of the study**

This study intends to examine the waste management system in low income communities within the Katsina central senatorial district and to explore the possible means through which environmental waste could serve as a source of income to the populace within the low income communities in the study area, the study intends to Examine the Waste management system in Katsina central senatorial district. and Explore the means of earning livelihood from environmental waste in Katsina central senatorial district.

### **LITERATURE REVIEW**

Solid Waste refers to the materials discarded in the urban and semi-urban areas for which municipalities are usually held responsible for collection, transport, and final disposal. Solid waste encompasses household refuse, institutional wastes, street sweepings, and commercial waste, as well as construction and demolition debris. In developing countries, MSW also contains varying amounts of industrial waste from small industries, as well as dead animals and fecal matter.

Collecting, transporting, and disposing of Solid Waste according to Martin (2010) represents a large expenditure for developing country cities: waste management usually accounts for 30–50 per cent of municipal operational budgets. Despite these high expenses, cities collect only 50–80 per cent of the refuse generated.

### **Waste Management**

According to Saxena et al., (2010) Waste management includes collecting, sorting, processing, recycling, and providing a source of energy and resources when adequately supported. The production and manufacturing of items require a lot of precious energy and resources, which can be challenging to manage. Proper waste management is very important to protect our environment and also there is a need to educate the people and companies themselves about the environment. Moreover, key components of solid waste management are classified into five, namely; Generation, storage, Collection, Transportation and disposal. Several types of waste management exist; some of which according to Iqbal, Naz and Naseem (2021) includes; Landfills Waste disposal in a waste site which requires waste burying, in most countries is still a widespread practice. Landfills in disused or abandoned quarries were regularly built. A well-managed and properly designed landfill can be a clean and comparatively low-cost technique of waste material treatment Incinerators/combustion; In Incineration or combustion, waste material goes through a heat linked combustion process. It is also called "thermal treatment" as it is a high-temperature waste treatment system. Incinerators transform waste into gas, heat, ash, and steam. Incineration is commonly used in those countries which have rarer land as in incineration method normally not much area is used as in landfills.

Other types of waste management include Composting which is a naturally carried out process of organic materials decomposition. Where people have their land organic waste can be dug into humus and fiber.

Recovering and Recycling: "Recycling" is an environmentally friendly way to manage waste. This approach refers to find out the way to recycle your waste instead of letting it to the landfill.

### **Challenges of Waste management**

Some of the major challenges of waste management includes; Hazard which is The first and main challenge in waste management processes is to make sure that consumers and recyclers are both protected from poisonous and hazardous chemicals present in waste (Viljoen et al., 2021). Next is the high costs involved in solid waste management, It can be quite expensive to set up and improve waste collection, recycling, treatment, and disposal systems. Building and managing sanitary landfills and incineration plants, for example, necessitates significant capital expenditures as well as significant running and maintenance costs (Wilson et al., 2010). Furthermore, this cannot be viewed as short term profitable investment because implementing sustainable waste management solutions necessitates a large sum of money (Ziraba et al., 2016).

Other challenges include Lack of waste management sites: Because of the prevalence of the Not In My Backyard (NIMBY) mentality among communities, finding acceptable locations for waste treatment plants is becoming increasingly challenging. Meanwhile, if garbage grows at a rate of 3% to 5% per year as well as the rural to urban migration raises the population of cities at the same rate, garbage creation in a city will be twice every ten years (Wilson et al., 2010). Next is the Quality of recycled products, down cycling, the recycling process that converts waste materials into low-quality items, may wreak havoc on the quality of secondary products.

### **Benefits of Waste Management**

Despite environmental hazard and adverse effect of waste on human lives, Iqbal, Naz and Naseem (2021) identified the under listed benefits of an effective waste management;

To start with Pollution reduction, properly managed garbage not only eradicates consequent waste but also lessens the intensity and impact of hazardous green-house gases like CO, CO<sub>2</sub>, and CH<sub>4</sub>. These gases are recurrently released by the collected waste in the landfills (See, Amasuomo and Baird, 2016). Next is Job creation in which Hundreds of jobs are created by the recycling business alone. Organizations that create and sell recycled products will become more prominent as more individuals adopt this environmentally responsible activity. This helps them grow their business and creates hundreds of jobs.

Other benefits are the Energy conservation, Recycling as an imperative waste management component helps to preserve energy over time. One of the most visible instances of this advantage is the practice of recycling paper. Thousands of tree are presumably cut down to make paper, as we all know. The requirement for trees to be cut down is greatly reduced when used paper is recycled. Lastly, Social Impact, Improved waste management not only creates jobs but also improves the quality of life of residents by increasing sanitation and decreasing health hazards related to the inadequate collection of waste and unlawful dumping.

### **Empirical literature**

Population growth and economic activity in rural areas are factors driving the waste generation rate. Semi-urban and Rural waste management generally still applies conventional patterns and has the potential to damage the environment and threaten human health. This section reviews previous studies on environmental waste management and the opportunities arising from solid waste management as it appears in scholarly write-ups.

To begin with reasons for increase in environmental waste in semi-urban settlements, Zahoori and Ghani (2017) in a study on municipal solid waste management challenges and problems of cities in low-income and developing countries, this study reported that migration from rural to urban areas have resulted in an unplanned settlement in semi-urban areas accommodation leading to increase in solid waste and expand the vulnerabilities of surface and ground water pollution which increases as a result of the inadequate surveillance and effective waste management while neglecting the severity of the harmful impact of environmental waste. This was supported by the findings of Syafrudin, Masjhoer and Maryono (2023) posits that population and economic growth in rural regions lead to rapid waste generation and that local government in developing economies do not give the much needed attention and which lead to conventional waste management which could trigger health problems and threatens human lives. Furthermore, Yakubu et-al (2023) studied generation and composition of solid wastes in low income areas of Jos, Plateau State, this study also reported that solid waste mostly composed of biodegradable (65.2%) recyclable (13.2%) residual (21.6%), though, urbanization is identified to be responsible for the increase of solid waste which ranges between 1.7kg to 18.3kg per week in every household. This study was silent on how this composition of environmental waste could be to useful products.

In a related development, Babyloni, Manimanga and Pydimila (2014) explored the major sources of waste with the keen interest in identifying possible process of converting solid waste to sustainable products. The study opined that the generation of wastes beyond handling capacities of government and the need for eco-friendly products to minimize the relative impact of environmental wastes calls for the residues to make useful products from environmental wastes in addition to the production of bioplastics from toxic chemicals, essential oil from dry leaves and agricultural wastes to paper products so as to save the environment and progress to the path of sustainable development and minimal wastage. This study was silent on how these wastes could be transformed to the types of the products mentioned.

### **DATA AND METHODOLOGY**

A mixed method of data collection strategy was adopted via a combination of both qualitative and quantitative methods, this includes Primary data which was sourced mainly from the administration of 820 questionnaires based on non-probability sampling technique, 684 questionnaires were returned (83.41% of the questionnaire administered) which is more convenient and provide direct opportunity for the study to contact the respondents. Other means of data generation includes experiments and waste composition analysis.

Data was analyzed using descriptive statistics presented in tables to indicate frequencies and percentages, while inferential statistic includes Chi-Square ( $X^2$ ) Which was conducted to investigate the difference in income of the households dealing with any of the composition of waste within the study area. Chi- Square estimation was made through equation 1 below:

Chi-Square is given by  $X^2 = \frac{\sum(f_o - f_e)^2}{f_e}$ .....(1)

Where  $f_o$  is the observed frequency and  $f_e$  is the expected frequency to be measured against critical values  $X^2_{df} = (r - 1) (c - 1)$  where  $r$  is the number of rows and  $c$  is the number of columns in the table.

Table 1: Demographic Characteristics of the Sample Studied

Variables	Type	Frequency	Percent (%)
Gender	Male	572	83.63
	Female	112	16.37
Age (in years)	18 – 30	123	17.98
	31 – 40	273	39.91
	41 – 50	167	24.42
	More than 50	121	17.69
Education	First school leaving certificate	216	31.58
	Secondary School	257	37.57
	NCE/Diploma	109	15.94
	Bachelors	102	14.91

Source: Field Work, 2024.

Table one presents the demographic characteristics of the respondents, it begins with gender in which five hundred and seventy-two (572) are male representing 83.63% while one hundred and twelve (112) representing 16.37% are female. Ages of the respondents indicates that one hundred and twenty-three (123) are between the ages of 18-30 representing 17.89% of the sample, two hundred and seventy-three (273) are between the ages of 31-40 which represent 39.91%, one hundred and sixty-seven (167) of the respondents are between 41-50 years while one hundred and twenty-one (121) respondents are above 50 years of age and which represents 24.42% and 17.69% of the respondents respectively. Educational Attainment of the respondents, two hundred and sixteen (216) respondents have first school leaving certificates, two hundred and fifty-seven (257) have secondary school certificates, one hundred and nine (109) have either NCE or Diploma, while one hundred and two (102) have first degrees.

Table 2: Income and Mean Waste Generation

Household Monthly Income (NGN)	Number of Households	Average waste Generation Rate (kg/cap/day)
< 18,000	73	0.29
18,000 – 50,000	371	0.47
51,000 - 100,000	215	0.53
101,000 – 150,000	14	0.64
>150,000	11	0.73

Source: Field Work, 2024.

Table 2 presents a summary of the monthly income of the respondents and average waste generation rate in kilogram per day within the study area. Seventy-three (73) households earn a monthly income of less than N18,000 with a waste generation rate of 0.29kg of waste generation. Three hundred and seventy one (371) earn between N18,000 to N50,000 monthly with a corresponding average waste generation of 0.47kg, two hundred and fifteen (215) households earn between N51,000 to N100,000 with a corresponding average waste generation rate of 0.53kg, 14 households earn between N101,000 to N150,000 monthly, with a corresponding average waste generation rate of 0.64kg while eleven (11) Households earn above N150,000 with a corresponding average waste generation rate of 0.73kg.

Table 3: Overall Composition of Waste/Quality of Waste Components

Category	Total waste (kg)	% of waste sampled
Food	179.1	36.55
Ash/unburnt wood	113.3	23.12
Plastic	76.4	15.59
Paper/card	27.3	05.57
Textile	19.8	04.04
Glass	17.4	03.55
Metals	26.2	05.35
Garden Wastes	19.3	03.94
Others	11.2	02.29

Source: Field Work, 2024.

Table 3 presents the overall composition and quality of waste sampled within the study area. It composes of 179.1 kg (36.55) of food waste, 113.3Kg (23.12%) of Ash and unburnt wood, 76.4Kg of Plastic Waste which represent 15.59%, Paper card has 27.3Kg (5.57%) of the waste sampled, 19.8Kg of Textile waste (4.04%), 17.4Kg of waste from glasses amounting to 3.55%, 26.2Kg of Metallic waste (5.35%), 19.3Kg of garden waste and 11.2Kg of other wastes representing 3.94% and 2.29% respectively.

Table 4: Means of Waste Disposal

Means	Frequency	Percentage (%)
Burning at backyard	378	55.26
Throwing in water bodies	172	25.15
Takes to public waste container	98	14.33
Throwing in to the pit	36	05.26

Source: Field Work, 2024.

Table 4 presents means of waste disposal within the study area, three hundred and seventy-eight (378) respondents (55.26%) disposes waste through burning at backyard, one hundred and seventy-two (172) disposes by throwing in water bodies, ninety-eight (98) representing 14.33% disposes wastes in public containers while thirty-six (36) respondents threw their wastes into the pit.

Table 5: Income generated from Wastes

Component	Frequency	Range of Income Generated /Month (NGN)
Food	61	1,000 – 15,000
Ash/Unburnt wood	42	3,000 – 18,000
Plastic	143	7,000 – 68,000
Paper/Card	101	4,000 - 52,000
Textile	32	1,000 – 8,000
Glass	16	1,000 – 4,000
Metals	248	21,000 – 60,000
Garden Wastes	57	4,000 – 10,000
Others	0	0

Source: Field Work, 2024.

Income generated from wastes is presented in table 5, sixty-one respondents earn between N1,000 to N15,000 from food waste, Ash and unburnt wood gives an income that ranges from N3,000 to 18,000, one hundred and forty-three (143) of the respondents earn between N7,000 to N68,000 monthly from plastic wastes, paper cards gives an income that ranges from N4,000 to N52,000 while Textile waste gives an income that ranges from N1,000 to N8,000 monthly. Wastes from Glasses attracts an income

that ranges from N1,000 to N4000 monthly while Garden wastes gives a range of N4,000 to N10,000 monthly.

Table 6: Chi-Square Hypothesis Testing

Variable	Co-efficient	Assumption Sig
Food	3.287	0.030
Ash/Unburnt wood	3.396	0.162
Plastics	1.324**	0.003
Paper/Card	2.733**	0.004
Textile	1.646	0.074
Glass	2.168	0.033
Metals	1.998*	0.001
Garden waste	1.217	0.020

Source: Author's Computation Using SPSS 21.0

Indicates Level of significance at 1% (\*), 5% (\*\*), 10% (\*\*\*) respectively.

Results of Chi-Square hypothesis test was presented in Table 6 which is conducted to show the significant impact of the various components of wastes on income of residents within Katsina Central Senatorial district. The result indicates that Plastic wastes, Paper cards and Metallic wastes has significant impact on the income streams of the residents that deals in waste as a means of generating income, with the Co-efficient of 1.324 and 2.733 which are statistically significant at 5%, while Metallic waste has coefficient of 1.998 which is statistically significant at 1%.

### DISCUSSION OF FINDINGS

Demographic Characteristics of the respondents within the study area is presented in the first table, it revealed the Gender, Ages and Educational status of the respondents within the study area. The second table presents a summary of the monthly income of the respondents and average waste generation rate in kilogram per day within the study area. Seventy-three (73) households earn a monthly income of less than N18,000 with a waste generation rate of 0.29kg of waste generation. Three hundred and seventy one (371) earn between N18,000 to N50,000 monthly with a corresponding average waste generation of 0.47kg, two hundred and fifteen (215) households earn between N51,000 to N100,000 with a corresponding average waste generation rate of 0.53kg, 14 households earn between N101,000 to N150,000 monthly, with a corresponding average waste generation rate of 0.64kg while eleven (11) Households earn above N150,000 with a corresponding average waste generation rate of 0.73kg.

the overall composition and quality of waste sampled within the study area shows that 179.1 kg (36.55) of food waste, 113.3Kg (23.12%) of Ash and unburnt wood, 76.4Kg of Plastic Waste which represent 15.59%, Paper card has 27.3Kg (5.57%) of the waste sampled, 19.8Kg of Textile waste (4.04%), 17.4Kg of waste from glasses amounting to 3.55%, 26.2Kg of Metallic waste (5.35%), 19.3Kg of garden waste and 11.2Kg of other wastes representing 3.94% and 2.29% respectively. While means of waste disposal within the study area shows that three hundred and seventy-eight (378) respondents (55.26%) disposes waste through burning at backyard, one hundred and seventy-two (172) disposes by throwing in water bodies, ninety-eight (98) representing 14.33% disposes wastes in public containers while thirty-six (36) respondents threw their wastes into the pit.

Income generated from wastes is presented in the fifth table where sixty-one respondents earn between N1,000 to N15,000 from food waste, Ash and unburnt wood gives an income that ranges from N3,000 to 18,000, one hundred and forty-three (143) of the respondents earn between N7,000 to N68,000 monthly from plastic wastes, paper cards gives an income that ranges from N4,000 to N52,000 while Textile waste gives an income that ranges from N1,000 to N8,000 monthly. Wastes from Glasses attracts an income that ranges from N1,000 to N4000 monthly while Garden wastes gives a range of N4,000 to N10,000 monthly.

Results of Chi-Square hypothesis test which is conducted to show the significant impact of the various components of wastes on income of residents within Katsina Central Senatorial district. The result indicates that Plastic wastes, Paper cards and Metallic wastes has significant impact on the income streams of the residents that deals in waste as a means of generating income, with the Co-efficient of 1.324 and 2.733 which are statistically significant at 5%, while Metallic waste has coefficient of 1.998 which is statistically significant at 1%.

## CONCLUSIONS

Results from analysis in the previous parts of this article revealed the composition and quality of wastes within the study area while exposing the relative earnings accruing to respondents that deals in waste as a means of earning income. Major components of waste within low income communities is found to be food waste and Ash/unburnt wood. The study also found that wastes within the study area is mostly disposed through burning at the backyard or throwing in water bodies which are proved to be environmentally hazardous. Lastly, the study found that plastic wastes, paper card and metallic wastes yields relatively higher income which has significant impact on the lives of the respondents within the study area. It is therefore recommended that authorities should device means of waste disposal which is environmentally friendly. It is also recommended that means of value addition to waste through the transformation of plastic wastes and paper cards into useful, innovative and ecofriendly material through recycling via simple technologies that will reduce the negative impact of waste while creating more job opportunities to low income households.

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