

Assessing the Knowledge of Household Practice and Solid Waste Characterization in Lokoja Metropolis

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Abstract

The study investigated the extent to which household solid waste characterisation knowledge was practised as a unit of waste management in the Lokoja metropolis. It focused on households' knowledge, attitudes and practices in waste separation and also analysed the determinants of these practices. The survey was conducted on 384 homes using systematic random sampling techniques. The questionnaire utilised for the study targeted household heads. In the absence of a male household head, it was administered to the next eldest person, irrespective of gender. Descriptive statistics were utilised to analyse the data collected for the study on the knowledge of solid waste and the reasons for engaging in solid waste management practices. The Pearson Correlation analysis technique was employed to understand the determinants of household solid waste segregation. The findings revealed that a significant number of households had knowledge of solid waste separation. However, they practised it for different reasons, such as time-consuming, financial constrain, and waste bin cost. The study observed a significant negative correlation between solid waste segregation and household income, with a negative correlation value of -0.735 and a p-value of 0.002. This is less than the alpha significance level of 0.005, and the correlation value is negative. The result implies that an increase in household income is associated with a decrease in the level of solid waste segregation. The p-value of 0.056, greater than the alpha value of 0.005, implies a weak correlation between solid waste segregation and educational level. This implies that educational level has little or no influence on solid waste segregation in the Lokoja metropolis. Providing garbage collection bins to households was recommended to be a good starting point and encouragement towards effective and efficient solid waste segregation in the Lokoja metropolis.

Keywords: *solid waste, waste segregation, assessing, household, management.*

Introduction

In the context of Integrated Solid Waste Management, waste is regarded both as useless and as a helpful material providing a potential source of income. It can, in fact, be the only free resource available to poor people or urban dwellers who cannot cut wood or use other common property resources available in the country. (Klundert & Anschue, 2001). There are many categories of solid waste, such as food waste, rubbish, commercial waste, institutional waste, street sweeping waste, industrial waste, construction and demolition waste, and sanitation waste. Solid waste contains recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines), compostable organic matter (fruit and vegetable peels, food waste) and medical waste

(blood-stained cotton, sanitary napkins, disposable syringes) (Jha et al., 2003).

As towns and cities around the world expand and population increases, so do volumes of waste generated increase and the challenges of solid waste change. Effective and sustainable waste management through source reduction and recycling goes hand-in-hand with good local governance and sound municipal management. Solid waste disposed of in a landfill requires a complex process, leading to hazardous emissions like Sulphur, carbon monoxide, lead oxide, etc. The dangerous emissions threatened human health and quality of life in the metropolis. The government and stakeholders require a range of programs and policy instruments to manage this waste appropriately. Creating an environmentally sustainable community

requires the involvement of households in recycling solid waste (Kato et al., 2015). As such, it is necessary to increase public awareness of waste generation and separation at the source. This will reduce the volume of waste to be disposed of. Waste reduction can help reduce government expenditures and investment by lowering collection, treatment and disposal costs, and it can also protect the environment (Walailak, 2002).

Waste minimisation is a technique used to achieve waste reduction, predominantly through source reduction by characterisation but also by recycling and reusing materials. The benefits of waste minimisation are environmental and financial and comprehensive in their coverage (Vipin et al., 2012). Most recent studies recommend reusing and recycling of solid waste (Pokhrel & Viraraghavan, 2005; Banga, 2008; Ekere & Drake, 2009). However, for any recycling activity to occur, the waste must be characterised. One of the problems of waste management in Nigeria is the absence of a culture of waste characterisation at the generation points.

Therefore, this study seeks to evaluate the knowledge and practice of solid waste characterisation by households in the Lokoja metropolis. The study reviews relevant literature on solid waste characterisation and its importance, examines the extent to which households have knowledge of the practice and their attitude towards it and then makes recommendations towards promoting the practice.

Literature Review

Solid waste is the unwanted or useless solid materials generated from residential, industrial and commercial activities in a given area. It may be categorised according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper); or according to hazard potential (toxic, non-toxic, flammable, radioactive and infectious (Sanjay et al., 2015)). Recycling is a method of solid waste management like controlling or incineration, but it is environmentally more desirable (Ruzi, 2001). Recycling can help the economy by recovering and reusing valuable materials. Recycling reduces the amount of waste that needs to be collected, transported and disposed of and extends the life of disposal facilities, saving the agency money (Ogwueleka,

2009). Household solid waste characterisation requires cleaning or washing the recyclables, sorting them into different materials, storing them in the household's premises, setting them out for collection or bringing them to drop-off zones.

Waste characterisation refers to a solid waste management practice of separating and storing different materials found in solid waste to promote recycling and re-use of resources and reduce waste volume for disposal (ability to sort out waste into different components for recycling purposes). Waste recycling at the household level refers to resource recovery activities such as recovering or diverting wastes from the waste stream to reuse, sell, give away or compost in the case of food waste. (Eugenia et al., 2002).

Solid waste separation of reusable and recyclable material starts at the source of waste generation by the residents, municipals or local governments (LG's) employees, private sector, etc. This is done in different ways and according to the considered waste collection system such as curbside collection and/or drop off centre. As pointed out, there are many advantages to applying separation at source (Lardinios & Fured, 2007).

- i. Achieving high separation rates.
- ii. Promotes clean, marketable materials
- iii. Limiting levels of contamination.
- iv. Not disposing of recyclable materials as solid waste.

Waste recycling is often seen as essential to an efficient and effective solid waste management system. Many substances in refuse have value. They include glass, wood, fibre, paper products and metals. Scientists have developed ways of recycling many wastes to be used again. As defined by Schultz et al. (1995), recycling is the process through which materials previously used are reused. A recycling program can only be successful if people support and actively participate in it. As pointed out by Thomas (2001), the diversion of waste to recycling will depend not only on the number of people who participated but on how well they do so and how effectively they participated.

Methodology of the Study

The study was conducted in the Lokoja metropolis, Kogi state, one of the major cities in North Central Nigeria. (Fig 1). Based on the 2006 census, the city has a population of 1,148,035, projected to be 2,137,027 by 2021. Data were collected from 384 households using systematic random sampling at an interval of one out of every ten households based on the population and household size. Out of this, only 357 questionnaires were successfully retrieved (93% of the total households in the sample). Also, structured interviews were conducted to collect data on household knowledge, attitudes and practices of solid waste characterisation in the study area. Descriptive statistics involving the use of frequency and percentages were used. Under the inferential statistics, a Pearson correlation analysis was carried out to determine the existence and extent of the relationship between household solid waste characterisation and income and educational levels, which are determinants for household characterisation knowledge.

The Study Area

Lokoja metropolis is the study area. It became the capital of Kogi State when it was created in 1991(Olawepo, 2009). The city is located between latitude 70 45' 27.56" -70 51' 04.34" N and longitude 60 41' 55.64" -60 45' 36.58" E of the equator with a total land coverage of about 63.82 sq. km. (Adeoye, 2012). The city is strategically located on the confluence of Rivers Niger and Benue, thus giving the city a unique geographical location both nationally and internationally (Olawepo, 2009). Lokoja was Nigeria's first administrative and commercial capital, which ended in 1960 (Ali, 2012). The city's location and surrounding geographical features have influenced the growth pattern over the years, from a small fishing village to its present political status. The linear development along Kabawa, Ganaja Road and Muritala-Muhammed Way is one of the prominent features of the city. Cluster population areas are in Adankolo, Angular Yashi Phase 1&2 areas of Lokoja. The two features have led to the concentration of commercial activities and residential areas along the roads and the subsequent heavy traffic generated by them.

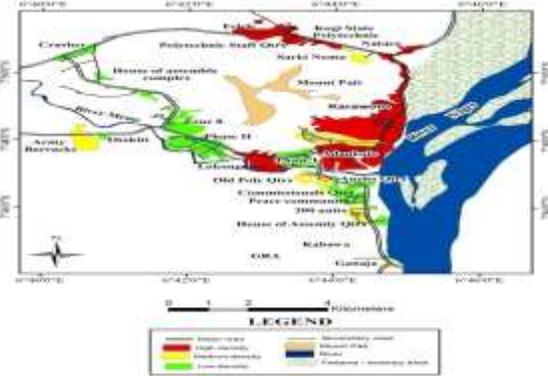


Figure 1: Lokoja Built-up Areas.

Results and Discussion

General Characteristics of the Respondents

The majority of the respondents were females (66.2%). The explanation is based on the fact that female members of the households were mostly found at home at the time of the survey. Furthermore, most of the husbands referred the questionnaire administration to their wives because they believed they were responsible for handling most of the household solid waste. The average household size is 8 people. 7.2% of the respondents had only Islamic education, 31.5% had primary education, 33.3% had secondary education, and the remaining 28% had different levels of tertiary education. This finding helped the researcher to determine how knowledgeable the respondents were in sorting out waste generation, collection and characterisation in the study area. The average monthly income per household sampled is 30,000 Naira.

Knowledge and Attitudes Towards Waste Characterisation

Sixty-two per cent (62%) of the households admitted having heard about waste characterisation (Table 1.0). They explained how they segregate solid waste into plastic bags, glasses, peelings (such as banana and yam) and metal. Others mentioned that waste separation also takes place at landfills. Furthermore, 40.1% of households said they heard of solid waste segregation from friends and relatives, 43.9% of the households heard about it from itinerant buyers, 9.2% from newspapers and magazines and 6.8% said they had learnt about it at school.

Households also expressed their opinion about solid waste separation in their homes. Approximately 46% of the households said it was a good idea. In contrast, 54.4% of the households (54.4%) said they did not support it because they felt it was a waste of time and led to dirty environments; hence, it should not be done at home but rather at collection points or the landfill.

When asked about their recycling knowledge, 156 respondents (43.7%) indicated that they had heard about it. The main source of information was from scrap (metal, plastics, paper, polythene and glass) dealers. Households were further asked if they had seen products from recycled materials. Three hundred forty-four of the respondents (96.4%), which represents the majority knew about recycled products from metal (charcoal stoves), building equipment, and domestic utensils (such as pots and saucepans), old tyres (ropes and fetcher) and straws (mats and bags). Households reported that the recycled products from metal were beneficial to them. They agreed that recycling metals have benefits because products from recycled metals are cheaper than the items produced from new materials.

Table 1.0: Knowledge of Segregation and Recycling

Knowledge of Segregation	No	%
Absolute knowledge	222	62.2
No knowledge	135	37.8
Total	357	100
Source of information		
Family and friends	143	40.1
Itinerant buyers	158	43.9
Newspapers and magazines	33	9.2
School	24	6.8
Total	357	100
Household Solid Waste Separation		
Good Idea	163	45.6
Not a good idea	195	54.4
Total	357	100
Knowledge of Recycling		
Correct	156	43.7
Wrong	201	56.3
Total	357	100
Knowledge of Recycle Product		
Perfect	344	96.4
No ideal	23	3.6
Total	357	100

Source: Author's fieldwork (2020).

Reasons for Engaging in Solid Waste Characterisation Practices

A breakdown of the reasons why households engage in the practice of solid waste characterisation (table 2.0). Out of the 222 respondent households involved in the waste separation, sixty-seven per cent of the households (67%) participated in waste characterisation because of the extra income earned from the separated waste. In contrast, the other households separated waste because they wanted it to be efficiently disposed of, and some respondents did so to make manure from the separated waste. These represented 6.3% and 21.3% of the households, respectively. Others had a combination of the other reasons (5.4%).

Table 2.0: Reasons for Engaging in Solid Waste Characterisation Practices

Reasons for Engaging	No	%
Extra Income	149	67
Efficient Disposal	14	6.3
Manure From separated Waste	47	21.3
Others	12	5.4
Total	222	100

Source: Fieldwork (2020).



Fig 2: Reasons for Engaging in Solid Waste

Characterisation Practices

Eighteen-point three per cent (18.3%) households responded to mostly separating broken and whole bottles, thirteen-point five per cent (13.5%) households engage more with metallic waste (13.5%) and seventeen-point six per cent with plastic waste (17.6%). The organic wastes are also sometimes fed to their animals. The separation of organic waste and making good use of it is a sign that, with time, there will be no organic waste in the waste stream. This will reduce the amount of waste disposed of at the landfill.

Table 3.0: Types of Materials Separated by Households

Materials	No	%
Plastic	46	17.6
Bottles	54	18.3
Metal	31	13.5
Organic	91	50.6
Total	222	100

Source: Fieldwork (2020).



Fig 3: Types of Materials Separated by Households

Reasons for not Separating Solid Waste

The households gave various reasons for not practising waste separation activities shown in Table 3. Out of the 135 respondents who do not engage in solid waste separation, their reasons are; separation is time-consuming (25.7%), lack of ready market for segregated waste (9.1%), not being able to afford separate bins for separated waste (14.4%), they do not

see the importance of separating since the waste is dumped together on the same truck or at the communal containers (8.0%), and lack of space (18.5%). Other households said they did not separate the solid waste because they (11.1%) already paid for waste collection. Therefore, they did not see why they should bother separating waste. The remaining 13.2% of the respondents had various reasons for not engaging in segregation.

Table 4.0: Reasons for not Separating Solid Waste

Reasons	No	%
Lack of space	25	18.5
Separation is not important	11	8.0
Separation is time-consuming	35	25.7
No ready market for recyclables	12	9.1
Cannot afford separate bins	19	14.4
I pay for solid waste collection	15	11.1
Others	18	13.2
Total	135	100

Source: Fieldwork (2020).



Fig 4: Reasons for not Separating Solid Waste
Source: Fieldwork 2020.

However, households not engaged in separating solid waste were asked what would be done to make them separate their waste before disposal. Some of them said if there is a market for the separated items (42.2%), while 35.8% said they could separate waste if they are supported by giving them containers where they will put the separated waste. The remaining 22% said they would engage in the practice when they had time.

Determinants of Household Solid Waste Segregation

The survey also reveals that most households segregating waste are usually in the low-income earners' category. The rate at which these households engage in solid waste segregation is limited by their knowledge of the practices and their value. A correlation analysis was done to establish the strength of the association between solid waste segregation and the income level of households, as shown in Table 5.0. The values presented are tested at 0.05 per cent significance. The correlation between solid waste segregation and household income was highly significant, with a negative correlation value of -0.735 and a p-value of 0.002, which is less than the alpha significance level of 0.005, and the correlation value is negative. This implies a close and inverse relationship, i.e., as household income increases, segregation decreases. There was little correlation between solid waste segregation and educational level. A correlation value of 0.03. With a p-value of 0.056 greater than the alpha significance value of 0.005. This implies that educational level has little or no influence on the practice of waste segregation in the Lokoja metropolis.

Table 5.0: Correlation between income level, Education and solid waste segregation in the Lokoja metropolis

	Solid waste segregation	Income
Pearson Correlation	-0.135	-.393
Sig. (1-tailed)	0.002 .026	1.000 .026
	Solid waste segregation	Education
Pearson Correlation	0.132	0.03
Sig. (1-tailed)	0.056 0.395	1.000 0.395

Source: Fieldwork (2020).

Conclusions

The study revealed that sixty-two-point-two per cent of the households (62.2%) were aware of solid waste segregation practices in the Lokoja metropolis. This was mainly done for financial gains. Households indicated that they did not separate solid waste

because they could not afford separate bins for separated waste.

The study results show that waste separation is inversely related to household income, i.e., the practice decrease as household income increases. This emphasises the fact that solid waste classification is primarily for financial gain. Furthermore, the study found that the level of educational attainment did not influence the practice of solid waste segregation, i.e., solid waste segregation is practised regardless of the educational level of the household, especially when there is a need for extra income, as shown in the study. Furthermore, the result revealed that people were aware of and had a positive attitude towards separating and recycling solid waste. The survey for this study showed that households with less education were more likely to separate solid waste for financial gains. There is a likelihood that more households would engage in solid waste segregation with increased exposure to environmental education through the school curriculum. There is a need to emphasise the protection of the environment in the curriculum at all levels of the education system.

Recommendations

If agencies involved with waste management and environmental issues in Kogi State want to promote waste separation, providing garbage containers to houses is a good place to start. This would encourage households to practise solid waste segregation and management.

There is a 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 the government must keep the environment clean. The awareness should include the health benefits of a clean environment.

As a matter of policy, the government should promote programs and policies that will encourage industries involved in developing reusable products that will reduce solid waste intended for disposal. This will boost the activities of the various stakeholders involved in solid waste characterisation. They include households, informal recyclers' scavengers and itinerant buyers. The recyclers produce low-cost household and farm tools, with a big market among the low-income population. Their contribution to reducing waste is significant.

The relevant government agencies must make efforts to promote the practice of solid waste segregation. This can be effectively achieved through a vigorous campaign about the benefits of solid waste separation.

There is also the need for the Kogi state government to make more funds available for effective waste management in the state so as to achieve good sanitation and a conducive environment that is void of hazardous substances but aesthetically pleasing for human habitation.

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