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DIMENSION OF ATTITUDE AND PERCEPTION ON SOLID WASTE SOURCE-SEPARATION AMONG LOW-INCOME HOUSEHOLDS IN BAUCHI METROPOLIS, NIGERIA.

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***Abstract*—an obvious environmental problem in cities all over the world is the solid waste produced by industry and consumption. In rapidly expanding metropolitan areas, this accumulation is more of a catastrophe problem than ever before. Municipal solid waste is a significant environmental issue in Bauchi. Government laments that the current disposal sites are quickly filling up following the privatization of services with various businesses known as private sector participants (PSPs) that run as Bauchi State Environmental Protection Agency (BASEPA) franchisees. In order to increase the amount of trash that is diverted from landfills as a result of the rapidly filling dumpsites, BASEPA plans to implement a solid waste source separation policy in the city. Examining the feasibility of implementing a source-separation policy in the less compliant low-income population segment by assessing the aspects of attitude and perception is intended to give insight into the practical feasibility of instituting source-separation in all population segments. The data for this study were collected using a structured questionnaire. All analyses were conducted using the statistical package for social sciences (SPSS v25). According to the study, more than half (50.9%) of surveyed households have a poor perception of source separation, while 49.1% had a good perception of source separation. Similarly, it was also found that over half (52.5%) of surveyed households have a poor attitude toward source separation, while 47.5% of them have a good attitude toward source separation. It is recommended that a bottom-to-top approach of sensitization, orientation, and community engagement be adopted to improve the dimensions of perception and attitudes towards solid waste source separation in the metropolis.**

***Keywords*—Source-Separation, Solid-Waste, Attitude, Perception.**

I. INTRODUCTION

One of the most visible environmental concerns in cities across the world is the accumulation of solid waste from industry and consumption. Such accumulation is more than ever a catastrophe in fast-increasing metropolitan areas. Garbage is indiscriminately disposed of, contaminating the air and land and threatening biodiversity. This is in addition to the health risks and aesthetic deficiencies that drive visitors away, among other things. When waste is burnt, it not only pollutes the air but also generates greenhouse gases (GHGs), which are key contributors to global warming. Waste disposed of in landfills jeopardizes the existence of vital microorganisms [1]. This is in addition to the leach ate that percolates through the topsoil and pollutes the water table, which is our sole source of water supply.

Solid waste, among other things, is an obstacle to the sustainability of most metropolitan places. One of the most revenue-depleting governmental services in metropolitan areas across the world is solid waste management [2]. It is frequently responsible for the depletion of up to 20% to 40% of municipal revenue in metropolitan areas. While everyone wants the economy to thrive, the increase in waste generation, as well as the accompanying costs and dangers, is an unavoidable byproduct of economic activities [3].

As a result, Georgescu-Roegen[4] was quick to point out that the more complex the product of our industrial processes, the more sophisticated the waste created by such activities. As a result, innovations in waste management systems will be required to reduce the strain on nations' economy as output and consumption rise, owing in part to population expansion. Each year, an estimated 5.2 million people worldwide, including 4 million children, die as a result of waste-related illnesses. [5]

Furthermore, the quantity of waste produced by anthropogenic activities is anticipated to double by 2025. [6, 7]. Solid waste is a major contribution to the degradation of the environment's visual value [6].

Nigeria is not an anomaly in this sense[8,9]. Nigeria creates around 25 million tons of solid garbage per year, according to the Federal Ministry of Housing and Environment, with a waste generation rate per capita of 0.49 kg/cap/day [10]. Furthermore, a recent report on Environmental and Social Management Framework for Public-Private Partnership

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(henceforth, PPP) identifies rising solid waste as one of Nigeria's major issues [11]. As a result, PPP has a specific industry in mind. Solid waste pollution is more of an urban problem, with households producing the majority of it.

Municipal solid waste management is a serious environmental issue in Bauchi. The fast-growing population because of the influx of migrants from neighboring states due to the town's relative security has resulted in an increase in domestic solid waste and a boost in economic activity. The Bauchi state environmental protection agency (BASEPA)faces a massive challenge of solid waste management because of this [12]. Each year, approximately 492,750 metric tons of waste are generated in Bauchi and its environs, according to BASEPA [13].

Solid waste prevention prior to generation as well as management after its generation Constitutes the two broad ways in dealing with solid waste [2, 1]. Previously, the overwhelming concern of dealing with Municipal solid waste in Nigeria was majorly concerned with the latter approach [14]. This earlier traditional method was based on the simple model of collection and disposal. However, the need to deal with growing solid waste around the world had necessitated the use of a more comprehensive method that incorporates both approaches dubbed integrated solid waste management-ISWM [15, 16, 17] .

This approach accents more on the diversion of waste from landfill sites. This is majorly done through reduce, re-use and recycling. The most sophisticated approach requires Strategies to prevent the waste from being generated in the first place. This is achieved through waste reduction and prevention mechanisms [18, 19].

The adoption of the traditional collection-disposal method had subjected cities to put up with the paradox of solid waste. By this paradox, we meant a scenario where Increase in a city's waste collection to avoid it aesthetic, health and biodiversity-threatening impacts increases land area requirement for land filling [20, 21]

Breaking this paradox is necessary for achieving decoupling link between waste generation, population, and other economic drivers. Although we cannot have 100% recycling, ISWM could help reduce the environmental impact of mixed solid waste production [22].

Environmental problems most especially, SWM is a serious issue of concern in Bauchi state [23].The Bauchi state government had taken important steps since the recent past, to curb the intensity of aesthetic Impairment, pressure on natural resources, as well as potential health impacts from Improper SWM [13]. However, the same improvement measures have created a new scenario where increased waste collection to avoid littering is accounting for the fast filling of existing dumpsites. This will increase land fill area requirements into the future [1].

To avoid this, recent studies examining solid waste Issues in Nigeria conclude that diversion through waste separation and recycling is important to solve such a problem [24, 14].Waste diversion is crucial as future demands for solid waste.

Thus, examining the feasibility of implementing source separation in the less compliant market segment is expected to provide insight into the practical plausibility of introducing source separation in the entire market segment. However, unlike the generation of mixed solid waste, source-separation requires households' commitment to some 'inconvenience costs' embodying buying and maintaining more than one waste storage container as well as time and effort inputs required for sorting generated waste [25].

II. METHODOLOGY

A. Study Area

Bauchi is in northeastern Nigeria, between latitude 100 180 57" North and longitude 90 50' 39" East, at an elevation of approximately 690.2m above sea level. It receives 1091.4mm of rain per year. The hottest and coldest months are April and (December, January), with temperatures of 40.560c and (6.110c and 7.220c) respectively. Bauchi encompasses the old walled city as well as a large surrounding area. Altogether, it covers a total land area of 3,604sq.Km.

Municipal solid waste management is a serious environmental issue in Bauchi. The fast-growing population because of the influx of migrants from neighboring states due to the town's relative security has resulted in an increase in domestic solid waste and a boost in economic activity. The Bauchi state environmental protection agency (BASEPA)faces a massive challenge of solid waste management because of this[12].

As such, in this study, Bauchi is chosen as a fertile research setting with the hope that the findings from its industry will benefit other states.

B. Determination of Sample Size

In this study, the sample frame consists of low-income households in Bauchi Metropolis. However, since most of the low-income households are found in low-income areas, this study relied on the categorization of such areas as carried out by Bogoro and Babanyara [26]. Their categorization identified 5 wards within the Bauchi Metropolis as Low-income areas in Bauchi Metropolis: namely, Nassarawa, Dan Kade, Dawaki, Dan Amar, and Hardo wards. These wards are estimated to contain 25,884 Households as shown in Table 1 Below;

Table 1: Categorization of Low-Income Areas

Wards	Households
Nassarawa	5,604
Dan Kade	5,022
Dawaki	6,437
Dan Amar	6,472
Hardo	2,349
Total	**25,884**

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There is an estimated, 25,884 households across the 5 low-income wards of Bauchi Metropolis per the findings of Bororo and Babanyara [26] projected by 3%. The Bukhari [27] excel based sample determination calculator is used to arrive at the final sample size of 379 for this study as shown below:

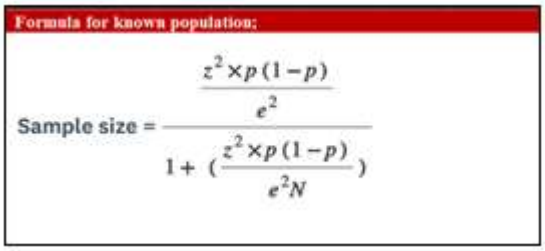

Figure 1; Formula for known population

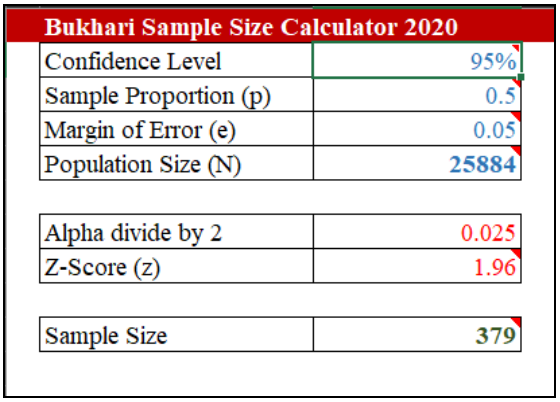

Figure 2; Result of Excel-based sample size calculator (Bukhari, 2020)

Thus, the sample size for this study was determined to be **379**

C. Sampling Technique

The multistage random sampling technique requiring four sequences of sampling was adopted. In the first stage Nassarawa, Dan Kade, Dawaki, Dan Amar, and Hardo wards were selected from three strata of the study area.

In the second sequence, a disproportionate number of households were selected from each of the designated low-income wards as shown in Table 2 below.

In the third sequence, one neighborhood was purposively selected from each ward, making a total of 4 selected neighborhoods. In the fourth sequence, systematic simple random sampling was adopted to select households from each neighborhood.

Finally, in the fifth stage of the sampling, a household representative within each of the selected was administered the questionnaire. Sampling in the last stage was not randomized as preference is given to household heads where available. Such non-randomness of selection in this final stage is common in household surveys [28].

Table 2:Respondents per neighborhood

Wards	Households	%	Neighborhood	Sample Size
Nassarawa	5,604	22	Kofar Kobi	81
Dan Kade	5,022	19	Bakin Kura	72
Dawaki	6,437	24	Tirwun	90
Dan Amar	6,472	25	Bakaro	96
Hardo	2,349	10	Unguwar Jaki	39
Total	**25,884**	**100 %**		**379**

D. Data Collection

The main data for this study was collected from the primary source. This study used the personal interviews mode for data collection as advocated by Mitchell and Carson [29]. These sources recommend the use of personal interviews because of its highest aptitude among the survey modes. It has the advantage of providing visual information and making interviewers available to clarify the information and respond to questions that may arise from the respondents during the survey [30].

Three (3) enumerators were chosen and trained on the contents of the questionnaire and assisted the researcher in personally administering of the questions using a structured questionnaire. The data collection period lasted 2 months.

E. Questionnaire Design

This study used a structured questionnaire. The questionnaire was designed by the researcher based on a literature review and amended question formats from previous studies. The questionnaire was designed in accordance with the objectives of this study and contains three sections (Sections A-C).

Section A and B contain perception and attitudinal questions. The last section elicits socio-economic information from respondents. Table 3shows the summary of the questionnaire contents for this study.

Table 3; Summary of Questionnaire Contents

	Description
A	Perceptive dimension of urban households' towards solid waste source-separation
B	Attitudinal dimension of urban households' toward solid waste source-separation
D	Socio-economic and Household Information

i. Section A: Perception on Source-Separation

Towards determining the household perception of solid waste source separation, respondents were asked questions that

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sought to evaluate their perception of source separation of solid waste. The question was designed using a 3-point Likert scale. Respondents were required to select from 'yes', 'no' and 'unsure'.

ii. Section B: Attitude towards Source-Separation

Towards determining the household perception towards solid waste source separation, respondents were asked questions that sought to evaluate their attitude towards source separation of solid waste. The question was designed using a 4-point Likert scale. Respondents were required to select from 'strongly agree', 'agree' 'disagree' and 'strongly disagree'.

***F.* Data Analysis**

After the data collection, the filled questionnaires were then sorted to ensure completeness, version of the statistical package for social sciences (SPSS) (Version 25) was used for data analyses, from coding, entry, cleaning, preliminary and final analysis. Prior to the proper data analyses for answering the objectives of the study, certain preliminary analyses were conducted. Missing values were sorted where necessary. Also, all continuous variables which will be required in categorical form to ease analyses were computed and categorized accordingly.

The responses were all summarized and reported in form of frequencies, charts, percentages, and mean distribution.

***G.* Data Reliability**

Reliability refers to the ability of a measuring instrument to provide the accurate and dependable outcomes. This denotes that the consistency of study outcomes depends on the extent to which measures are free from error (Sundaram et al., 2013).

The reliability of the instrument for this study was measured using internal consistency method [31]. Internal consistency is often measured by Cronbach's Alpha (α). Cronbach's Alpha value ranges between 0 and 1, with upper values showing greater internal consistency (and eventually reliability).

Though a lot of controversies exist concerning the scale to use in determining the strength of Cronbach's alpha value, Taylor, (2013) classified Cronbach's alpha values as 0.00 - 0.69 = poor, 0.70 - 0.79 = fair, 0.80 - 0.89 = good and 0.90 - 0.99 = excellent/strong.

The questionnaire for this study was pretested among 10% of the estimated sample size. The pretest is expected to generate useful information, particularly in helping the researcher to simplify statements that may likely be difficult to be comprehended by the respondents. It helped to provide insight on the time to be taken by the respondents (20 minutes) to fill the questionnaire.

This was important as it provided a first-hand insight on the reasonable time required for filling the instrument during the final survey. After receiving the data from the pretest, statistical package for social sciences (SPSS version 25) was used to measure the internal consistency of the questionnaire based on Cronbach's alpha.

The values for the dependent and independent variables are within the accepted ranges for Cronbach's alpha value provided by Taylor, [32] as discussed in the first paragraph of this subsection. Thus, all the constructs of this study's instrument meet-up the acceptable Cronbach's alpha value, and thus the questionnaire is considered reliable.

III. RESULTS AND DISCUSSION

***A.* Socio-Demographic and Household Characteristics**

Table 3 shows the socio-demographic and household characteristics of the 379 respondents surveyed in the study.

Table 4: Socio-Demographic and Household Characteristics

Variables	**Freq.**	**Percentage**	**Mean**
Gender			
Male	230	60.7	
Female	149	39.3	
Age (years)			**39Years**
Youth	293	77.3	
Adult	86	22.7	
Education			
High Education	299	79.9	
Low Education	80	20.1	
Marital Status			
Single	9	2.4	
Married	271	71.5	
Divorced	82	21.6	
Widowed	17	4.5	
Occupation			
Government	75	19.8	
Private	76	20.1	
Pensioner	38	10	
Entrepreneur	152	40.1	
Unemployed	38	10	
Gross Household Income (₦)			**₦ 235,522**
₦<200,000 -	131	34.6	
₦<500,000 -	248	65.4	
Type of Household			
Traditional	151	39.8	
Modern	228	60.2	
Rooms in Household			**~2**
2-4 Rooms	176	46.4	
4-6 Rooms	141	37.2	
6-8 Rooms	41	10.8	
8-10 Rooms	16	4.1	
Above 10	5	1.3	
Refuse Disposal Concern			
Father	224	59.1	
Mother	100	26.4	

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Children	42	11.1
All	13	3.4

Source: Field Survey, 2022

The study revealed that 60.7% of the respondents were male while 39.3% were female, this may be attributed to the socio-cultural setting of the study area, in which males are more engaged in outdoor endeavors than females.
The mean age of the respondents was 39 years, signifying that most of the respondents are still in their active age, thus, enhancing the objectivity of the study.
It was found from the study that the majority (79.9%) of the respondents had a high level of education, while only 20.1% of them had a lower level of education.
A majority (71.5%) of the respondents were married while only 2.4% were married. The divorced and the widowed accounted for 21.6% and 4.5% respectively.
The study also revealed that 19.8% of the respondents were employed with the government, 8.3% in the private sector, 10% are pensioners, 10% are unemployed, while a slight majority (40%) reported to be self-employed.
It was also inferred from the result that the average Gross Monthly income of the respondents was N235,522.
It was found that the majority (60.2%) of the respondents lived in Modern Homes, while only 39.8% lived in traditional homes.
The average number of rooms in the surveyed households was found to be ~2. The foregoing results per housing type and the number of rooms per household indicate a significant per capita generation of waste from households included in this study.
Per refuse disposal concern, a slight majority (59.1%) of the households reported that the father was more concerned with refuse disposal, with a close 26.4% reporting that the mother was more concerned, and 11.1% reporting that the children were more concerned with refuse disposal. Only 3.4% reported that all of the above were concerned with refuse disposal in the household.

B. Perception Analysis

The respondents were given 10 statements for the perception in the form of a Likert scale. There were five possible responses: 1 for Strongly Disagree, 2 for Disagree, 3 for Uncertain, 4 for Agree, and 5 for Strongly Agree. The respondents were then asked to rate how much they agreed with the statements based on the available choices. The mean and sum of the perception scores, which ranged from 29 to 39, were also determined. Respondents were classified as having good perception if their scores were average or higher (≥ 34), while those with scores below average (<34) were classified as having poor perception.
According to the study, slightly more than half (50.9 percent) of surveyed households had a poor perception of source separation, while 49.1 percent had a good perception of source separation.

Table 5: Perception Categories and Mean Scores

Items	**Frequency (%)**	**Mean±SD**
Perception Score		35±2.8
Perception		
Good	193 (49.1)	
Poor	186 (50.9)	

Source: Field Survey, 2022

C. Attitude Analysis

Ten statements were presented to respondents in Liker's scale format for attitude. 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. Following that, respondents were asked to rate their level of agreement with the statements based on the options. The attitude scores ranging from 20 to 30 were added together, and the mean was computed. Respondents with average or higher scores (≥26) were considered to have a good attitude, while those with lower scores (<26) were considered to have a poor attitude.

It was deducted from the study that more than half (52.5%) of surveyed households had a poor attitude towards source separation, with about 47.5% of them exhibiting a good perception towards source separation.

Table 6:Attitude Categories and Mean Scores

Item	**Frequency (%)**	**Mean ± SD**
Attitude Score		27±3.12
Attitude		
Good	180(47.5)	
Poor	199(52.5)	

Source: Field Survey, 2022

VI. CONCLUSION

This study sought to investigate the feasibility of implementing solid waste source separation in a less compliant market segment of Bauchi metropolis by determining perception and attitude dimensions, with the goal of providing insight into the practical feasibility of implementing a source separation policy in the metropolis's entire market segment. It was inferred that more than half of the surveyed respondents have a poor perception (50.9%), and a poor attitude (52.7%) toward solid waste source-separation.
It is recommended that BASEPA, in collaboration with the state government, take a bottom-up approach of sensitization, orientation, and community engagement measures to ingrain the social, environmental, and economic benefits and opportunities provided by solid waste source separation. This

will improve the dimensions of perception and attitudes toward solid waste source separation in favor of source-separation policy shifts and acceptance in the metropolis.

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