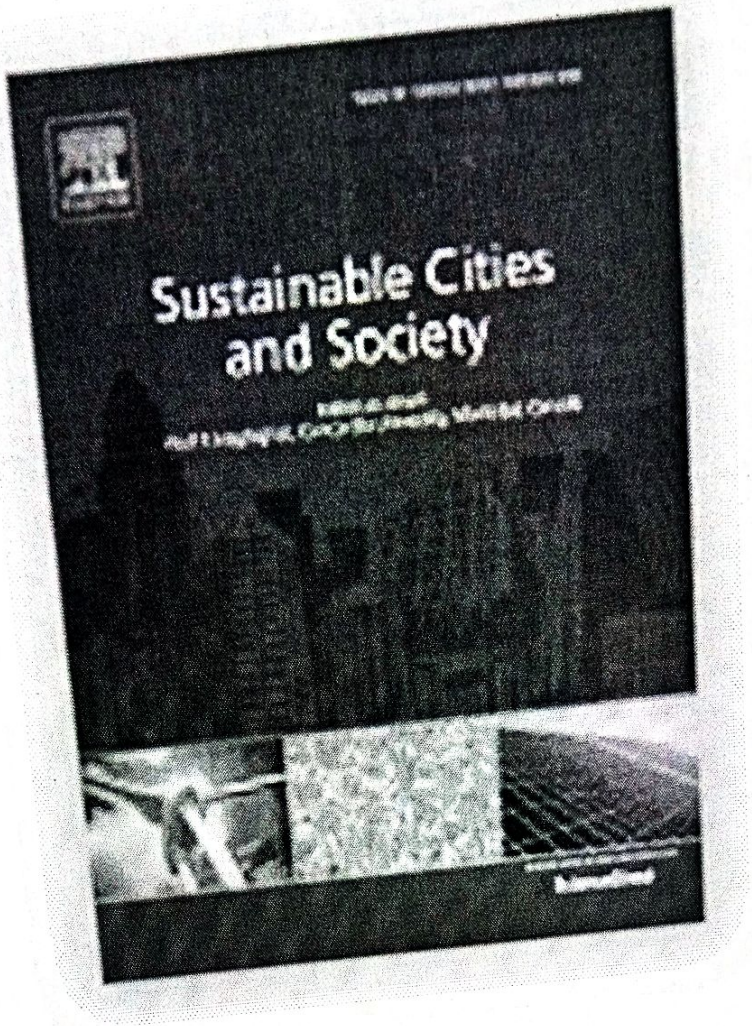


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Date: Jul 17, 2016

To: "Nelson Tajudeen Adewale ABD'RAZACK" abdrazacknta@futminna.edu.ng,isbamat_2@yahoo.co.uk

From: Fariborz HAGHIGHAT ees.scs.4c.3aade4.25f005da@eesmail.elsevier.com

Subject: Your Submission

Ms. Ref. No.: SCS-D-16-00198
Title: Habits and Benefits of Recycling Solid Waste among Households in Kaduna, North West Nigeria
Sustainable Cities and Society

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Reviewer #2: Paper review 16.05.2016
Manuscript number: SCS-D-16-00198
Habits and benefits of recycling solid waste among households in Kaduna, North West Nigeria

This paper investigates habits and benefits of recycling MSW among households in Kaduna, Nigeria. The subject of the manuscript is suitable for the Journal and the readers. The paper is well written, pleasant to read and uses primary data analyzed statistically to obtain some new information about the pattern, recycling activities and habits of residents in the study area. Analysis of the manuscript shows:

The title and the keywords are suitable for the manuscript contents.

No highlights are provided for this manuscript.

The abstract represents well the contents of the manuscript. The first two sentences should be replaced by others describing the present state in Kaduna and the necessity for this investigation.

The introduction section gives account of the problem and efforts to stimulate recycling worldwide and in Kaduna. A good literature revision is presented but few additional references very much related to the subject are listed below for the authors' appreciation. The authors should check the reference list to complete missing information as in Sanusi, Selim, and many others. Lines 34 -44 in page 3 should be removed and inserted nicely in the objectives of the present investigation.

Section 2 describes the study area gives the necessary information about population and location. Figure 1 is useless, I suggest replacing it by more adequate one.

Section 3 on materials and methods gives details about data sources and method of treatment. This section is clear, objective and has adequate information.

Section 4 presents the results with some brief explanations of the tables and the results.

Section 5 presents discussion of the results of section 4 and comparisons with other results from other research works conducted by other researchers.

Section 6 presents the final important conclusions of the study without any further discussion. I suggest that this section should be rewritten.
The section on references should be completed as mentioned before.

The paper as whole represents a good contribution and can be useful for other similar cases . I can recommend the paper for publication if all the suggested modifications are included in the text.

List of relevant references

Alternative treatments for the municipal solid waste and domestic sewage in Campinas, Brazil. Resources, Conservation and Recycling, v. 81, pp. 24 - 30, 2013.
Evaluation of the potential of recycling for the reduction of energy and C02 emissions in Brazil. Sustainable Cities and Society, v. 8, pp. 24 - 30, 2013.
MSW recycling as a mechanism for the social inclusion in Brazil. International Journal of Environment and Waste Management. v. 12, pp. 264 - 279, 2013.
Analysis of the potential of municipal solid waste in Brazil. Environmental Development, v. 4, pp. 105 - 113, 2012.

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Yours sincerely,

Fariborz HAGHIGHAT, Ph.D., P.Eng.
Editor -in-Chief
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Comments from the editors and reviewers:

Reviewer #2:
SCS-D-16-00198R1

The revised version of the manuscript looks good. The authors managed to include most of the suggestions in their revised version. The references were updated, additional comments and discussion were introduced and new figures were presented. I feel satisfied with their effort to make the manuscript looks better.
I suggest accepting the paper without any further modifications.

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# Habits and benefits of recycling solid waste among households in Kaduna, North West Nigeria

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ABSTRACT

Solid waste generation is an unavoidable product of man's activities, however, sustainable management of such waste is a challenge faced in many towns and cities in Nigeria. Many cities in Nigeria including Kaduna lack adequate plans and infrastructure required for efficient and sustainable management of municipal solid waste. This paper assesses the perception of households in Kaduna metropolis, north western Nigeria on the issue of solid waste recycling and benefits derived among households. Quantitative approach was used in data collection and stratified random sampling was used to select respondents. Random sampling was used to administer 500 questionnaires to the households. Descriptive statistics were used to analyze the perception and benefit of recycling and correlation of the benefits and habit of recycling was carried out. The result indicates that low income households are found to recycle their waste compared to high income households. The type of housing occupied by the respondents also indicated their recycling habits. This has greater effect on the general environmental management in the city. Correlation analysis indicated that there are three basic recycling habits among the people, which are: disposal, Segregation and Information gathering. The research indicated that four elements of perceptions about recycling benefit households in the city: Environmental Preservation, Resources and Cost Conservation, Monetary Reward and Environmental Awareness.



## 1. Introduction

The implementation of the Millennium Development Goals (MDGs) as a global development instrument ends in 2015. So, the attention of the global community turns to post 2015 Agenda which is focusing on Green Economy. Green growth is considered as a subset of sustainable development which can help to achieve concrete and measurable progress at the interface between economy and the environment. Within the context of the green economy, solid waste is seen both as an environmental problem and as an economic opportunity (Sanusi, 2010). Records indicated that the dependable disposal of waste generated covers a small proportion of the total waste generated by households (Selim, 2013). The majority of the households lack access to solid waste management.

Although solid waste as an environmental problem is covered directly in the Goal 7, the truth is that solid waste relates to other components of the MDGs (UN, 2000). Solid waste is related to well-being, as it may indicate capacity to contain the waste as an external effect or that it can contribute to poverty; it is related to health as poor solid waste management has serious health implications. In the same vein, solid waste management can contribute to gender equity because women will suffer more from exposure to the poor sanitary environment occasioned by poor solid waste management. So, in all dimensions, solid waste is related to the MDGs.

Ogwueleka (2009) indicated that on average, people of northern Nigeria generate 0.56 kg of waste per capita per day; this implies that a total of over 736.7 metric tonnes of waste is being generated by the population of the city on a daily basis. This amount of waste generated by people on a daily basis is increasing geometrically due to change in socioeconomic characteristic of people, technology and lifestyle (Abd'razack, Yusuf, & Utange, 2013). Another factor that encourages the massive waste generated is population increase of households. There is no doubt that solid waste management is a serious problem in Nigerian urban centres (Sanusi, 2001). Sanusi (2010) notes that the solid waste problem is visible in most parts of the cities; on the roads, within the neighbourhoods and around residential buildings.

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2210-6707/

One of the processes of solid waste management adopted is landfill, this process has been overstressed and the resultant effect is that landfills in many cities in Nigeria are currently facing a critical condition in managing the domestic solid waste (Adefemi & Awokunmi, 2009). Port-Harcourt in south southern Nigeria was known as the garden city in the 1970 but is now known as garbage city because of poor waste management practices. The 2010 report of the World Health Organization (WHO, 2010) indicated that there are over 509 landfills in Nigeria. Most of these landfills, site is operated by the process of the open dumping system (Abd'Razack et al., 2013). The attendant effect of the long period of open-dumps landfills is the pollution of the environment, especially water and air (Adebola, 2006). The best method of waste management should therefore be sanitary landfills, which are more environmentally friendly than the open dump landfill system currently in use. There are only few sanitary landfills in Nigeria operated by state such as Lagos, Kano and Cross Rivers (Agwu, 2012)

The report of WHO (2010) further indicated that many landfills in Nigeria are no longer operational and required to be closed. Consequently, in the process of extending the lifespan of the landfills in Nigeria, the federal and state governments have to launch a recycling programme and campaigns to the populace so as to reduce waste at micro level. The activities of scavengers need to also be incorporated into the chain of waste handling and management (Abd'Razack et al., 2013). The vision 2020 of the federal government should address the goal of Millennium Development Goal Number 7 (Environmental Sustainability) by reducing the burden of solid waste management by 22% (Anijah-Obi, Eneji, Ubom, Dunnamah, & Williams, 2013). More awareness campaign on the importance of recycling should be embarked upon by government at all levels. The current estimate of 500,000 t of solid waste produced daily by Nigerians would increase by a drastic 75% per day by 2020 (Agunwamba, Ukpai, & Onyebueyi, 1998) if the current lifestyle continues and no effort is put in place to reduce the waste by recycling, reuse and reduction at the household level (Ugwuegbu, 2011).

A research conducted by Lagos State Solid Waste Management Authority (Danmegoro, 2002) on resident of Lagos Island indicated that about 89.0% of respondents were aware of the importance of waste recycling, but only 47.8% are committed to recycling. This has proved that the number of people practicing recycling is incomparable with recycling awareness of the people. One of the goal of the Millennium Development Goal is to reduce waste, in order to achieve the target of 75.0% recycling by the populace of third world countries the year 2015. (UN, 2000), more efforts must be put in place so as to improve the attitude and responsiveness of households to waste three Rs (Recycling, Reuse and Reduction in waste generation) in Nigeria, and also proper awareness that will encourage Nigerians to imbibe the spirit of recycling as means of solid waste reduction. According to Abd'Razack et al. (2013) a multifaceted problem occurs in solid waste Management in Nigeria, theses encompasses many issues such as inadequate funds, bureaucratic bottleneck, lack of proper management and expertise, low level of public awareness and indistinguishable legal framework in place. Several ways abound to solve these problems, one of such way is to address such issues is to relate the perception of people who recycle with those who do not (Ebreo & Vining, 2001; Vining & Ebreo, 1990). Consequently, it is imperative to establish the socio-demographic and psychological characteristics of recyclers and non-recyclers in Kaduna metropolis. The status of solid waste management in Nigeria calls for concern; records show that dependable disposal of waste generated covers a small proportion of the total waste generated by households. The majority of the households lack access to solid waste management. At the national level, between 2008 and 2010, less than 10 per cent of the households in the country have access to formal and legitimate means of solid waste management; 9.4% in 2007; 7.2% in 2008, 9.2% in 2009 and 9.4% in 2010) (UN-Habitat, 2010).

Although the situation in the urban centres is fairer, the large proportion of the urban dwellers simply self-adjust in managing their solid waste. In 2007, 23.1 per cent of the households have access to formal means of disposal; 23.5 per cent in 2008; 23.1 per cent in 2009 and 28.8 per cent in 2010 (NBS, 2012; UN-Habitat, 2008). The trend between 2008 and 2010 indicates that significant difference would not have occurred between 2010 and the end of 2014. Without doubt, this is highly unacceptable and by all means the situation represents an unsustainable development practice.

The method of recycling and status of the people may be different in many ways. This research therefore assesses psychological characteristics of the households in two ways. Foremost, the household's awareness about waste management and waste materials from households was identified. That was possible by examining the habit households' exhibits toward recycling activities by relating habitual behaviour of households who recycle and those who do not recycle. Habits are characteristically interpreted as acquired, specific, achievable acts that become involuntary answers in certain circumstances (Aarts, Verplanken, & Knippenberg, 1998). Instinctive reactions are observed as an act executed with unconscious cognitive reasoning in a specific period. This research, therefore, viewed character as an act that the recycle households and non-recycle households exhibit when they are met doubt of whether the solid waste materials are recyclable or not.

The various dimensions of the solid waste problem have also been examined by analysts. Kagu (1997), Momodu, Dimuna, and Dimuna (2011), Selim (2013) Agwu (2012), have emphasized various aspects of solid waste management in Nigeria. Kagu examined the generation and disposal of solid waste by households in Maiduguri and posited that open refuse dumps is common in the city leading to health related issues of foul odour, breeding of insects and rats and pollution of the environment.

In a similar manner, Momodu et al. (2011) observed that improperly sited refuse dumps deface several cities in Nigeria, thereby endangering public health while Agwu examined the problem from behavioural point of view, From the point of views of existing studies and policy and from the realities of the green situation on the ground within the urban centres; fuller understanding of the solid waste problem is lacking. Studies have been confined to a few areas and to different aspects of the waste management. Existing studies are also fundamentally broad, hiding the problem as it happens at the level of the neighbourhoods, defective in measurements and rely essentially on what people say. A study based on measurement of the waste generated by households will be important in understanding the full scale of the problem in order to find sustainable solutions that will address solid waste as a problem and as an industry (Stock, 2010).

Next, the observations of recycled households and non-recycle households in the direction of recycling benefits were also evaluated. According to Wright (2011), analysis of research findings has indicated a flawless relationship between attitudes to recycling and waste reduction in American society, concentrating on both individuals and society on their feeling about waste recycling and the environment. The study concludes that individuals who think a positively about recycling benefits will, therefore, engage him/herself in recycling activity. Therefore, it is significant to comprehend attitude of people, whether at individual or household level to recycling, for the reason that if societies understand that if there is no benefit to whatsoever they do, they will not involve themselves in it (McKenzie-Mohr & Smith, 1999).

Aarts et al. (1998) opined from their research that habit plays a significant role in the process of recycling. They referred to it as attitude-behaviour models which they interpreted to have three characteristics. The characters exhibited are: one, habits that con-

sist of a targeting automaticity; two, recurrent behaviours that are triggered by pleasing understandings; and finally, cognitive performances that indicated the intermediary of habitual reactions. Behaviours are connected to recurring character, for example, if the member of household, especially wife is ambiguous to what constitute recyclable waste material, she might decide to discard it into the dustbin; the decision she would take will be based on attitude and behaviour. When such behaviour becomes a reoccurring decimal, it will become a habit. It is highly perquisite of this research to study recycling habits among households so as to advance for the future forecast of household behaviours. Consequently, if the habits of the households for recycling are recurring over time, future conclusions are no longer directed by attitudes, but rather principally prejudiced by lifestyles. Ronis, Yates, and Kirscht (1989) concluded that there is a correlation between attitude and behaviour and the moderating factor is the habit strength (reason-based concept).

Research carried by Vicente and Reis (2008) indicated that factors that affect recycling habits among households are the attitude of a household's to recycling, household size, composition of household material usage and disposal method. Several constituents of household attitude include: Awareness of Recycling Benefits. This can be further subdivided into five sub-components which include: conservation of energy, garbage reduction, pollution reduction, preservation of natural resources and reduction in land required for solid waste dumps.

Equally, research by Abd'Razack (2014) assessed the views of Kaduna State Environmental Protection Agency's (KASEPA) perceptions of benefit of recycling, the result indicated that there is high level of awareness among them because it is one of the cardinal objectives of the organization to reduce municipal solid waste through recycling and other methods such as reuse and reduction of waste. The research by Abd'Razack et al. (2013) also corroborated this assertion and further implies that three possible benefits of recycling can be deducted which include: reduction in quantity of waste that will be disposed, reduction in the quantity of waste that will be collected by the responsible agency and generates jobs (both formal and informal) for the low-income earners in the society. (Momodu et al., 2011) has a contrary opinion that despite the fact that the officials of the responsible agency of waste management in Nigeria are aware of the benefits of recycling, their attitudes does not indicate whether that could be generalized as norms or practice about recycling, they exhibit the same character with general society and merely uphold the status quo of the conventional waste collection and disposal.

Several research has been carried out to explain the behaviours of recyclers and non- recyclers in solid waste management (e.g. Adewole, 2009; Agunwamba et al., 1998). The researches vary according to what they intend to achieve. Researches by different professionals on recycling behaviours have been studied across different professions ranging from economics, sociology, law, psychology and civil engineering. In the field of environmental psychology, researches carried out centered on identifying features affecting household recycling character in relation to its correlated, enthusiasms, causes and obstacles (Miafodzyeva & Brandt, 2013). These studies show deficiencies on issues concerning household behaviour.

### 1.1. Objectives of the study

This study aimed at appraising the recycling habits among households and their perceptions towards recycling benefits in Kaduna metropolis, with the following objectives: assess the recycling habits of households; examine the habits of the households in an uncertainty circumstance of whether the waste material is recyclable or not; assess the perceptions of recycling benefits among households; and evaluate the socio-demographic and psychological characteristics of recycling and non- recycling households.

## 2. Study area

The Kaduna metropolis is located between latitude 10°N and11°N and longitude 7° and 8° E. It has approximately 3080 Km$^2$. The geographical spread of Kaduna metropolis is shown in Fig. 1. Kaduna metropolis is a town dated back to the 19th century. Kaduna is used to refer to crocodiles in the Hausa language. Before the advent of the Europeans, it was under the influence of Zaria province. The earliest inhabitants of Kaduna were the Hausa, Fulanis, and Gwaris.

The city is located on the Kaduna River. It is a trade centre and a major transportation hub for the surrounding agricultural Area with its rail and road junction. Kaduna town has four LGAs namely: Kaduna North, Kaduna South, Doka and Igabi. River Kaduna is a major geographical feature in the metropolis, the climatic condition in the city indicated that it has a tropical climate and has two seasons (rainy and dry season with a little period of Harmattan).

The population of the 24 neighbourhoods as indicated by the National Population Census of 1991 and projected to 2014 was estimated at 1,315,510 (Kaduna North, 299,951; Kaduna South, 241,987; Chikun, 478,274 and Igabi, 295,325). This population comprises of 219,258 households based on average of 6 persons per household (NPC, 2011). The selected neighbourhoods are chosen based on proximity to the central area of the metropolis. 2 neighbiurhoods were selected in both Kaduna North and South Local Government and 1 each from Igabi and Chikun Local Government Areas. The spatial location of the selected neighbourhoods in relation to Kaduna State and Nigeria is shown in Fig. 1.

## 3. Materials and methods

This research was conducted using both primary sources and secondary sources of data. The primary data were used to collect data from households through the use of a close-ended questionnaire. The questionnaire was divided into five sections aimed at examining several variables that relate habit to recycling, this includes: attitudes, behaviours, barriers, motivation and psychosocial and demographic characteristics. The secondary data was collected from literature such as books, journals, internet materials on the subject matter of attitude, recycling and solid waste management.

The stratified random sampling technique was employed for the study. The metropolis of Kaduna ware divided into 24 neighbourhoods from which 6 neighbourhoods (25%) were selected. A total of 500 questionnaires were used based on Abraham, Barr, and Bryman (2001) method of selecting sample size based on 1991 National Population Census (NPC, 1996) that provided the neighbourhood population of Kaduna metropolis. After the estimation of the sample size, simple random sampling was employed to administer the questionnaire in each of the 6 neighbourhoods and was based on the population of each locality. Equity was used to determine the number of questionnaires in each locality as shown in Table 1.

The data collected was analyzed in sequential order; there were two levels of analysis carried out. The first analysis was on thematic analysis that conducted by the procedure laid down by Braun and Clarke (2006). The socio-demographic data were presented using descriptive and inferential analysis. There was the correlation of the result to indicate the relationship and interaction between the habit and recycling process, attitudes, behaviours, barriers, motivation and psychosocial and demographic characteristics of respondents. There were cross tabulations of data, correlation matrix were also used to indicate the relationship of socioeconomic characteristics

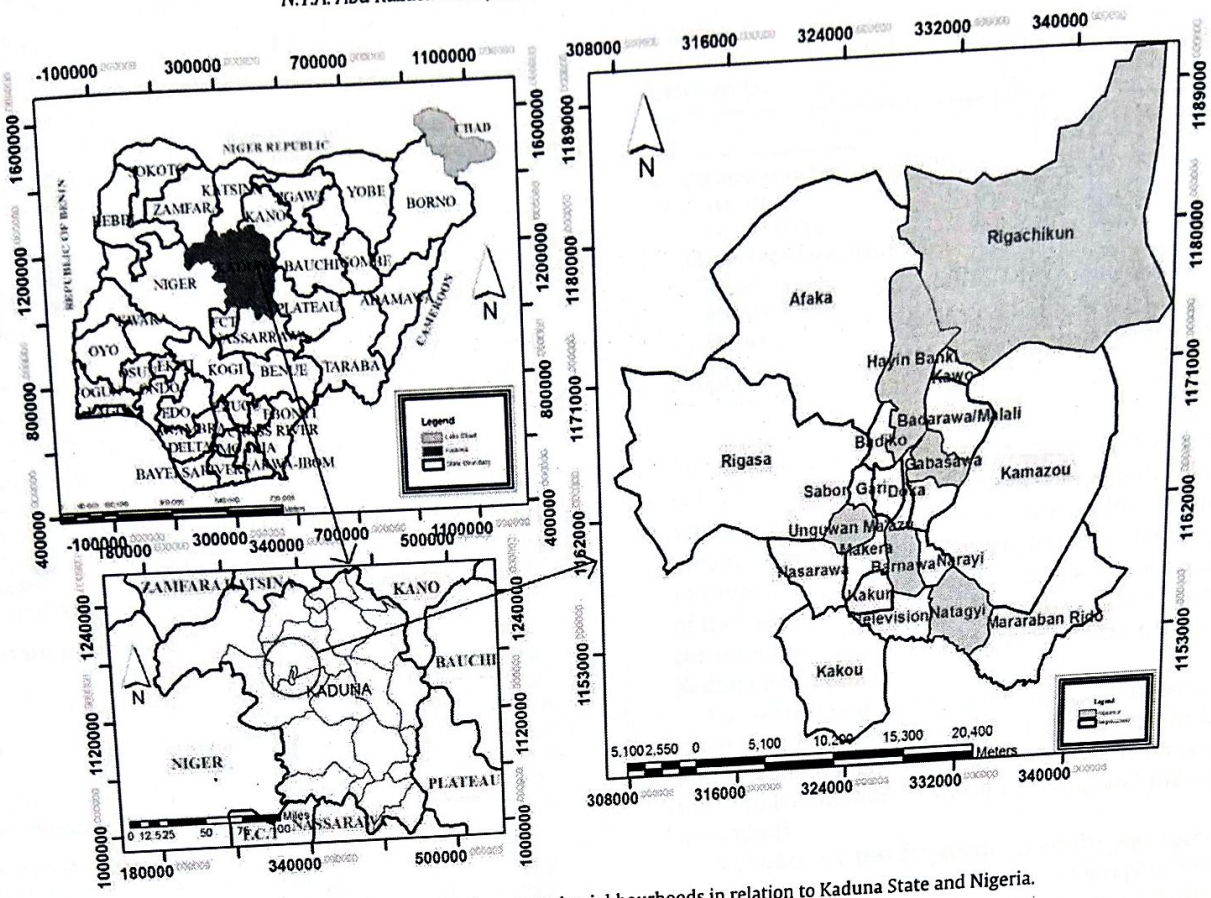


**Fig. 1.** The spatial location of the selected neighbourhoods in relation to Kaduna State and Nigeria.

**Table 1**
The Sample size and Number of Questionnaire Administered.

| Localities | Population | No of Households | Sample Size |
|---|---|---|---|
| Hayin Banki | 60,515 | 10,085 | 101 |
| Barnawa | 37,760 | 6293 | 63 |
| Gabasawa | 37,467 | 6244 | 62 |
| Angwa Muazu | 45,857 | 7642 | 76 |
| Rigachukun | 34,682 | 5780 | 58 |
| Matagyi | 84,026 | 14,004 | 140 |
| Total | 300,207 | 50,048 | 500 |

and the habit exhibited. Standardization of the data was carried out to allow the data set to be at the same level of measurement before the cross tabulation and correlation was carried out.

## 4. Results

### 4.1. Socio-demographic characteristics of respondents

There are 500 households used for this study, which cut across 11 neighbourhoods in Kaduna metropolis. It also follows the three income level in the metropolis. The result indicated that the majority of the households is dominated by the male household head 75.6%, while about 24.4% of the households are headed by females. This implies that the tradition of African society was exhibited by households in Kaduna metropolis where men are the bread winner of the family. The average age of the household head ranges between 25 and 55. The result of the study indicated that the majority of the sample household head has an age range between belongs 26 and 45 years (66.6%). The household size ranges between 5 and 25. The highest household size in the study ranges between 11 and 20 people per household. This is in line with the religious belief and a fertility rate in Africa which is very high. This therefore implies that average household size was 7 people per household. The educational qualifications of respondents indicated that majority of respondents have primary and secondary education (64.0%).tertiary education in the metropolis accounts for 8.0% while 22.0% do not have formal education. The implication of this is that large percentage of respondents might be unaware of the importance of solid waste management and importance of recycling as a mean of solid waste reduction and handling for waste management. The majority of respondents in a high density environment (67.5%) lives in tenement building which is mostly on rental basis, the medium density area has about 22.5% respondent, living in both bungalow and semi-detached building, mostly on owner occupiers, while about 10.0% of respondents who lives in low density area lives in building such as mansions, duplexes and row of flat in government quarters, mainly in an owner occupied building basis. This indicated that there are about 32.4% of respondents who lives in an owner occupied building while the other resides in tenement buildings.

The analysis of the occupation of respondents indicated that 50.0% of respondents are self-employed ranging from small scale businesses to medium and large scale retailing. Other occupation in the metropolis include civil servant (24.0%) who are mainly government official at the three tiers of government (Federal, State and Local Government); Military personnel (there exist the 1st mechanized Division of Nigerian Army, Nigerian Defence Academy; Nigerian Air force Base, Police Academy amongst others). The unemployed people interviewed are up to 16.0%. This shows the level of national employment in the country. The result indicated that 34.0% of respondents are government workers while the rest (66.0%) are either working as self-employed or unemployed. The demographic characteristics are summarized in Table 2.

The conclusions on the socio-demographic characteristics of the residents of Kaduna metropolis have shown variation in their educational status, employment, occupation and location of their homes. The level of education indicated that there is high level of people with no formal education; this might have consequences on their perception on waste management and habit toward recycling. The household size also plays importance on waste generation, the lifestyle of the people which is a function of their income level also affect their level of recycling. The location of households on high

**Table 2**
Socio-Demographic Characteristics of the Households in Kaduna Metropolis. Source: Authors Field Survey, 2014.

| | Number of Respondents | Percentage |
|---|---|---|
| Gender of Respondents | | |
| Male | 378 | 75.6 |
| Female | 122 | 24.4 |
| Educational Status of Respondents | | |
| Primary Education | 120 | 24.0 |
| Secondary Education | 200 | 40.0 |
| Tertiary Education | 40 | 8.0 |
| Vocational Education | 30 | 6.0 |
| No Formal Education | 110 | 22.0 |
| Age of Respondents | | |
| Less than 25 Years | 85 | 17.0 |
| 26–35 Years | 150 | 30.0 |
| 36–45 Years | 183 | 36.6 |
| 46–55 Years | 60 | 12.0 |
| More than 55 Years | 22 | 4.4 |
| Household Size of Respondents | | |
| 1–5 | 40 | 8.0 |
| 6–10 | 35 | 7.0 |
| 11–15 | 135 | 27.0 |
| 16–20 | 190 | 38.0 |
| 21–25 | 55 | 11.0 |
| >25 | 45 | 9.0 |
| Average Household Size | | 7 |
| Area Location of Respondents | | |
| High Density Area | 338 | 67.6 |
| Medium Density Area | 112 | 22.4 |
| Low Density Area | 50 | 10.0 |
| Type of Dwelling for Respondents | | |
| Tenement Building | 300 | 60.0 |
| Bungalow | 60 | 12.0 |
| Semi-Detach Housing | 75 | 15.0 |
| Block of Flats | 40 | 8.0 |
| Duplex | 25 | 5.0 |
| Ownership of the Dwelling | | |
| Owner Occupier | 162 | 32.4 |
| Rented Apartment | 338 | 67.6 |
| Occupation Respondents | | |
| Civil Servant | 120 | 24.0 |
| Self Employed | 250 | 50.0 |
| Military | 30 | 6.0 |
| Paramilitary | 20 | 4.0 |
| Unemployed | 80 | 16.0 |
| Total | 500 | 100.0 |

density implies that large volume of solid waste is produced in such neighbourhoods.

### 4.2. Recycling and non-recycling habits and demographic characteristics of respondents

In the process of determining the recycling habits of respondents, the household's head was questioned about separation of garbage for recycling purposes. This was done using simple response to the question in either yes or no. the perception of the respondents is reported in Table 3. There was variation in the perception of households in the Kaduna metropolis on the attitude to recycling of solid waste. The result indicated that there are more households who separate their waste than those who do not (Non-Recyclers). The result further stated reason for recycling by the households which include: reuse, recycling and reduction of household waste. Reuse is the most favoured and perceived method of waste management in the study area. This is most common with plastic products and bottles among the high density population.

The analysis further strengthened the fact that the habit of recycling habit is a function of how informed individual is on the



**Table 3**
Perception of Households to Recycling and Non-Recycling Habit in Kaduna Metropolis.

| | Number of Respondents | Percentage |
|---|---|---|
| Perception to Separation of Waste | | |
| Yes We Do | 375 | 75.0 |
| No, We Don't | 125 | 25.0 |
| Method of Separation of Waste | | |
| Reuse | 169 | 45.0 |
| Recycle | 150 | 40.0 |
| Reduce | 56 | 15.0 |
| Total | 375 | 100.0 |

benefits of recycling. 75.0% of respondents are aware of the process of separation of the different components of waste (recycling) while 25.0% are not aware of the importance of separation of components of solid waste. This implies that the recyclers in Kaduna metropolis are more of the educated people, who are well informed of the benefits of recycling. Comparing Table 2 with Table 3 shows the relevance of education to waste recycling habit of the people of Kaduna metropolis.

Considering the 375 households who engaged in recycling indicated that three methods were employed (also known as 3Rs). The most favoured method is reuse, followed by recycling while 15.0% uses reduce method in waste handling and managements in the metropolis.

A Chi-Square test for goodness-of-fits was carried out to show the relationship between socio-demographic characteristics of respondents and their recycling habits. Cross tabulation was used to establish the relation and the result indicated that there are significant correlations between age [Pearson $X^2$ (df = 1, N = 500) = 0.426, p = 0.008], education [Pearson $X^2$ (df = 1, N = 500) = 0.534, p = 0.005], types of dwelling [Pearson $X^2$ (df = 1, N = 500) = 0.926, p = 0.001], occupation [Pearson $X^2$ (df = 1, N = 500) = 0.633, p = 0.031], household size [Pearson $X^2$ (df = 1, N = 500) = 0.667, p = 0.004] and recycling habits. This implies that the type of accommodation by households, the size of the households and the occupation of the household members has a relationship with the level of recycling employed in such households. Meanwhile, there is no significant correlation between gender and recycling habits. This implies that the production of solid waste does not have anything to do with whether the respondent is a male or not. Table 4 shows the relationship between social-demographic characteristics and recycling habits of respondents in Kaduna metropolis.

### 4.3. Habits of households to solid waste materials in Kaduna metropolis

Perception, though subjective in nature determines the attitude of respondents to issue of recycling in Kaduna metropolis, this was therefore analyzed to identify and examine the habit of household solid waste materials. Data for the analysis of the habit of respondents to different methods were divided into sub-methods for easy interpretations. This indicated the habits of the households towards the recycling of solid waste materials. Three methods were identified as a major procedure for the habits towards waste materials. Analysis of the respondent's response regarding their habits towards non-recyclable materials indicated that Dispose of is the most favoured (54.6%), this involve using of dustbins, open dump, buried to the ground, throwing of the waste to water channels and burning of such waste, followed by asking for better Information on how to manage it (24.4%) such as asking from friends, family, experts, internet materials, label of the products among others and Segregation is the least (21.0%). Table 5 indicated the main method and sub-method employed by the households and their habits towards waste materials.

**Table 4**
Chi Square Correlation between Households Habits and Socio-Demographic Characteristics Respondents.

| Correlations | Recycling Households | | Non-Recycling Households | | $X^2$ Value | Sig. Lev. |
|---|---|---|---|---|---|---|
| | No of Respondents | Percentage | No of Respondents | Percentage | | |
| Gender | 375 | 75 | 125 | 25 | 0.504 | 0.061 |
| Education | 375 | 75 | 125 | 25 | 0.534 | .005[a] |
| Age | 375 | 75 | 125 | 25 | 0.426 | .008[a] |
| Household Size | 375 | 75 | 125 | 25 | 0.755 | .001[a] |
| Type of Dwellings | 375 | 75 | 125 | 25 | 0.633 | .031[a] |
| Occupation | 375 | 75 | 125 | 25 | 0.667 | .004[a] |

[a] Significant at $\alpha = 0.05$.

**Table 5**
Household Habit to Method of Solid Waste Material Disposal in Kaduna Metropolis.

| Methods | Sub-Method | Number of Respondents | Percentage |
|---|---|---|---|
| Dispose of | Dustbins | 58 | 11.6 |
| | Open Dump | 93 | 18.6 |
| | Buried in the ground | 42 | 8.4 |
| | Throw to Water Channels | 30 | 6.0 |
| | Burning | 50 | 10.0 |
| Sub-Total | | 273 | 54.6 |
| Segregate | Stored in a bin | 55 | 11.0 |
| | Separate | 33 | 6.6 |
| | Others | 17 | 3.4 |
| Sub-Total | | 105 | 21.0 |
| Seek Information | Ask question form Public | 25 | 5.0 |
| | Ask the question form Family | 13 | 2.6 |
| | Ask question form Friends | 22 | 4.4 |
| | Ask question form Experts | 10 | 2.0 |
| | Internet | 24 | 4.8 |
| | Labeling of the Products | 23 | 4.6 |
| | Others | 5 | 1.0 |
| Sub-Total | | 122 | 24.4 |
| Grand-Total | | 500 | 100.0 |

#### 4.3.1. Disposal method

Analysis of the most frequent used sub-method of disposal by respondents includes: Throw into Open Dump (18.6%), Throw into Dustbin (11.6%), and the last sub-method is Bury in the ground (8.4%). This implies that about 54.6% of respondents use this method to dispose of their solid waste. This might seem a better management style employed by the respondents, but without recourse to its environmental implications such as soil and air pollution, thereby reducing environmental quality.

#### 4.3.2. Segregate

Another method used by households for managing non-recyclable solid waste materials are Segregation. This method was further sub-divided into three groups, namely Collection and Storing of the waste (11.0%), Separation of the Wastes (6.4%) and others which are few in number (3.4%). This implies that these solid wastes are stored in a safe place and arrange neatly. Materials that are always stored include plastic and bottles.

#### 4.3.3. Seek information

The new dimension to solid waste management options open to households in Kaduna metropolis is seeking necessary information about the waste management method. This method is further classified into seven sub-groups, the first sub-group is asking the general public about waste management (5.0%) and the least is others (1.0%). This implies that about 24.4% of respondents seek necessary information on how to manage their non-recyclable solid waste in the study area.

A Pearson Chi-Square Test was carried out on relationship between recyclers and non-recyclers habits to solid waste materials in a situation they are at a crossroad with recyclable materials. The cross tabulation of correlation between components of Disposal indicated that there is significant correlation between recyclers and non-recyclers and the disposal method [Pearson $X^2$ (df = 1, N = 500) = 0.826, p = 0.001]. This implies that non- recyclers are most likely to throw the material away when they did not know whether the waste material is recyclable or not. On the other hand, Segregation shows also a significant correlation [Pearson $X^2$ (df = 1, N = 500) = 0.738, p = 0.021] and Seeking Information indicated that there is no significant correlation [Pearson $X^2$ (df = 1, N = 500) = 0.473, p = 0.522] showed no significant differences between recyclers and non-recyclers. Table 6 shows the summary of the relationship between recyclers and non-recyclers habits towards waste materials.

### 4.4. Perceptions of benefits of recycling

Analysis of the perception of the households to benefit of recycling is broadly divided into four constituents; these were obtained from the responses provided by the respondents on their perception to the benefits obtainable if recycling is adopted as a mean of solid waste reduction. The analysis of the most benefit to recycling indicated that Environmental Preservation, Resources and Cost Conservation, Monetary Reward and Environmental Awareness are the preferred choice in the level of preference as indicated in Table 7. The result indicated that environmental consciousness is one of the major reasons for recycling and has further thrown an informal occupation to some set of people who engage in scavenging as a means of livelihood. The perceptions of households with the benefits of recycling do not limit to the four options selected but the major ones are those mentioned.

#### 4.4.1. Environmental preservation

Five sub-components were considered in the Environmental Preservation benefit of recycling, which include: Environmental Protection (11.4%), Environmental Cleanliness (13.8%), Pollution Control (6.4%) Waste Disposal Reduction (5.0%) and other means (2.0%). This implies that environmental preservation is the highest rank benefit of recycling as it has ability to conserve the earth resources; ensure the cleanliness of the environment; reduces environmental pollution, reduces the amount of waste sent to landfills and incinerators and prevents industrial pollution by reducing the need use of new raw materials.

#### 4.4.2. Monetary reward

Another important benefit of recycling identified by respondents in Kaduna metropolis is Monetary Reward. This benefit was said to be in two ways, namely Monetary Reward to Households (11.0%) and Employment to Scavengers who traverse the metropolis to scavenge useful materials from dustbins, dump site (20.0%). This implies that the slogan of waste to wealth is alive in Kaduna.

**Table 6**
Chi Square Correlation between Households Habits and Recycling Methods.

| Correlations | Recycling Households | | Non-Recycling Households | | $X^2$ Value | Sig. Lev. |
|---|---|---|---|---|---|---|
| | No of Respondents | Percentage | No of Respondents | Percentage | | |
| Disposal Method | 375 | 75 | 125 | 25 | 0.826 | .001[a] |
| Segregation Method | 375 | 75 | 125 | 25 | 0.738 | .021[a] |
| Seeking Information | 375 | 75 | 125 | 25 | 0.473 | 0.522 |

[a] Significant at $\alpha = 0.05$.

**Table 7**
Identified Benefits of Recycling as Perceived by Households in Kaduna Metropolis.

| Methods | Sub-Method | Number of Respondents | Percentage |
|---|---|---|---|
| Environmental Preservation | Environmental Protection | 57 | 11.4 |
| | Environmental Cleanliness | 69 | 13.8 |
| | Pollution Control | 32 | 6.4 |
| | Waste Disposal Reduction | 25 | 5.0 |
| | Others | 10 | 2.0 |
| Sub-Total | | 193 | 38.6 |
| Monetary Reward | Household Monetary Reward | 55 | 11.0 |
| | Employment to Scavengers | 100 | 20.0 |
| Sub-Total | | 155 | 31.0 |
| Resources and Cost Conservation | General Cost Saving | 15 | 3.0 |
| | Solid Waste Management Cost Saving | 13 | 2.6 |
| | Cost Saving on Solid Waste Processing | 12 | 2.4 |
| | Securing Sustainable use of Resources | 4 | 0.8 |
| | Material Waste Reduction | 10 | 2.0 |
| | Others | 3 | 0.6 |
| Sub-Total | | 57 | 11.4 |
| Environmental Awareness | Ease of Waste Disposal | 58 | 11.6 |
| | Creating Value and Awareness | 17 | 3.4 |
| | Inculcating Environmental Sanitation to Young People | 20 | 4.0 |
| Sub-Total | | 95 | 19.0 |
| Grand-Total | | 500 | 100.0 |

One of the respondent who is a scavenger discussing the benefit of recycling stated that *"collecting recyclable materials, especially Aluminium cans, Bottles and Metal Scrap and selling it provide us with income to cater for our daily need since we don't have other means of livelihood"*. A lot of literatures reported monetary incentives as the one of the important motivations to scavenging and recycle (Oskamp, 1991) particularly amongst high density household. High density households usually sell and reuse comparatively more of their post- consumption household materials than wealthy households (Abd'Razack et al., 2013).

### 4.4.3. Resources and cost conservation

Resources and Conservation component of the benefits of recycling has six sub-components which all amounts to 11.4%. This is the least benefit, according to respondents. This benefit echoed more among the highest income earners. Prevention of wastage, conservation of natural resources, spending less on expenses to produce new products, etc. can be saved in terms of cost of living, extending the limited earth's resource for future generation and transforming of old paper, plastic, bottles, and Aluminium cans into new product.

### 4.4.4. Environmental awareness

The analysis of Environmental Awareness is considered in three sub-components, namely: Ease of Waste Disposal (11.6%), Nurturing Values and Awareness (3.4%) and Inculcating Environmental Sanitation among Young People (4.0%). The implication of this benefit is that it will allow an efficient implementation of the disposal system, inculcate the habit of clean environment and can also help to educate people to respect the environments. Environmental awareness is a prelude to environmental preservation and monetary benefits. Therefore, it can be established that all the components of the benefits as itemized interrelate with one another.

A Pearson Chi-Square Analysis was carried out to compare the relationship between the habits of recyclers and non-recyclers perceptions towards the benefits of recycling as reported by respondents in Kaduna metropolis. Three of the benefits indicated that there is a significant correlation (Environmental Preservation, Monetary Benefit and Environmental Awareness) with respondents recycling habit while one benefit (Resources Conservation) do not relate with the recyclers and non-recyclers habits. The result of correlation between Environmental Preservation and recyclers and non-recyclers habits indicated that [Pearson $X^2$ (df = 1, N = 500) = 33.232, p = 0.004], also relationship between Monetary Benefit and recyclers and non-recyclers habits is significant [Pearson $X^2$ (df = 1, N = 500) = 23.212, p = 0.017], and the relationship between Environmental Awareness and Resources and recyclers and non-recyclers habits are significant [Pearson $X^2$ (df = 1, N = 500) = 22.242, p = 0.008]. On the contrary, there is no significant correlation between Resources Cost Conservation and recyclers and non-recyclers habits are significant [Pearson $X^2$ (df = 1, N = 500) = 73.441, p = 0.218]. This implies that recyclers are more likely to perceive environmental preservation, monetary benefits and Environmental Awareness as a form of recycling benefits compared to non-recyclers. Table 8 indicated the relationship between recyclers and non-recyclers perception towards recycling benefits.

**Table 8**
Chi Square Correlation between Households Recycling Habits and Benefits.

| Correlations | Recycling Households | | Non-Recycling Households | | $X^2$ Value | Sig. Lev. |
|---|---|---|---|---|---|---|
| | No of Respondents | Percentage | No of Respondents | Percentage | | |
| Environmental Preservation | 375 | 75 | 125 | 25 | 33.232 | .004[a] |
| Monetary Benefit | 375 | 75 | 125 | 25 | 23.212 | .017[a] |
| Environmental Awareness | 375 | 75 | 125 | 25 | 22.242 | .008[a] |
| Resources Cost Conservation | 375 | 75 | 125 | 25 | 73.441 | 0.218 |

[a] Significant at $\alpha = 0.05$

## 5. Discussions of findings

The analysis presented above indicates that there is a high level of educated people in the Kaduna metropolis (78.0%) when all forms of education are combined (from primary education to tertiary education) while only 22.0% do not have any formal education. This implies that there is high level awareness among the households on issues concerning solid waste handling and management. This shows that the metropolis is well informed and has a higher level of people with formal education than the national average. The National Bureau of Statistics (NBS, 2012) and National Population Commission (2011) have put the national illiteracy level at 28.0%. Therefore, an informed society will definitely manage their waste properly, but the reverse is the case as the city is dotted with heaps of solid waste in its every nook and crannies. The age range of the respondents also proved that it ranges between 25 years and over 55 years. The highest population of the sampled survey shows that the ages between 26 and 45 years are the commonest. These are working class people who have higher cost of consumption of resources (both natural and man-made) that can lead to the production of a higher solid waste generation. Therefore, the need for proper orientation to households on solid waste handling and management is required. This also set of people that are highly educated in the study, the need for proper handling of recyclable waste material is important.

The household size ranges between 1 and 5 people per household to above 25 people per household. The higher the household size, the higher the level of solid waste generated. The study also revealed that, households with 11–15 and 16–20 people per household are higher in the study area. Therefore, the level of waste generated was higher. These households also have higher education and therefore consume resources that generate more recyclable materials and are well informed about recycling of waste. The average household size in Kaduna metropolis is about 7 people per household, which is higher than 6 people per households as national household size in Nigeria. The implication of this is that 3.92 kg of waste is generated by each household, compared to 2.94 kg per household using national average (Ogwueleka, 2009 has put average waste generated per individual in Northern Nigeria at 0.56 kg per capita while the national average is 0.49 Kr per capita). Household therefore needs adequate information on solid waste handling and management to reduce and recycle waste.

Location of households in the study revealed that, higher population is concentrated in low income area (67.6%). This therefore implies that there is a higher generation of waste compared to medium and low density areas of the metropolis. Though research has proved that high income earners produces more waste than low income earners, the concentration of low income population, therefore, produces higher waste than the low and medium income area (Abd'Razack et al., 2013). The study revealed that high income earner has a lower recycling habit compared to low income households that reduces their waste through reuse and recycling. Different dwelling type also indicated that low income households depend on tenement building (68.0%) that are clustered in the inner city, while the high income households dwell in the row of flats, duplexes and detached bungalow (17.0%). The implication of the cluster is that a high number of households are involved and, therefore, generates higher solid waste than the suburb of the metropolis that is planned and lower population. The occupations of the resident also play an important role in the solid waste handling and management in the metropolis. 34.0% of respondents are government officials while 66.0% are either self-employed or unemployed. This has effect in that the level of awareness of a government official is higher than another set of occupation.

Table 3 indicated that the majority of the households in the study area were recyclers (75.0%), though at different degree of recycling while 25.0% of respondents do not recyclers at all (25.0%). This is at variance with the Nigerian situation which, according to Sanusi (2001) accounts for only 25.0% of Nigerians involved in recycling activities whether formal or otherwise. Additional discussion about recycling habits of Nigerian can also be established, the analysis indicated also that households that do separation of their waste for recycling purposes can be seen as those who are well informed about the action and inaction to solid waste management. Many of these households are involved in recycling activities because of the environmental benefit not the monetary benefit accrued to it. However, a relationship between recyclers and non-recyclers provided an opportunity to assess the responses of the two categories if the people in the study area (recyclers and non-recyclers). This is a function of the lifestyle of the households which include accommodation types, household size, income and benefits.

The research carried out by Momodu et al. (2011) on housing types and the impact of waste in urban centres in Nigeria shows a significant correlation to recycling habits, attitudes and awareness. This corroborated this research that low income households living in compact housing are more likely to recycle their waste with added determination. This study is also similar to the work of Abd'Razack (2014) and Selim (2013) that recycling habit does not have significant differences between genders. This implies that irrespective of your gender, there is always the production of waste. Curiously, this study indicated that no significant differences occur between ages and recycling habits, but some contrary, research such as Ebreo and Vining (2001), Steg and Vlek (2009) indicated that adults usually recycle more than young people. The literature abounds about relationship socioeconomic and demographic characteristics of people and recycling habits.

The analysis of the recycling habit of the resident of Kaduna metropolis indicated that 75.0% of respondent are involved in solid waste handling and management. They practice this through reuse (45.0%), recycling (40.0%) and reduce (15.0%). The study revealed that higher populations of respondents are aware of the importance of household waste handling. This is as a result of the high level of people with formal education. Correlation analysis of the socio-economic and demographic characteristics of the respondents and recycling habit indicated that there is significant correlation between age and recycling habit; education and recycling habit; type of dwelling and recycling habit and household size and recycling habit while the gender of respondents does not correlate with recycling habit (see Table 4). This implies that the people of Kaduna metropolis are well aware of the importance of recycling

of solid waste materials. The study also revealed that whether you are a male or female, it does not have any implication on your ability to recycle except you are informed about the importance of waste recycling.

The result of this study indicated that the larger percentage of households in the study area dispose their waste material the moment they are in a dilemma of whether the material recyclable item or not. Therefore, it is pertinent to create the necessary awareness to the populace on the environmental consequences of their actions. One way of creating awareness by the government was the creation of environmental sanitation days to sensitize people on danger of unclean environment. By improving the knowledge base of the people, behavioural attitudes among households will ultimately change for better. This will provide households opportunity to appraise the merits and demerits of their action towards the environment and waste management, which will influence future behaviour of the people to the environmental preservation.

The study revealed that under uncertainty condition of solid waste materials, households employed three methods of handling such waste. These include disposing of; segregation and seeking necessary information about the product. The disposal of is the most favoured (54.6%); followed by seeking of information (24.4%) while segregation accounts for 21.0%. They disposed of was carried out through the use of dustbins, open dump, buried in the ground, thrown to the water channels and burning (see Table 5). Seeking information on waste is carried out through friends, family member, experts, label of the used products and other sources. The correlation between recycling habit and waste handling in an uncertainty condition revealed that there is significant correlation between disposed of and recycling habit and segregation and recycling habit while there is no significant correlation between seeking information and recycling habit (see Table 6). This implies that the method employed by residents in an uncertain situation on recycling habit is significant.

The perception of the residents to benefit of recycling shows that there are four categories of benefits identified. These include environmental preservation (38.6%); monetary reward (11.4%); environmental awareness (19.0%) and resources and cost conservation (11.4%). The environmental protection benefits include environmental protection, cleanliness, pollution control, reduction in quantity of solid waste and others. The monetary benefits include employment (scavengers, junk shops etc.) and household income. The resources and cost conservation benefits include general cost savings, municipal solid waste management savings, municipal solid waste processing (time and cost), sustainable use of resources, material waste reduction and a host of others. The environmental awareness benefits include ease of waste disposal, creating value and awareness and inculcating environmental sanitation among youths (see Table 7). The correlation of the perception of residents to recycling and recycling habits shows that there is significant correlation between environmental preservation and recycling habit, monetary benefits and recycling habit and environmental awareness and recycling habit, while there is no correlation between resource conservation and recycling habits. This implies that the benefit of resource conservation is not yet known by the residents on issues of recycling of solid waste materials (see Table 8).

Household perceptions towards benefits accruing from recycling can be observed as a plus for the environment and required change of habit because of the fact that the issue of climate change and environmental degradation could be addressed. The analysis from the study indicated that environmental issues are paramount to survival and livelihood of the citizens globally. About 38.4% implies that recycling is beneficial to environmental preservation. There is significant correlation between environmental awareness and recycling behaviour of the respondents, this agreed with the work of Perrin and Barton (2001), Afroz, Hanaki, Tuddin, and Ayup (2010) and Nyamwange (1996). This study also indicated that the attitude of recyclers to general environmental values is positive and proper awareness could is likely improve the level of recycling behaviour and attitude to the environment. This is in line with Bolaane (2006) that predicted that households with higher awareness about recycling will duly recycles more, though awareness is not the major factor that will translate practicing recycling to households, but it is a precursor to environmental concern in the society.

This study on perceptions of households with benefits of recycling in Kaduna metropolis has proved that Environmental Preservation supports the result of the findings of Vicente and Reis (2008) that level of awareness of recycling benefits to people can lead to better participation in recycling activities by the household members. Guaranteeing that recycling will continue to be beneficial in the future, necessary programmes, campaigns, are needed to enlighten the populace about the benefits of recycling.

The correlation analysis of the study indicated that three components of the benefits of recycling highlighted by the respondents correlate significantly amongst recyclers and non-recyclers. It was established that recyclers in the study area believes that recycling is a way of preserving the environment and conserve the resources. The study corroborated the findings of Kaiser, Wolfing, and Fuhrer (1999) that there is a significant relationship between environmental concern and recycling behaviour of people.

## 6. Conclusions

This study centered on assessing households' habits and perception of the benefits of recycling in Kaduna metropolis, North Western Nigeria. The result presented in preceding section indicated that there is a high level of formal education acquisition by the residents of the Kaduna metropolis. The education ranges from primary education to tertiary education. There is about 22.0% non-formal education of the people of the metropolis. This place people in a better position to understand the importance of environmental protection and recycling. The average household size in the metropolis is 7 people per capita, and produces about 3.92 kg of waste per household. The major occupation of the residents is self-employed and about 34.0% are government officials.

There is a significant correlation between some variables of socio-economic and demographic characteristic of the residents to habit and benefits of recycling. There is significant correlation between age of respondents and recycling habits; educational status and recycling habit; types of dwelling and recycling habits and household size and recycling habits. On the other hand, there was no significant correlation between the gender of respondents and recycling habit. This therefore implies that irrespective of respondent's gender, it does not encourage or discourage recycling.

It was observed that three methods with several sun-methods were usually employed by households when confronted with recycling in an uncertainty situation. These include: Disposal, Segregation and seeking necessary Information for solid waste management. These methods are employed on a different scale. The study shows that there is significant correlation between disposal and recycling habit and segregation and recycling habit, while there is no significant correlation between seeking necessary information on such waste and recycling habit.

The households' perception of the benefits of recycling is categorized into four constituents, namely Environmental Preservation, Monetary Reward, Environmental Awareness and Resources Cost Conservation in their order of importance. The result indicated that housing type, household size and income influences recycling habits among households. It further shows that non-recyclers households dispose their waste materials when confronted with

uncertain of whether the waste materials could be recyclable or not when related to recyclers in the study area. Furthermore, the study proved that recyclers usually have a superior environmental concern than the non-recyclers. This study has tended to provide opportunity to formulate an efficient method of generalizing habitual environmental behaviour of residents of a particular geographical location. Amazingly, the research indicated that recyclers showed a higher environmental consciousness than non-recyclers households in Kaduna metropolis.

## References


Aarts, H., Verplanken, B., & Knippenberg, A. (1998). Predicting behaviour from actions in the past: Repeated decision making or a matter of habit? *Journal of Applied Social Psychology, 28*(15), 1355–1374.

Abd'razack, N. T. A., Yusuf, A. E., & Utange, J. Z. (2013). An appraisal of solid waste generation and management in Jalingo city, Nigeria. *Journal of Environment and Earth Science, 3*(9), 20–28. ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online). www.iiste.org

Abd'razack, N. T. A. (2014). *Ecological footprint as an assessment tool for sustainable development in Minna, Nigeria. An unpublished PhD thesis.* Department of Urban and Regional Planning, Universiti Teknologi Malaysia.

Abraham, A. E., Barr, E. B., & Bryman, A. (2001). *Social research methods.* Oxford: University Press.

Adebola, O. O. (2006). The roles of informal private sector in integrated solid waste management in the achievement of the millennium development goals (MDGs) in lagos, Nigeria. *Paper presented at the solid waste, health and millennium development goals, CWB-WASH workshop, 2006 in Kolkata, India.*

Adefemi, S. O., & Awokunmi, E. E. (2009). ***The impact of municipal solid waste disposal in ado-Ekiti, metropolis, ekiti state, Nigeria.***. Cited in http://www.academijournal.org/AJEST/PDF. Retrieved on 2nd June 2011

Adewole, T. A. (2009). Waste management towards sustainable development in Nigeria: A case study of Lagos state. *International Non-Governmental Organization (NGO) Journal, 4*(4), 173–179.

Afroz, R., Hanaki, K., Tuddin, R., & Ayup, K. (2010). A survey of recycling behaviour in households in Dhaka, Bangladesh. *Waste Management & Research, 28*(6), 552–560.

Agunwamba, J. C., Ukpai, O. K., & Onyebueyi, I. C. (1998). Solid waste management in Onitsha, Nigeria. *Journal of Waste Management Research, 16*(1), 23–31.

Agwu, M. O. (2012). Issues and challenges of solid waste management practices in Port Harcourt City Nigeria: A behavioural perspective. *American Journal of Social and Management Sciences, 3*(2), 83–92.

Anijah-Obi, F., Eneji, C. O., Ubom, B. A. E., Dunnamah, A. Y., & Williams, J. J. (2013). Introducing environmental sanitation education in primary school curriculum. *Education Research, 4*(3), 227–230.

Bolaane, B. (2006). Constraints to promoting people centered approaches in recycling. *Habitat International, 30*(4), 731–740.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Danmegoro, B. S. (2002). *Partnership in urban solid waste management in Lagos state. An unpublished B.Tech dissertation.* Minna, Nigeria: Federal University of Technology.

Ebreo, A., & Vining, J. (2001). How similar is recycling and waste reduction? Future orientation and reasons for reducing waste as predictors of self-reported behaviour. *Environment and Behaviour, 33*(3), 424–448.

KASEPA. (2014). *Profile of Kaduna state environmental protection agency.* Kaduna Nigeria: KASEPA Publications Government Press.

Kagu A. (1997). Refuse Generation and Disposal in Maiduguri, Borno State in Daura, M. M. (ed). *Issues in Environmental Monitoring in Nigeria* Nigerian Geographical Assocaition (NGA).

Kaiser, F. G., Wolfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology, 19*(1), 1–19.

McKenzie-Mohr, D., & Smith, W. (1999). *Fostering sustainable development an introduction to community-based social marketing Canada.* New Society Publishers.

Miafodzyeva, S., & Brandt, N. (2013). Recycling behaviour among householders: Synthesizing determinants via a meta-analysis. *Waste and Biomass Valorization, 4*(2), 221–235.

Momodu, N. S., Dimuna, K. O., & Dimuna, J. E. (2011). Mitigating the impact of solid waste in urban centres in Nigeria. *Journal of Human Ecology, 34*(3), 125–133.

NBS. (2012). *Abstracts of statistics.* Abuja, Nigeria: National Bureau of Statistics Publications Presidency.

NPC. (1996). *1991 National population census report.* Abuja, Nigeria: National Population Commission Publications Unit, Presidency.

NPC. (2011). *2006 National population and housing census report.* Abuja, Nigeria: National Population Commission Publications Unit, Presidency.

Nyamwange, M. (1996). Public perception of strategies for increasing participation in recycling programs. *The Journal of Environmental Education, 27*(4), 19–22.

Ogwueleka, T. C. (2009). Municipal solid waste characteristics and management in Nigeria. *Iran. J. Environ. Health Sci. Eng., 6*(3), 173–180.

Oskamp, S. (1991). *Attitudes and opinions.* Englewood Cliff: Prentice-Hall inc.

Perrin, D., & Barton. (2001). Issues associated with transforming household attitudes and opinions into materials recovery: A review of two kerbside recycling schemes. *Resources, Conservation and Recycling, 33*(1), 61–74.

Ronis, D. L., Yates, J. F., & Kirscht, J. P. (1989). Attitudes, decisions, and habits as determinants of repeated behaviour. *Attitude Structure and Function*, 213–239.

Sanusi, Y. A. (2001). Partnership in the management of urban environment: The case of solid waste in Nigeria. *A paper presented at the conference on environmental planning, design and management, held at Federal Polytechnic, Nasarawa between 18th to 19th july.*

Sanusi, Y. A. (2010). Capacity issues of private sector participation in urban solid waste management in Nigeria. *Humanity and Social Sciences Journal Pakistan, 5*(No 1), 7–18.

Selim E. (2013). Solid Waste Management And Health Effects: A Qualitative Study on Awareness of Risks and Environmentally Significant Behaviour. In Mutomo Kenya.(Ed.), B.Tech Thesis submitted to UMEA University.

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*(3), 309–317.

Stock, R. (2010). Environmental sanitation in Nigeria. *Review of Political Economy, 42*, 19–31.

UN (2000): United Nations Millennium Declaration, Resolution adopted by the General Assembly, A/RSS/55/2, 18 September 2000.

UN-Habitat. (2008). *The state of the world's cities report, 2008–2009 harmonious cities.* London: Earthscan.

UN-Habitat (2010): Solid Waste Management in the World Cities, Water and Sanitation in the World Cities. United Nation Human Settlement Programme.

Ugwuegbu, D. C. F. (2011). *Social psychology and social change in Nigeria, a system evaluation.*

Vicente, P., & Reis, E. (2008). Factors influencing households' participation in recycling. *Waste Management & Research, 26*(2), 140–146.

Vining, J., & Ebreo, A. (1990). What makes a recycler? A comparison of recyclers and non-recyclers. *Environment and Behaviour, 22*(1), 55–73.

WHO (2010). Population Health and Waste Management: Scientific Data and Policy Options; Report of a WHO Workshop, Rome, Italy, March 29.

Wright, Y. L. (2011). *Relating recycling: demographics, attitudes, knowledge and recycling behavior among UC Berkeley students.*