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RESEARCH ARTICLE

ASSESSMENT OF PUBLIC PARTICIPATION ON SOLID WASTE DISPOSAL IN SOUTHERN KADUNA STATE, NIGERIA

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ABSTRACT

Solid waste comprises all specks of dirt discarded which are unwanted be human as well as harmful to our environment. There is a rapid increase in the generation and disposal of solid waste such as refuse, garbages, dry leaves, old irons aluminum and many more. The southern Kaduna is a region with rapid growth in population. The rise in the per capita income of the individual increases the rate of their consumption. The rate of population growth also escalates the disposal of solid waste. The human health is in danger of communicable diseases, air and waterborne diseases because of the reckless disposal of solid waste in Southern Kaduna; (Sanga, Jemaa and Kaura Local Government area). The public sector participation is low which increases refuse dumpsite that affects the environment. The blockage of the street by the heap of refuse, the bad smile or odour, the groundwater contamination and spoil soil structure and it affluent. The use of statistical methods of correlation analysis proves that there is a significant relationship between public participation and waste dumping in the study area. About 330 samples of respondents were taken and the result of 0.97 correlation of weekly waste disposal, 0.96 correlation of monthly disposal and 0.98 correlation coefficient of annual solid waste disposal waste was obtained.

KEYWORDS

public participation, Solid Waste, Human Health, Regression Analysis.

1. INTRODUCTION

Solid waste defined as the system of transporting, collecting, disposing of, monitoring, managing, and processing waste material either in solid or liquid form. The waste ate referred to the human-generated waste materials mostly from the households. Inadequate and poor waste management became a major problem health in our cities nowadays. The climatic factors are very important to be considered in solid wastes management, this affects both urban and rural areas (Enete and Amusa, 2010). The issue of community health workers is adversely involved in this aspect. People will no longer stay in a dirty environment as such they require the service of health workers to educate people on the danger of reckless and indiscriminate refuse disposal on street and backyard. The issue of solid waste management and deterioration of the agricultural land is alarming in most of the Nigerian States. The open refuse dumps and the threat to health are mismanaged (Ikporukpo, 1983).

Waste dumping is done illegally in most of our cities today. The provision of waste facilities management is very vital in converting indiscriminate dumping of refuse in our environment (Curran et al., 2007). Centralized disposal and collection centres are paramount in waste management strategy public sewage and household waste must be properly kept and disposed of because of the hazardous industrial waste England declare is as the "dustbin of Europe" 57 million tons of rubbish which include industrial waste as its disposed in landfill sites (Hamilton et al., 2014). The cost of paying criminals for illegal dumping is almost paying greatly for waste disposal company (Read et al., 2001). One of the urban life by-products is a municipal solid waste (MSW). About 3.5 million tons of MSW is the generation of waste daily on a global scale. Lack of good management of solid waste can lead to contamination of dioxin to the inhabitant cause health hazards, most of the cities in China are facing the serious challenge of municipal solid waste management with increasing economic growth and urbanization (Liu et al., 2017; Rada et al., 2011).

Illegal dumping (also called fly dumping or fly-tipping) refers to waste dumping on sites with no license instead of using an authorized rubbish dump and being disposed of properly at a landfill site. The underlying soil quality and watercourse are under high risk of being damaged if solid wastes are dumped inappropriately. Further, if the waste disposal is uncontrolled, it will damage the environment, particularly when it consists of used drugs, asbestos sheeting, and drums of toxic material or syringes (Ino, 2011). Centralized collection and disposal is an important waste management strategy for waste taking the form of solids or liquids. It is used to manage the waste of household, public sewage, hazardous waste of industries and business (Hamilton et al., 2014). England is declared as the "dustbin of Europe", it will run out of landfill sites in 2018. Every year, 57 million tons of rubbish, including industrial waste, are being disposed of in landfill sites. The data on household waste is paramount (Qdais et al., 1997).

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The age and education level or are based on a random sampling contingent on the electoral register (Dennison et al., 1996; Pladerer, 1999). Waste generated within the investigated period (from one month to several years) is collected, separated by 6 up to 36 fractions and documented; these tasks are partly carried out by the participants themselves. Household characteristics are mainly gained by personal interviews and surveys, as census data are not available on an individual level due to data protection issues. The wastes sorted by households were further segregated into 23 various sub-fractions and analysed by their weight as well as the percentage composition as described (Pichtel, 2005; Standard, 2008).These include:

A. Organics, Food waste, yard waste (grass trimmings), wood, animal droppings.

B. Paper, cardboard, newsprints, office papers, tissue papers),

C. Plastics, Polyethylene terephthalate (PET), High density Polyethylene (HDPE), Polyvinyl chloride (PVC),

D. Low-density polyethylene (LDPE), Polypropylene (PP), Polystyrene (PS), other plastics, Metals, Scrap, Cans/Tins

E. Glass, Coloured, Plain

F. Rubber and leather

G. Textiles

H. Inert (sand, fine organics, ash).

I. Miscellaneous (construction and demolishing waste, batteries, paints, any other waste fraction not fit in the categories). The percentage composition of each of the components was calculated by the formula

Percentage composition of waste fraction:

$$= \frac{Weight\ of\ separated\ waste}{The\ total\ of\ mixed\ waste\ sampled} \times 100$$

The per capita generation was also determined as per the mixed or the total waste collected in a day and also the separated fractions using this formula:

Per capita waste generation:

$$= \frac{Weight\ of\ MSW\ generated\ at\ Household}{Total\ number\ of\ persons\ in\ the\ household} \times \text{Total number of generation days}$$

Level of compliance in the separation Source sorting and separation of waste by households require the input of the generators. The ability of household participants to sort and separate their waste well serves as a yardstick for authorities to consider introducing source sorting and separation of household waste. Initially, there was a questionnaire administration to assess the willingness of selected households to participate in the survey. Afterward, they were made sort and separate their waste by the one-way sorting and separation system which involved the two categories of the waste, organics and non-organics. The compliance level of the sorting and separation was measured by taking the weight of waste rightly sorted into the appropriate bins provided as a percentage over the total weight of waste in the same bin.

$$\text{Compliance Level} = \frac{Weight\ of\ sorted\ waste\ in\ the\ right\ bin}{The\ total\ weight\ of\ all\ waste\ separated\ into\ the\ bin} \times 100$$

The Federal Government Establishes an Environmental Sanitation to reduce the solid waste disposal and clear the refuse dumps every Saturday in many states of the federation (Momodu et al., 2011). The developing country like Nigeria still there is unplanned growth for future population growth. Scavenging is the business done by picking scraps from refuse dumps and selling it to local dealers.

2. Materials and Methods

2.1 Study area

Southern Kaduna has a mixed population. The State has about 23 Local Government areas. The people of the state engaged in agriculture. Only three of the 23 LGAs were selected from the south in this study.

2.2 Location

Kaduna State is located in the North-west geopolitical zone. This study will consider the three major LGAs, that is Sanga, Jemaa and Kaura with the following locations Lat 9°11'56.89"N Long 8°33'44.21"E Sanga, Lat 9°28'2.34"N Long 8°22'27.48"E Jemaa, Lat 9°37'48.29"N Long 8°33'25.04"E Kaura; as shown in Figure 1.

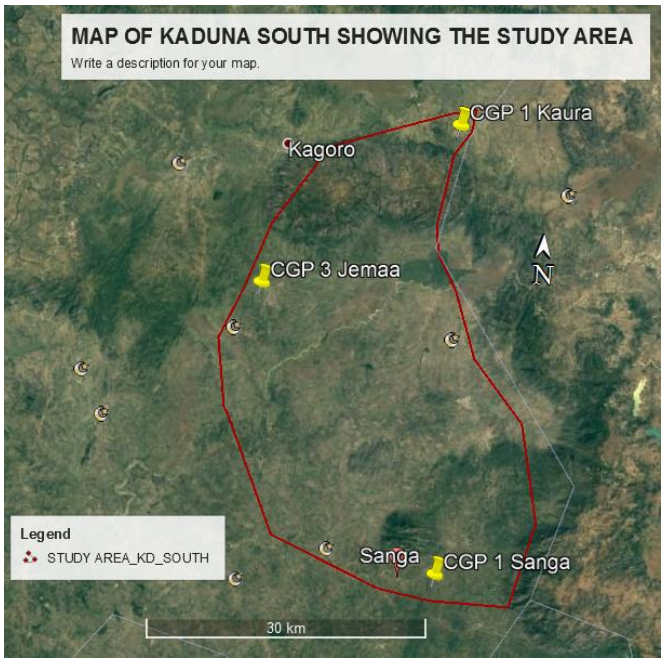

Figure 1: The Locations of the Study Area

2.3 Population of the Study Area

The total population of Kaduna State is 8,252,400. The study area divided into three different Local Government Areas. According to the National Population Commission 2016, Sanga has a total population of 204,500; Jemaa has 375,500, Kaura 235,700.

3. Result and Discussion

To achieve the aim and objectives of this study, data were obtained the following:-

i. Household characteristics, waste generation and management through a questionnaire survey.

ii. Waste composition and volume through on-site sorting and measurement of wastes.

iii. The capacity of solid waste management agency and activities through in-depth study added by structured questionnaires and check-list.

iv. The biophysical and socio-economic environment of the study area through field observation.

The methods used for the analysis of data consisted of descriptive statistics of frequency count, mean, tabulation and percentages to summarize the data into a meaningful form. Also, analysis of variance (ANOVA) in SigmaStat 3.5 Package was employed to determine the significant difference on the generation of wastes among the household groups on one hand and waste collections by the authorities on the other hand as well as an average waste generation between the three major income groups (high, middle, and low) in the four residential areas namely, Sanga Jemaa and Kaura. The statistical test for significance was based on a 5% level of significance (95% confidence level). Graphs were plotted with Microsoft Excel 2010 version and convert it to Minitab statistical analysis to obtain the regression analysis as stated below.

3.1 Weekly analysis and Result of Firewood and Charcoal users in the Study area.

Table 1: Weekly Disposal of solid waste in the study area

No of Respondents	Amount of solid waste used per capital per week in (Kg)
15	200
10	150
18	300
12	180
25	500
16	180
110	1770

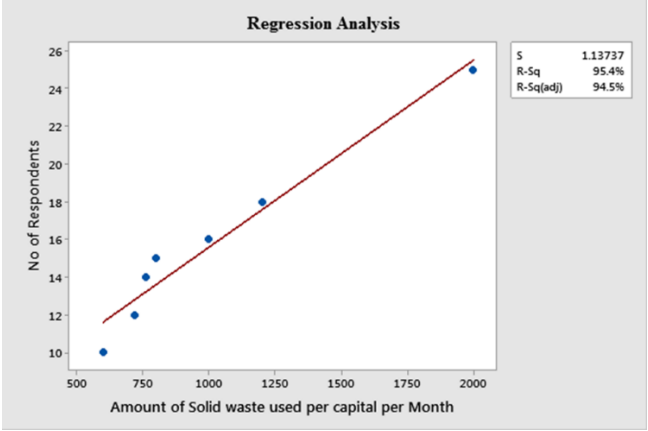

Figure 2: The Regression Analysis with 95% of the coefficient of determination

At 0.976865 correlations, the model indicates that there is a high correlation between the respondents and the amount of solid waste per capita per week in the study area.

3.2 Monthly firewood and Charcoal Users in the Study area

Table 2: Monthly Disposal of solid waste in the study area

No of Respondents	Amount of Solid waste used per capita per month in (Kg)
15	800
10	600
18	1200
12	720
25	2000
16	1000
14	760
110	7080 kg

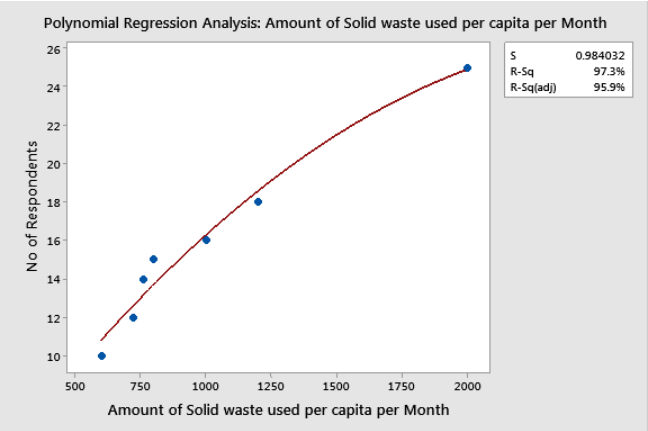

Figure 3: Polynomial Regression showing 0.97 correlations coefficient

There is a high correlation of 0.964815 between the respondents and the amount of solid waste per capita per month disposal in the study area.

3.3 Annual Firewood and Charcoal use in the Study area

Table 3: Annual Disposal of solid waste in the study area

No of Respondents	Amount of Solid waste used per capita per annum in (Kg)
15	9600
10	7200
18	14400
12	8640
25	24000
16	12000
14	9120
110	84960kg

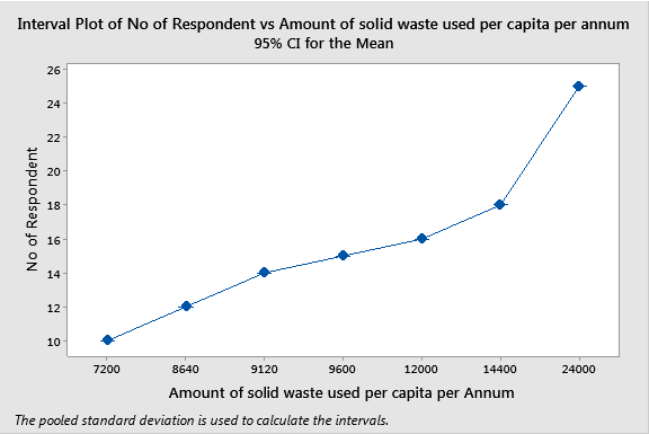

Figure 4: The Standard deviation with 95% of the mean calculated per Annum

There is also a strong relationship of 0.98391 between the respondents and solid waste been disposed of annually in the study area.

4. Conclusion

All these three variables tested for the significance of solid waste disposal in the study area have proven to have a high correlation coefficient of 0.98. The analysis was conducted base on the frequencies of public disposal of solid waste. The outcome shows that weekly disposal of solid waste in the study is about 1770kg per week, 7080kg is produced monthly and 84960kg per annum. This figure may be projected base on the increase in human number per head in the individual household.

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