

## Survey of Waste Disposal and Its Perception among Residents of Sokoto Metropolis, North-Western Nigeria

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### ABSTRACT

*Sokoto metropolis is located at extreme Northern Nigeria with a population of 4,244,399 people. This survey was conducted to evaluate the pattern of waste disposal and regularity of sanitation. Waste samples from the five LGAs that makeup the metropolis was collected for analysis and questionnaire was distributed to residents around the collected waste dumpsites. Biodegradables waste dominated the categories of waste collected. There was lack of waste collecting centres in the metropolis. Majority of the residents disposed off waste at any available space or inside drainages around their houses. Respondents were also aware of diseases associated with waste disposed around their residential area. The government of the State is aware of this environmental problem and willing to take corrective measures. There is need for proper enlightenment on the efficient waste disposal and management system.*

**Keywords:** Biodegradables, Metropolis, Respondents, Sokoto, Waste

### INTRODUCTION

Sokoto is located in the extreme part of North-western Nigeria with little industrial activities, but solid waste dumps on the streets and in drainages is the major environmental problem to inhabitants. Municipal Solid Waste (MSW) management is one of the fundamental issues in the contemporary urban areas especially in developing countries such as Nigeria<sup>1</sup>. Waste can be loosely defined as any material that is considered to be of no further use to the owner and is, hence, discarded. However, most

discarded waste can be reused or recycled, one of the principles of most waste management philosophies<sup>2</sup>. What may be of no further use to one person and regarded as waste to be dumped, may be of use to the next person, and is the basis of the rag picking trade, the sifting through of refuse at landfills for recovery and resale, a very fundamental historical waste management practice still functioning in many countries, often conducted on a highly organised commercial basis<sup>2</sup>.

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Wastes generated by the full extent of human activities range from relatively innocuous substances such as food and paper waste to toxic substances such as paint, batteries, asbestos, healthcare waste, sewage sludge derived from wastewater treatment and as an extreme example, high-level (radioactive) waste in the form of spent nuclear fuel rods. Numerous classifications of solid wastes have been proposed<sup>3&4</sup> and the following represents a simple classification of waste into broad categories according to its origin and risk to human and environmental health: Household waste; Municipal waste (MSW), Commercial and non-hazardous Industrial wastes, Hazardous (toxic) industrial wastes, Construction and demolition (C&D) waste, Health care wastes – waste generated in health care facilities (e.g. hospitals, medical Research facilities), Human and animal wastes and incinerator wastes<sup>2</sup>. Waste management is one of the crucial global issues that affects our environments, this may be due to rapid population growth, developing technology and human affinity to use more consumable

materials, which brought about increasing of solid waste generation rate<sup>12</sup>. As more impetus is being enforced to enhance cleanliness and preservation of the environment, Sokoto State Government has introduced a monthly incentive of one million naira to any of the 10 zones adjudged to be the cleanest in the State<sup>5</sup>. This paper aimed to evaluate the pattern and perception of waste disposal by the inhabitants of Sokoto metropolis.

### MATERIALS AND METHODS

Sokoto State lies between longitudes 4°8'E and 6°5'E, and latitudes 12°N and 13°58'N (Mamman, 2000). The climate is tropical continental, with much of the rains between June to September, while the long dry season is from October and May (Ita *et al.*, 1982). The central metropolis is covered by Sokoto North, and Sokoto South local government areas, with some parts of Kware LGA from the North, Dange Shuni from the South and Wamako LGA to the East. Sokoto metropolis has an estimated population of 427, 760<sup>8</sup>.

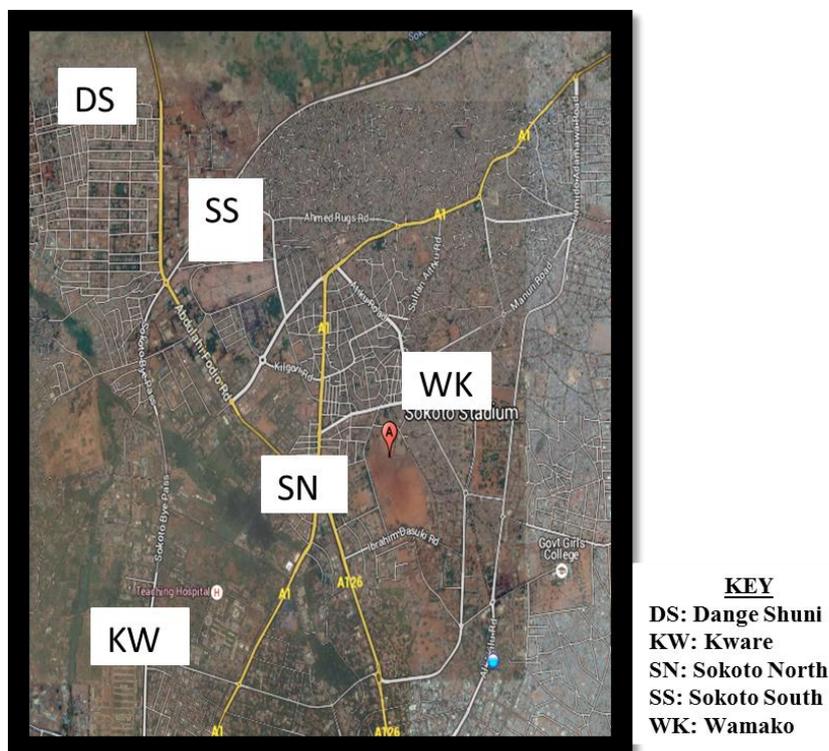


Fig. 1: Map of Sokoto Metropolis Showing the Sampling Stations

### Sample collection

Samples were collected from different dump sites distributed within the metropolis; these were located at five Local Government Areas that makeup the metropolis; Sokoto South dump site, Sokoto North dump site, Wamako dump site, Dange Shuni dump site and Kware dump site. Ten kilogram of waste was collected in a polythene sack from dump sites (two samples each). The survey also randomly selected residents of Sokoto metropolis using structured questionnaire for the evaluation of their perception and practices of solid waste disposal in Sokoto metropolis. This was distributed around the dumpsites surveyed within the metropolis.

### Sample Separation and Determination of Heavy Metals

Various categories of the solid waste were separated and weighed according to contents. These were decayed organic wastes which include; food remnant, leaves and animal dung. Non- degradable inorganic wastes include; synthetic wrappings plastic containers, glasses, cellophane bags etc. Each waste was weighed from all the sampling sites and recorded in Kilogram After separation 1g of dried contaminated soil sample was taken, this was digested and heavy metals concentrations was determined using an atomic absorption spectrophotometer (AAS), the three elements analyzed were Lead, Chromium and Zinc<sup>9</sup>.

### Statistical Analysis

Data obtained from the study were analyzed by descriptive statistics using means and standard errors. Analysis of variance (ANOVA) was used to analyze the data obtained from the study.

## RESULTS AND DISCUSSION

Solid waste disposal is one of the major environmental problems in Sokoto metropolis, the results of the waste composition from the collected samples within the metropolis reveals that lead (Pb) concentration >chromium(Cr)> zinc (Zn), with highest values of 9.15g/kg, 20.01g/kg and 0.73g/kg respectively. Concentration of heavy metals in

food chain, is a problem that illustrates the relationship between municipal solid wastes and liquid industrial effluents containing heavy metals discharged to a drainage system and open dumping sites of municipal solid wastes and the wastes discharged thereby maintains a vicious cycle<sup>10</sup>.

Solid wastes have varied in compositions and constituents from place to place<sup>11</sup>. In the present study decomposed waste into soil remnant dominated the categories of collected waste, which was followed by rubber with a mean of 0.80kg at Sokoto North, broken glasses has the least category of waste collected of 0.25kg (Table 1), this been reported by many<sup>3,4,11,12</sup> that biodegradable waste account for over 50% of the Municipal Solid Waste (MSW). There were four age groups among the surveyed respondents, in which 20-30 were dominant; this means Sokoto metropolis is populated with this reproductive age group. The perception of these respondents also revealed that 20% of the 20-30 age groups were found to dump their waste in the house while only 2% of them dump their waste outside the house (Table 2). Fifty two percent (52%) of 20-30 age group disposed their waste at any available dump site around their area, 40% of this age group also were reported to dispose their waste weekly. The following were found to dispose their waste monthly; 22% among 20-30, 12% among 31-40, 6% among 41-50, and 2% among 51-60 age groups. There are several diseases associated with dumped waste, in the present survey 40% among the respondents reported that malaria is associated with waste dumped, while only 2% among the 41-50 age groups agrees diarrhea to be associated with dumped waste. Though 14% of 20-30 age group also agrees that waste dumped are associated with cholera, 6% among 31-40 and 41-50 age groups also reported that dumped waste to contribute on spread of cholera. The present finding therefore is in line with the report of<sup>11</sup> that waste are sources of contamination due to incubation and proliferation of flies, mosquitoes, and rodents; which in turn are

disease transmitters that affects population's health. Generally there was few among respondents that used government provided waste dumped centers, in which only 4% in each among 20-30 and 31-40 age groups used the government waste collection centers. This therefore shows that government in Nigeria does not provide collection centers for its

citizen to dispose waste properly. This has been reported by <sup>14</sup> that private sector participation, highway managers, local government and other agencies are responsible for the collection and disposal of all types of waste generated. In Sokoto collection of waste is poorly coordinated or even lacking.

**Table 1: Waste Composition and Some Heavy Metals of LGAs Within Sokoto Metropolis 2015**

Variable	Sokoto North	Sokoto South	Wamako	Dange Shuni	Kware
Lead (g/kg)	9.15±0.82	8.93±2.26	5.39±0.09	4.04±2.35	6.34±3.06
Zinc (g/kg)	0.00±0.00	0.73±0.46	0.34±0.34	0.04±0.04	0.22±0.22
Chromium (g/kg)	2.01±0.89	1.57±1.57	0.48±0.54	0.85±1.15	0.63±0.63
Soil (Kg)	8.20±0.20	7.9±0.40	7.65±0.35	8.25±0.05	7.70±0.20
Glasses (Kg)	0.25±0.05	0.45±0.35	0.45±0.15	0.65±0.05	0.45±0.05
Stones (Kg)	0.75±0.15	0.65±0.05	1.40±0.40	0.75±0.05	0.95±0.25
Rubber (Kg)	0.80±0.00	1.0±0.00	0.50±0.10	0.30±0.05	0.90±0.10

**Table 2: Percentage of Respondents Perception on Waste Disposal in Sokoto Metropolis 2015**

Respondents Perception	Age Groups			
	20-30	31-40	41-50	51-60
Waste Dump in the Houses	31(62)	11(22)	4(8)	1(2)
Waste Dump outside the House	1(2)	2(4)	-	-
<b>Categories of waste Dumped</b>				
Soil	13(26)	3(6)	1(2)	-
Broken Glasses	4(8)	3(6)	1(2)	-
Animal Dung	10(20)	6(12)	2(4)	1(2)
Rubber	5(10)	1(2)	-	-
<b>Methods of Waste Disposal</b>				
Dustbin in the House	4(8)	2(4)	-	-
Any Waste Dump in the Area	26(52)	9(18)	4(8)	1(2)
Government Provided Waste Dump	2(4)	2(4)	-	-
<b>Regularity of Waste Collection</b>				
Daily	1(2)	-	-	-
Weekly	20(40)	7(14)	1(2)	-
Monthly	11(22)	6(12)	3(6)	1(2)
<b>Diseases Associated With Waste Dumps</b>				
Malaria	20 (40)	5 (10)	-	1(2)
Cholera	7 (14)	3 (6)	3 (6)	-
Diarrhea	5 (10)	5 (10)	1(2)	-
<b>Sokoto Metropolis Should Be Sanitize</b>				
Weekly	20 (40)	10(20)	2(4)	1(2)
Biweekly	6 (12)	3(6)	2(4)	-
Monthly	6 (12)	-	-	-

### CONCLUSION

This survey reveals that Sokoto metropolis need to be sanitized weekly because of the indiscriminate dump of waste all over the metropolis. The samples collected have also shown that the major waste are biodegradables, but the concentration of some three heavy metals analyzed also shows that lead has high concentration compared to others. There is need for regular sanitation in the metropolis.

### Recommendations

- i. There is a need for government to provide waste collecting centers and landfills
- ii. Drainages should be kept clean, because they attracts dump of waste by households
- iii. Laws on waste disposal should be enforced with penalties
- iv. Regularity on waste collection by government agencies should be maintained
- v. Household should be encouraged to provide collection centers in their homes
- vi. Government should develop a method of purchasing recyclable waste constituents

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