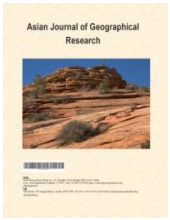

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Assessment of Challenges Associated with Waste Disposal in Zuru Town, Kebbi State

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The topic of environmental protection has attained highest importance in this era globally but the practices of basic concepts of waste disposal are often neglected. People around the globe are aware of the impact of improper waste disposal practices, but the negative attitude of implementation gives rise to chaotic situations. This study was conducted to assess the challenges associated with waste disposal in Zuru town, Kebbi state. This cross sectional study was conducted using a well-designed and validated questionnaire. Purposive sampling method was adopted to select three residential categories. After which Yamane's formula was adopted to arrive at the sampling size of 312. The data was analyzed using frequency, percentage, Chi-square and ANOVA. The result shows that 58.3% of the respondents are female, 32.1% fall between the ages 30 and 39 years, while only 3.8% are above 60 years. Majority, (70.2%) possessed primary education; many (36.2%) are business personnel and only 9.6 of the respondents earn above ₦100,000 per month. Result further shows that majority (80%) of the waste are non-biodegradable. Result also revealed that many (42.3%) of the households burns their waste. The result shows that 52.6% of households are ignorant of the problems associated with indiscriminate disposal of waste in the area while

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47.4% claimed they are aware. A portion (61.2%) of the households identified environmental pollution as the major problem of indiscriminate waste disposal, 22.4% of the household claimed outbreak of diseases as the problem of indiscriminate waste disposal, 8.3% and 8.0% of them identified other problems and breeding of disease pathogens as the major problems of indiscriminate disposal of waste respectively. The level of ignorant of Zuru households about the problems associated with indiscriminate disposal of waste could be ascribed to inadequate sensitization about the menace of the improper disposal of waste in the area or low level of education. The study concludes that the waste generation from the different residential categories in Zuru town is both the biodegradable and non-biodegradable. The study recommends adequate sensitization on the menace of burning waste.

Keywords: Challenges; waste disposal; Zuru Town; Zuru Rikoto; Rafin Zuru.

1. INTRODUCTION

The generation of solid waste in developing nations has been a major challenge. This is due to the high rate of turnover of goods produced, sold and bought which consequently brings about the waste products. The factors affecting such incremental change include; increase in population, change in life style and increasing use of disposable materials, excessive packaging of items and consumer habit [1]. The growth of human population coupled with increased economic activities has resulted into high rate of solid waste generation. The day- to-day activities of man generally draw inputs from the natural base in his environment. This may be by way of raw materials for industrial production or by direct utilization of the resources from the reserve in land, water and air. However, the use of these resources in turn results in the generation of various classes of unwanted, useless, damaged and discarded materials termed Waste. Therefore, waste is any unavoidable material resulting from industrial, household, and or commercial activity for which there is no economic demand by the owner and which must be disposed of [2].

Waste generation rate is 25 million tons annually and at a daily rate of 0.44 kg - 0.66 kg/capital/day [3] as opposed to 0.7 kg - 1.2 kg/h/d in developed countries [4]. The improper management of municipal solid waste is one of the challenging environmental problems facing urban centers worldwide, particularly in developing countries [5]. Little attention is given to waste management practices as it is common to see in the major cities heaps of waste littering the streets, dumped indiscriminately in drainages, vacant plots and open space especially in the developing nations. This has contributed not only to the spread of communicable diseases in the affected areas but also has effect on flooding and other environmental problems [6]. It is fast becoming a difficult task which must be surmounted by developing countries especially Nigeria if she is to realize the reduction of solid waste in the cities by 75% as proposed by Millennium Development Goals (MDGs) in 2015.

About 1.3 billion tons of wastes are generated globally, 0.035% being generated in Nigeria with about 85.8% of Nigerian waste generated by households [7]. It is estimated that an average Nigerian in the urban or rural areas generates about 0.49 kg of solid waste per day with household and commercial centers contributing almost 10% of total urban waste burden. Of this about two thirds of wastes are dumped indiscriminately on the streets and in the drains thus posing serious environmental health hazards [8]. The indiscriminate and improper dumping of Municipal Solid Waste (MSW) is on the increase in Zuru in town and Nigeria in general. It is compounded by a cycle of poverty, expanding population, decreasing standard of living, poor governance and low level of environmental awareness, and the end product of it all is the dumping of these waste in any available open space [9]. It has been observed that improper land use planning in some parts of many developed cities has resulted into the creation of informal settlements with narrow streets, which makes it difficult for waste's collection trucks to access such areas [10].

Inappropriate waste disposal practice has been a major problem facing Zuru town in Kebbi State, which takes the form of dumping of waste in unauthorized places and in uncompromising manner. From the foregoing, and based on the researcher's physical observation of the menace of household waste generation in Zuru Township, there is the need for a thorough assessment on "what constitutes the different wastes generation

by individual household" in the study area with a view to suggesting possible solution to the problem. It is against this backdrop that this research focuses on "An assessment of Challenges Associated with Waste Disposal in Zuru town, Kebbi State".

2. MATERIALS AND METHODS

2.1 Experimental Site

The study area is Zuru town in Kebbi State, Nigeria. Zuru is a town in Zuru Local Government area of Kebbi state, which is one of the twenty-one Local Government Area in the State. It is located in the Northern Guinea Savanna agro ecological zone of Nigeria. It lies between latitude 11°15' N and 11°27' N, longitude 5°13' E-5°15' E and an altitude of about 259 cm above the sea level covering an area of about 461,880 SqKm. The area is situated at the extreme Southern part of Kebbi State. Zuru Local Government has six administrative districts namely Dabai, Rikoto, Rafinzuru, Manga, Senchi and Ushe. Zuru Local Government bounded by Danko/Wasagi Local Government in the east, Sakaba Local Government in the South East, Fakai Local Government in the North west, and in the South with Rijau Local Government of Niger State.

2.2 Materials

The materials used for this study include the literatures and other publications consulted for the successful completion of the study. Other materials used in the study include the computer software package for social sciences (SPSS version 20).

2.3 Methods

Data collection comprise the important components of research methodology, which include the source of data collection, methods of data collection, sampling techniques and sampling size and the methods of data analysis.

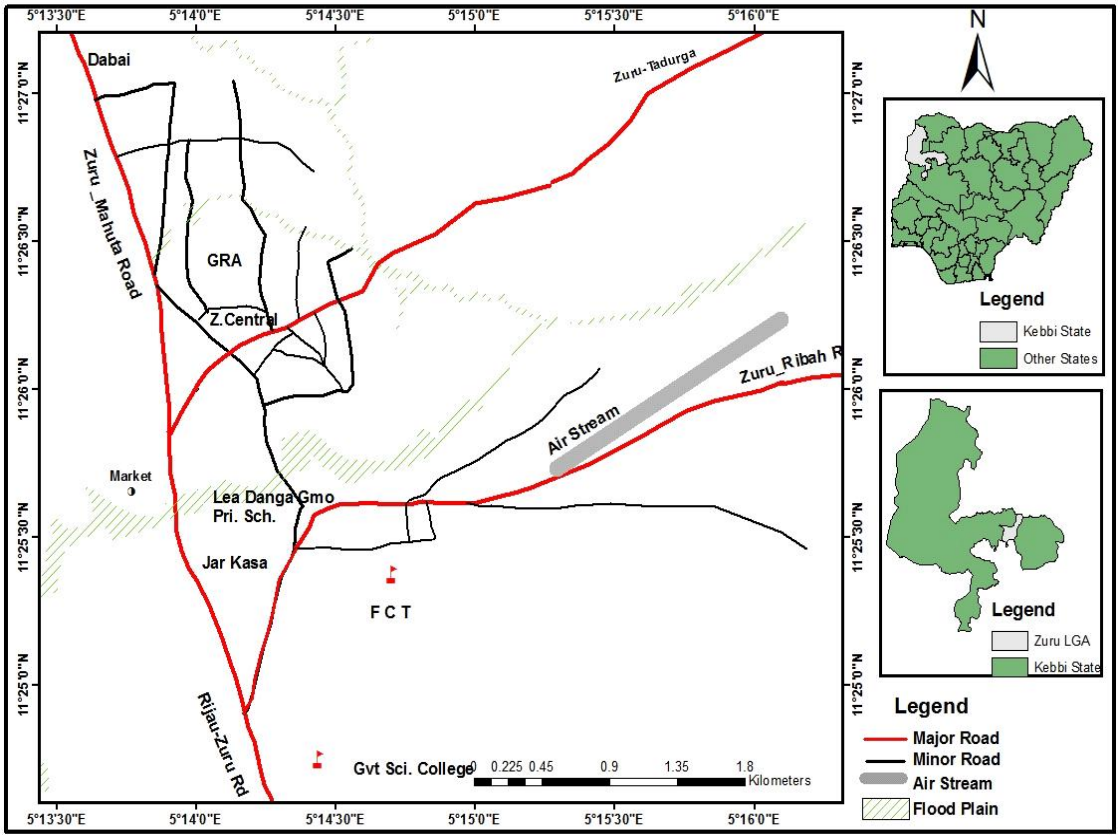

Fig. 1. The Study Area (Zuru Town)

Table 1. Distribution of selected districts, area, sample frame and sample size

L.G.A districts	Categories	Areas	Sample Frame (SF)	Sample Size (SS)
Zuru Rikoto	3	Rikoto	955	192
	2	Twins quarter	114	22
Rafin Zuru	1	GRA	260	51
	2	Jarkasa	119	26
	3	Mangorori	135	29
Total			1583	320

2.4 Data Collection

Data was derived from two sources, primary and secondary. Primary data was collected through questionnaire interviews and Group Discussion from the respondents. Secondary data on population and household sampling was derived from the recent (2015) house listing exercise by the National Primary Health Care Agency for the Polio Immunization exercise. List of settlement was sourced from the NPC (2006) Census and housing data.

2.5 Method of Data Collection

The basic instrument used for data collection in this research was structured questionnaire. Structured questionnaire containing both open and closed ended questions were utilized to collect primary data from randomly selected households from the entire households of 1583 in the study area. The data collection was not through only the questionnaire and interview; rather the 312 households were given one basket each by the researcher to ensure unbiased determination of the types of waste generated by the three residential categories in the study area. See details of the sampling frame and sampling size in Table 1.

2.6 Sampling Techniques and Sample Size

Zuru town is made up of two (2) administrative districts namely: Rafin Zuru and Rikoto Districts. The sampling frame of the households was drawn from the record of routine immunization conducted by community health workers. The sampling in this study involved three stages before arriving at the required sample size. The first stage involved a random selection five (5) areas from the two districts within the study area (Rafin Zuru and Rikoto) and using the concentric zone model, the five selected areas were divided into three residential categories: high, middle and low ranked (1, 2 and 3 areas respectively). The residential categories were selected purposely because of the concentration of respondents that are suspected to generate huge solid waste in these areas. The second stage involve the use of Yamane's (1967) formula.

$$n = \frac{\mathrm{N}}{1 + \mathrm{N} + (\mathrm{e}\,\mathrm{x}\,\mathrm{e})}$$

where n = sample size, N= entire population size, e= 0.05 (95%) to determine the sampling size. The last stage involve allocation of sampled population proportionately to the selected areas based on the population/number of households as contained in Table 1.

2.7 Method of Data Analysis

The data collected was analyzed using the inferential and descriptive statistics, such as simple frequency and percentages, Chi-square and ANOVA. The data collected was coded for easy entering into the SPSS to process the needed results.

The hypothesis that "there is no significant relationship between the socio economic characteristics of household heads and waste generation for the different residential categories in the study area" was tested using Chi-square of association while that which says "there is no significant relationship in waste generated among different categories of households in Zuru town" was tested using three-way ANOVA.

3. RESULTS AND DISCUSSION

3.1 Challenges Associated with Waste Disposal

This result of the inference drawn on some of the challenges associated with the disposal of waste in Zuru town of Kebbi State. The outcome of the problems associated with waste disposal in Zuru town is contained in Table 2. It could be observed from Table 2 that 52.6% of households

are ignorant of the problems associated with indiscriminate disposal of waste in the area while 47.4% claimed they are aware. A portion (61.2%) of the households identified environmental pollution as the major problem of indiscriminate waste disposal, 22.4% of the household claimed outbreak of diseases as the problem of indiscriminate waste disposal, 8.3% and 8.0% of them identified other problems and breeding of disease pathogens as the major problems of indiscriminate disposal of waste respectively. Similarly, 77.9% of the households are not aware that burning of waste such as polythene bags, plastics rubber and other wastes are dangerous to the atmosphere while only 22.1% are aware. Still from Table 2, 43.9% of the household identified acid rain as the major consequence of burning waste items, 26.3% agreed on other negative consequences of burning waste, 19.9% of the households claimed that the burning of waste leads to air pollution and 9.9% identified ozone layer depletion as the danger of burning waste materials to the atmosphere.

Furthermore, the result in Table 2 reveals that 63.1 of the household in Zuru town are ignorant of the impact of waste burning to human life. While only 36.9% are aware of the fact that the burning of waste may cause problems to human life. In terms of the particular disease that may arise from the burning of waste, many of the household (49.4%) identified Asthma as the disease emanating from the burning of waste. This is followed by tuberculosis (27.6%), Health problem (15.7%) and cancer (7.4%).

Evidence of the environmental pollution in Zuru town arising from indiscriminate burning of waste especially smoke is depicted in Fig. 2.

The result of the problems associated with waste disposal in Table 3 has been proved to be statistically correct from the chi-square test in Table 3. The results of the chi-square summary are presented as follows: Are you aware of the problems associated with the ways by which you disposed your waste? (x^2 (1, n =312) 821, p =.365); particular problems associated with waste disposal (x^2 (3, n = 312) 225.21, p =.000); diseases that have disturbed their community in the past or currently (x^2 (3, n = 312)160.80, p =.000); a awareness that burning of wastes like polythene bags, plastic rubber and other waste are dangerous to the atmosphere (x^2 (1, n = 312) 97.04, p =.000); whether these materials dangerous to the atmosphere (x^2 (3, n = 312)

Fig. 2. Pollution in form of smoke from burning of waste in Zuru Town

Table 2. Challenges associated with indiscriminate dumping of waste

Variable	Frequency	Percent
Awareness on problems associated with waste disposal		
No	164	52.6
Total	312	100.0
Likely problems associated with waste disposal		
Environmental pollution	191	61.2
Outbreak of diseases	70	22.4
Breeding of disease pathogens	25	8.0
Others	26	8.3
Total	312	100.0
Type of disease from burning of waste		
Asthma	154	49.4
Tuberculosis	86	27.6
Hearth problem	49	15.7
Cancer	23	7.4
Total	312	100
Whether burning of wastes like polythene bags, plastic rubber etc dangerous to the atmosphere		
Yes	243	77.9
No	69	22.1
Total	312	100
How are these materials dangerous to the atmosphere		
It causes Acid rain	137	43.9
Air Pollution	62	19.9
Ozone Depletion	31	9.9
Others	82	26.3
Total	312	100
Whether burning of waste may cause some diseases to human life		
Yes	197	63.1
No	115	36.9
Total	312	100.0
Total	312	100.0

Table 3. Chi-square test summary on the challenges associated with indiscriminate disposal of waste

Variable	x^2	Df	P
Awareness about problems associated with disposal of waste	.821	1	.365
Likely problems associated with waste disposal	235.21	3	.000
Disease that disturbed community in the past or currently	160.80	3	.000
Whether burning of wastes like polythene bags and plastic rubbers other waste are dangerous to the atmosphere	97.04	1	.000
How some materials are dangerous to the atmosphere	76.44	3	.000
Whether burning of waste may cause some diseases to human life	21.55	1	.000
Type of disease burning of waste may cause	124.44	3	.000

76.44, p =.000); whether burning of waste may cause some diseases to human life (x^2 (1, n = 312) 21.55, p =.000) and type of diseases that burning of waste may cause (x^2 (3, n = 312) 124.44, p =.000). This shows clearly that the results on the problems associated with indiscriminate burning of waste do not happen by chance; rather it is statistically reliable and significant.

The result (Table 3) reveals that many of the households in Zuru town are ignorant of some of the problems associated with indiscriminate waste disposal in the area. The level of ignorant of Zuru households about the problems associated with indiscriminate disposal of waste could be ascribed to inadequate sensitization about the menace of the improper disposal of waste in the area or low level of education. It is

expected that every educated person should be able to understand that improper disposal of waste could lead to bad odor, outbreak of diseases and environmental pollution. Those that claimed they are aware of the problems associated with indiscriminate disposal of waste could be the well-educated households who understand the negative consequences of improper disposal of waste.

The result (Table 2) also shows that 77.9% of the households in the area are not aware that burning of wastes like polythene bags, plastic rubber and other wastes are dangerous to the atmosphere. In as much as people are ignorant of the danger of burning waste, the menace will continue unless there is proper sensitization about it.

This outcome further indicates that many people in Zuru town are not well educated about the effect of burning waste to the atmosphere. The result (Table 3) on the different ways the burning of waste material are dangerous to the atmosphere reveals that problems such as acid rain, air pollution, ozone layer depletion and other problems not mentioned are some of the consequences of burning waste in the environment. From the foregoing, 48.9% of the household are much aware of acid rain. All these are serious problems that could lead to climate change and even outbreak of some diseases. If the ozone layer is depleted for example extra windows are created, it will eventually lead to excessive passage of solar radiation on to the earth's surface, a process called global warming. (i.e. sudden increase in the global temperature) Global warming melts the ice thereby leading to increase in the volume of water in the sea. Acid rain could be poisonous to human and animal lives [11]. Air pollution from the burning of plastics rubber and other waste increases the concentration of carbon dioxide in the atmosphere, which contribute to the depletion of the ozone layer and result into Global warming [12].

It is evident from Table 2 that majority of the households are aware of the fact that burning of waste may cause some diseases to human life. The high level of awareness of the households about the diseases emanating from the burning of waste might be attributed to the advice and precaution they receive from the hospitals when they are affected by any of these diseases. Diseases like asthma, tuberculosis, health problem and cancer are all linked to the inhalation of smoke and dust particles from the burning of different waste.

This reveals indiscriminate disposal of waste in Zuru town is capable of littering the environment thereby resulting into environmental pollution, outbreak of diseases, breeding of disease pathogens and others. The problems of solid waste in terms of environmental pollution is in line with the claim of Abdullahi and Bena [13] which stress that the problem of solid waste is one of the most critical environmental challenges facing Nigerian urban centers. The breeding of disease pathogens as identified by this study is also in line with assertion made previously by Babayemi and Dauda [14], which reported that flies breeding can be encouraged by piles of rotting waste and the flies may play a role of disease pathogen. This may result into outbreak of disease like cholera and mosquito breeding. According to Babayemi and Dauda [14], piles of rotting waste may also result into yellow fever. Other disease pathogens that breed from waste piles could result yellow fever, Lassa fever, dysentery, diarrhea etc.

This study identifies damage to the atmosphere as a result of burning of waste which could be linked to the study of Olawale and Olayungbo [15] which state that the pattern of solid waste disposal and management in most developing countries in Nigeria like Ife central local government area are beginning to alter the patterns of biosphere function and contribute to ozone layer depletion. The finding on health consequence of indiscriminate waste disposal in Zuru town is also in agreement with Babayemi and Dauda [14], which state that flies breeding will be encouraged by the piles of rotting refuse and the flies may play a role of disease pathogen, which may result into the outbreak of disease like cholera. Pile of refuse will also encourage mosquitoes breeding sites that may lead to transmission of malaria fever, yellow fever, lassa fever, dysentery, diarrhea etc. Resources depletion has also been identified by (NEST, 1995) as one of the problem of waste disposal in Nigeria because according to the World Bank report, cost of water contamination from improper waste disposal to Nigeria is about N10 billion per annum and the lives of about 40 million people are at risk (NEST, 1995).

4. CONCLUSION

After detail analysis of result, the study concludes that the waste generated by the three

residential categories in Zuru town is both biodegradable (leftover foods, vegetable leaves, agricultural residues, animal dung etc.) and non-biodegradable (polythene bags, metals, glass, ceramics, plastic rubbers etc.). Awareness program of waste management is greatly needed. This can be given in the schools or in community based programs. For this purpose, education departments of the states/ country can implement environmental education programs.

5. RECOMMENDATIONS

The study recommends the followings:

I. Since the major waste generated by the households in Zuru town is non-biodegradable, government should establish a municipal recycling center where most of these items can be recycled.
II. Since majority of the respondents are not aware of the health hazards associated with the burning of waste, government should adequately sensitize households on menace of burning waste anyhow.
III. Publicity of waste management practices through distributing of leaflets, posters and mass media support.
IV. All the parties' (i.e. government, households and students etc.) spontaneous participation and involvement should be ensured to manage and dispose solid wastes properly in order to maintain clean and healthy environment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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