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GEOGRAPHICAL ANALYSIS OF HOUSEHOLD WASTE GENERATION AND DISPOSAL IN TARABA STATE, NORTHEAST NIGERIA

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ABSTRACT

Household wastes have become one of the greatest menaces in the world over, and the situation in developing countries such as Nigeria has become pathetic. The goal of this paper is to examine the nature of household solid waste generation, collection and methods of disposal in Jalingo, Taraba State, Nigeria. The data for this study was collected through primary and secondary sources. The Primary data sources include; field work, questionnaire and personal observation. The secondary sources of data were obtained from the ministry of Environment Jalingo, for a period of ten (10) years (2000-2013). A set of 200 carefully coded questionnaires were distributed, this was done to elicit responses from respondents. Analysis of variance (ANOVA) technique was employed in the examination of the statistical significance of the variation among the selected area of study. From our results, 56.5% of respondents are female while 43.5% of respondents are male. The study revealed that a large proportion (47%) of Jalingo residents dump their wastes at refuse disposal points in their neighborhoods, 35% dump their wastes in any available open land while 5 and 8% dump their wastes in streams and drainages respectively. The study concluded by noting that household waste is not properly managed in jalingo and therefore recommends that policy makers are required to identify and distinguish between the day time and official population in Jalingo and use the statistics as a basis for planning.

Contribution/Originality: This study is one of the very few studies which have investigated household waste generation in Taraba State, Northeast Nigeria. A lot has been written on solid waste management, Liquid wastes and municipal waste management in the study area, but curiously, scholars have either neglected or have chosen to form a blind eye to the rising challenges of household solid waste management in Jalingo. It is this gap that this research intends to fill.

1. INTRODUCTION

Waste is the by-product of living organisms. It is mandatory that all living organisms must produce waste and when they die, they also become waste themselves. Household wastes in most cases are solid in nature, therefore, when talking about household wastes, solid waste quickly comes to mind. Household waste and solid waste are inseparable this is because studies have shown that a large chunk of household wastes emanates from the kitchen, and kitchen wastes are usually solid with little or no liquid content in them. Nkwocha *et al.* (2019) defined solid waste as materials or substances which are regarded as un-useful by its producers or handlers and therefore

discarded. Household waste is defined as a type of solid waste which is generated from residential buildings. Hakami and Seif (2015) also defined household waste as a type of municipal solid waste (MSW) and consists mainly of plastics, paper, glass, metals, organics, wood and others. Orhorhoro et al. (2017) add that the generation rate of household wastes in Nigeria is 25 million tons annually at a daily rate of 0.24-0.66 kg/day/person.

Solid waste management problems have been a reoccurring issue in developing countries such as Nigeria. As the country develops, environmental issues such as solid waste also increase. This assertion underscores the submission of Hakami and Seif (2015) where they opined that development does not come without environmental burdens and generation of waste is one among them. It is estimated that more than 3.5 billion or more than 52% of the world population does not have access to the most elementary waste management services like sound waste collection and removal out of the residential areas and at least a controlled solid waste disposal system (Alemayehu et al., 2017).

The amount of household waste generation directly depends on the level of income and size of the household. This simply implies that the higher the level of income and the larger the size of the household, the larger will be the amount of waste generated. Problems of household wastes generation and management in Nigeria will keep increasing; this is as a result of the increase in population and physical developments ongoing in all states of the federation. This statement supports (Haile, 2011) argument where he stated that urbanization and population growth rate of a particular city/ nation is positively related with the generation rate of solid wastes. He further argued that the city which shows increasing population growth and its urbanization should take the question of how to manage solid wastes without scarifying environmental and human health as an agenda. Since the return of democracy in 1999, there have been serious competition among various state governors working hard to out-do each other in the development of their states. This is evident in the various agenda of each elected governor, as issue of housing is always a top priority – and once they are returned elected, next is to map out large expanse of land for construction of estates for the teeming populace. While construction of estates is a good thing, the problem remains the ability to properly manage the wastes that will be generated from these houses.

Proper solid waste management involves waste collection, storage, transportation, processing and disposal. The entire system need to be simple, affordable, and sustainable (financially, environmentally and socially) and should also be equitable, providing collection services to poor as well as wealthy households (Alemayehu et al., 2017). They further added that the primary objective of solid waste management activity is to make the environment sound and safe in human health via disposed of wastes in a well-organized manner. They concluded by asserting that through process, the stakeholders of the waste management system especially in the developed nations, did not stop on disposal of waste in open dump or landfill only; rather they tried to convert the solid wastes to cash and make strong their economy. Waste management in Taraba and many other states in Nigeria is poor. Wastes are dumped in open plots, river channels, road divides and drainage channels, distorting the aesthetic values of the state. This simply means that household waste is not properly managed at source by its generator.

2. MATERIALS AND METHODS

2.1. Study Area

Jalingo is the capital of Taraba state, located in Northeastern Nigeria. Geographically, Jalingo is located between latitudes $8^047'$ to $9^001'N$ and longitudes 11^0 $09'$ to $11^030'E$. It is bounded to the North by Lau Local Government Area, to the East by Yorro Local Government Area, to the south and West by Ardo Kola Local Government Area. It has a total land area of about 195km2. Jalingo has a population of 139,845 people according to the 2006 population census, with a projected growth rate of 3%.

The relief of Jalingo LGA consists of undulating plain interspersed with mountain ranges. The mountain ranges run from Kona area through the border between Jalingo and Lau LGAs down to Yorro and Ardo Kola LGAs in a circular form to Gongon area, thus given a periscopic semi-circle shape that is almost like a shield to

Jalingo town. Jalingo metropolis is drained by two rivers Mayogwoi and Lamurde which emptied there content into the Benue river system at lau village. The valleys of these rivers are characterized with ox-bow lakes which are as a result of depositional activities. Jalingo LGA has tropical continental type of climate characterized by well-marked wet and dry season.

The wet season usually begins around April and ends in October. The dry season begins in November and ends in March. The dry season is characterized by the prevalence of the northeast trade winds popularly known as the harmattan wind which is usually dry and dusty. Jalingo has a mean annual rainfall of about 1,200mm and annual mean temperature of about 29oC. Relative humidity ranges between $60-70$ percent during the wet season to about $35-45$ percent in the dry season. Jalingo is located within the northern guinea savanna zone characterized by grasses interspersed with tall trees and shrubs. Some of the trees include locust bean, sheabutter, eucalyptus, baobab and silk cotton tree. Figure 1 indicates the map of Nigeria showing Taraba State. Figures 2 and 3 indicates map of Taraba State and map of Jalingo respectively.
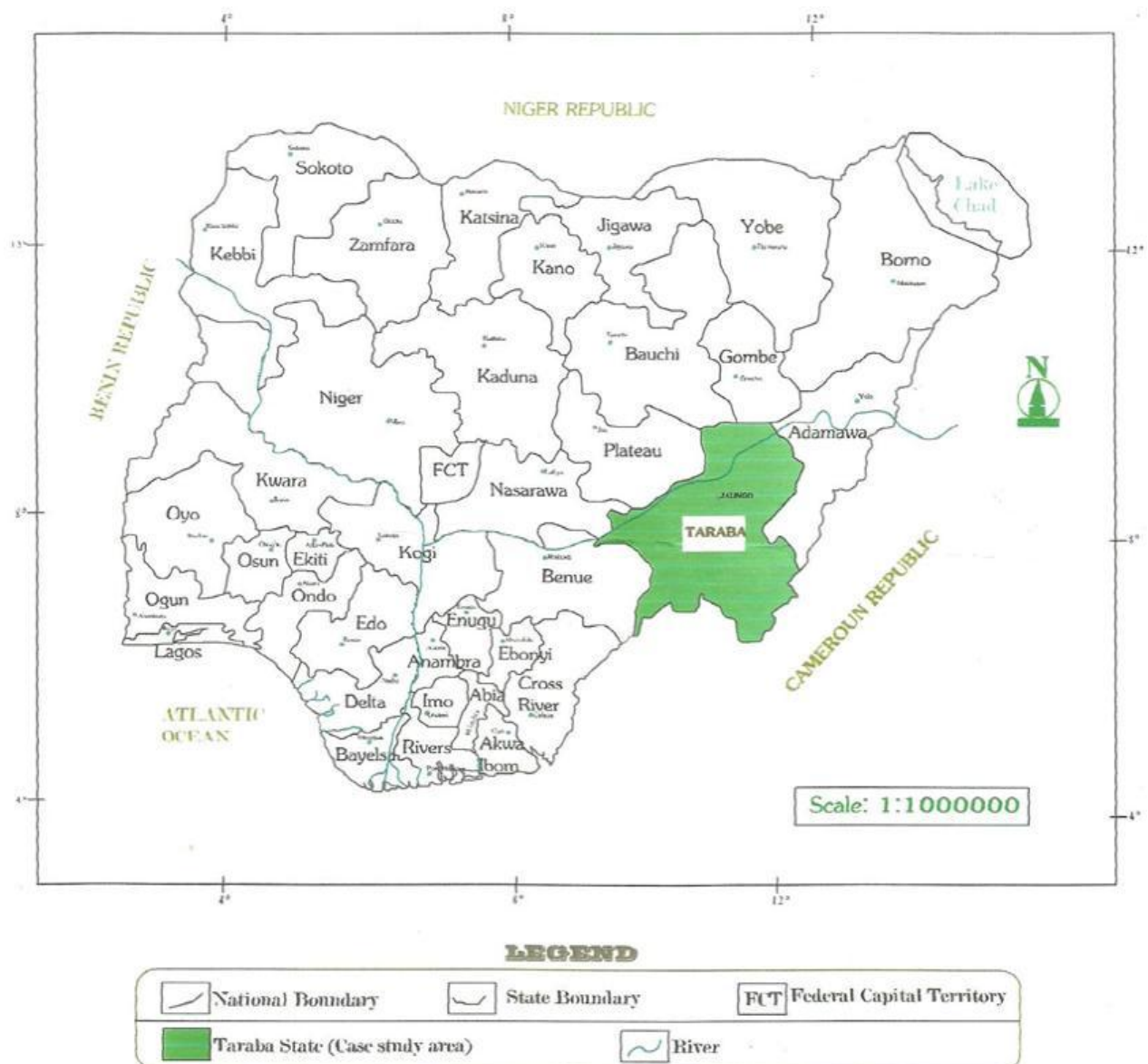

Figure-1. Map of Nigeria.
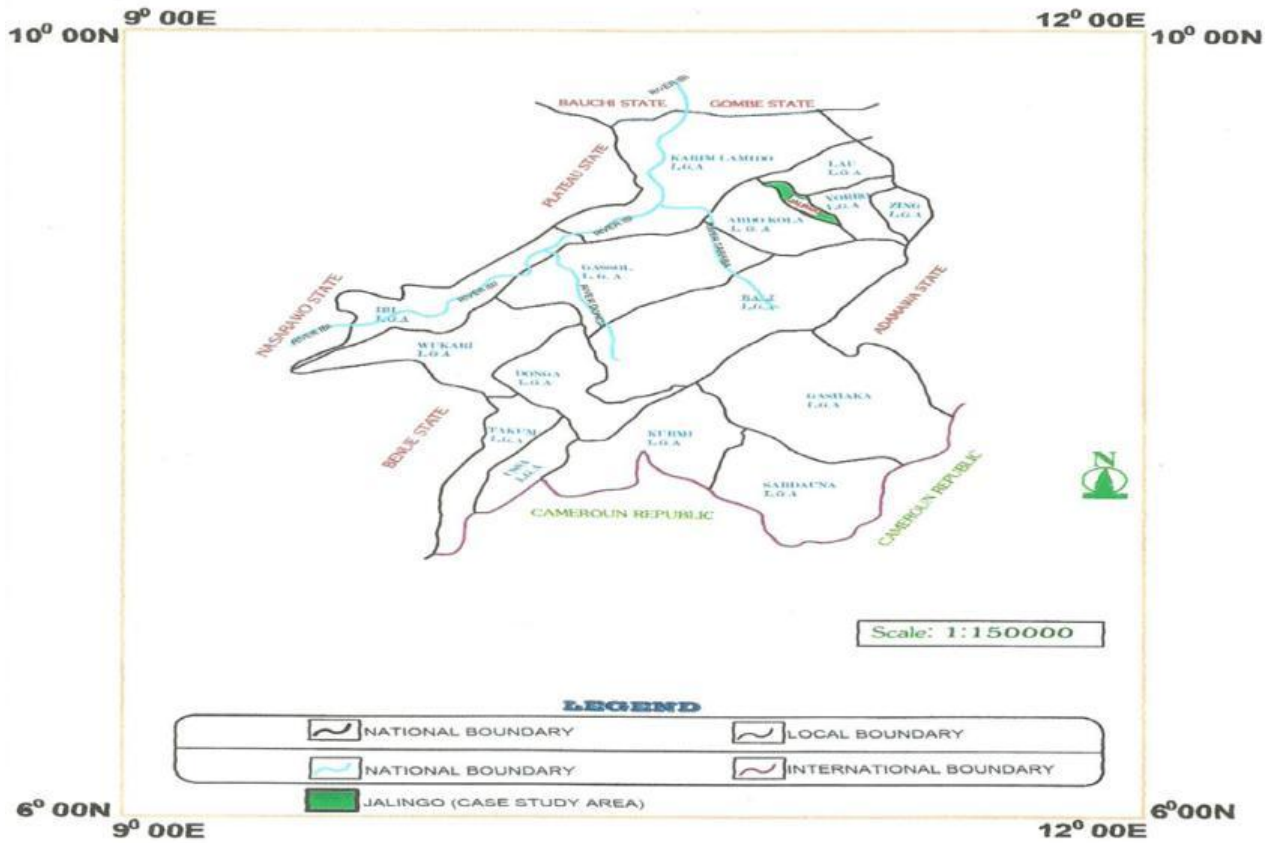
Source: Ministry of Lands and Survey.

Figure-2. Map of Taraba State.

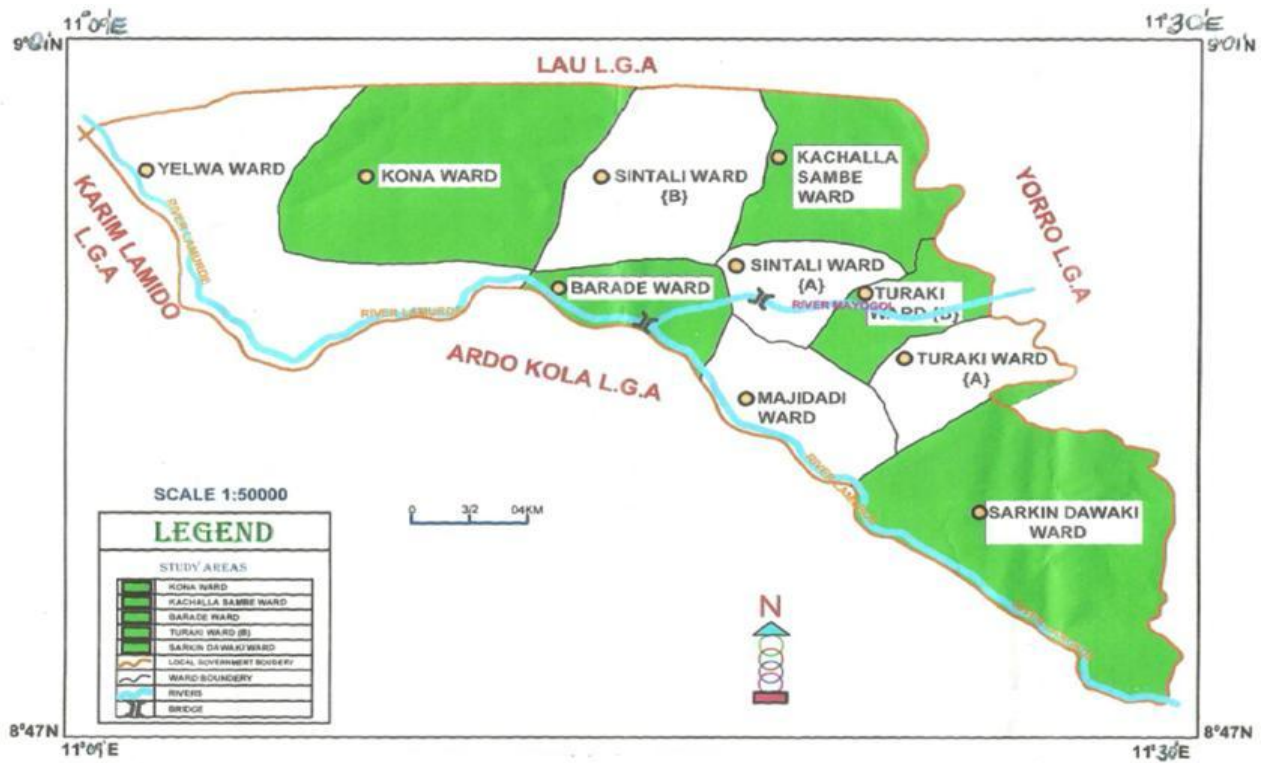**Source:** Taraba State Development Board.

and

Figure-3. Map of Jalingo.

Source: Field Survey 2013.

2.2. Data Collection

Data for this study were obtained from primary and secondary sources. Primary sources include questionnaire administration, field survey and oral interview with the respondents. Data on records of waste generated and collected in Jalingo L.G.A from the period of thirteen (13) years from 2000-2013 was sourced from Ministry of Environment and Urban Development Jalingo, Taraba State.

2.3. Results/Discussion

Table 1 show that greater percentage of the respondents (56.5%) is female while 43.5% are male. This study shows contrary trends to the work of Longe *et al.* (2009) which indicates that greater percentage of the respondents are male. This study by implication means female is more involved in household waste generation and disposal in the study area

Table-1. Socio-Demographic characteristics of the respondents.

S/N	Variable	Respondents (n=200)	Percentage %
1.	**Sex**	-	-
	Male	87	43.5
	Female	113	56.5
Total		200	100%
2.	**Age(Years)**	-	-
	15-19		
	20-24	8	4
	25-29	48	24
	30Above	66	33
Total		78	39
3.	**MaritalStatus**	200	100%
	Single		
	Married	57	28.5
		83	41.5
Divorced/Separated		5	2.5
	Widowed	55	27.5
Total		200	100%
4.	**Level of Education**		
	Primary	45	23
	Secondary	49	24
	Tertiary	65	32.5
	None	41	20.5
Total		200	100%
5.	**Occupation**		
	Farming	18	9
	Trading	79	39.5
	Civil Servant	66	33
	Others	37	18.5
Total		200	100%

Source: Field Findings (2019).

(i) Sex of the Respondents

Table 1 shows that greater percentage of the respondents (56.5%) is female while 43.5% are male. This study shows contrary trends to the work of Longe *et al.* (2009) which indicates that greater percentage of the respondents are male. This study by implication means females are more involved in household waste generation and disposal in Jalingo.

(ii) Age bracket of the Respondent

Table 1 shows that age is expected to play a significant role as maturity could affect level of awareness on environmental health and sanitation (Bradley *et al.*, 1999). The results on age in Table 1 shows that a greater percentage of the respondents are 30years. This by implication mean data on age above shows that subjects are matured adults whose reasoning level as regard household waste and management is expected to be high and thus facilitate public involvement in solid waste management process.

(iii) Marital Status of the Respondents

Table 1 shows that greater percentages of the respondents 41.5% are married, 28.5% are single while 27% are widowed. The result therefore indicates that greater percentages of the respondents are married. This by implication means married people are more involved in household waste generation and disposal in the study area.

(iv) Level of Education of Respondents

The Table 1 shows that greater percentages of the respondents (32.5%) had tertiary education. This study shows similar trends with the work of Longe *et al.* (2009) which indicates that greater percentage of the respondents had tertiary education but contrary trends to the work of Banjo *et al.* (2009) which indicates that greater percentage of the respondents had secondary education. This by implication means those that had tertiary educations are more involved in both generation and disposal of household waste in the study area.

(i) Occupation of Respondents

The occupation structure of the respondents presented in Table 1 reveals that majority of the respondents are traders representing 39.5%. This study shows contrary trends to the work of Banjo *et al.* (2009) which indicates that a greater percentage of the respondents are civil servants. This by implication means traders are more involved in household waste generation and disposal in the study area.

2.3.1. Sources and Types of Solid Waste Generation

Figure 4 shows that greater percentages of the respondents (53%) are cooking. This study shows similar trends with the work of Aliyu (2007) which indicates that cooking has the greater percentage of the respondents on sources of refuse generated in their compounds. This by implication means residential land uses are more involved in both generation and disposal of household waste in the study area this is because residential is the major land use which is associated with cooking.
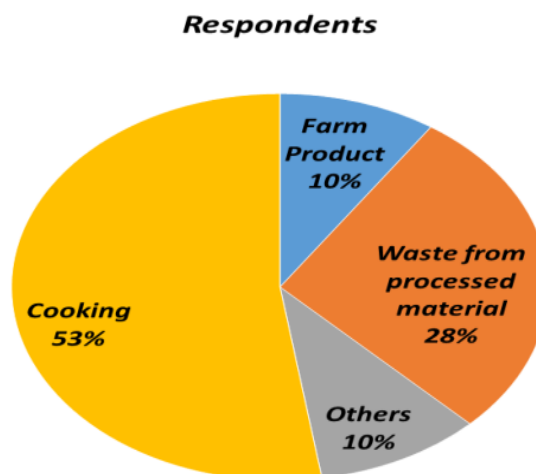

Figure–4. Sources and types of refuse in compounds.
Source: Authours field work 2019.

2.3.2. The Constituents of Solid Waste Generation in Household

Table 2, indicates that the greater percentage of the respondents agrees that food waste which constitutes 40.5% is the largest chunk of waste generated in their homes, while pure water leather constitutes 34.5%, plastics constitutes 7%, metal/bottles 3.5%, paper 9% and cloth/rags constituents 5.5% of the waste generated from households. The result fairly compares with the study undertaken by Lemma (2007) which indicates that greater percentage of the respondent's constitute food waste but contrary trends to the work of Otti (2011) which indicate that pure water leather constitute the greater percentages of the respondents. This study by implication means food waste are generated more rapidly compare to other wastes.

Table-2. Constituents of solid waste generation in household.

Constituents of solid waste	Respondents (n=200)	Percentages (%)
Food waste	81	40.5
Plastic/Rubbers	14	7
Metals/Bottles	7	3.5
Papers	18	9
Pure water leather	69	34.5
Cloth/Rags	11	5.5
Total	**200**	**100%**

Source: Field findings (2019).

2.3.3. Waste Disposal Site

Figure 5 shows that 8% of respondents dispose their waste into the drainage and gutters, 35.5% of the respondents dispose theirs in any available open land as seen in Figure 6 and 7 respectively, 47% of the respondents dispose their refuse at the disposal point in the neighborhood, 4.5% of the respondents dispose their waste on the streams and others represents 5%.
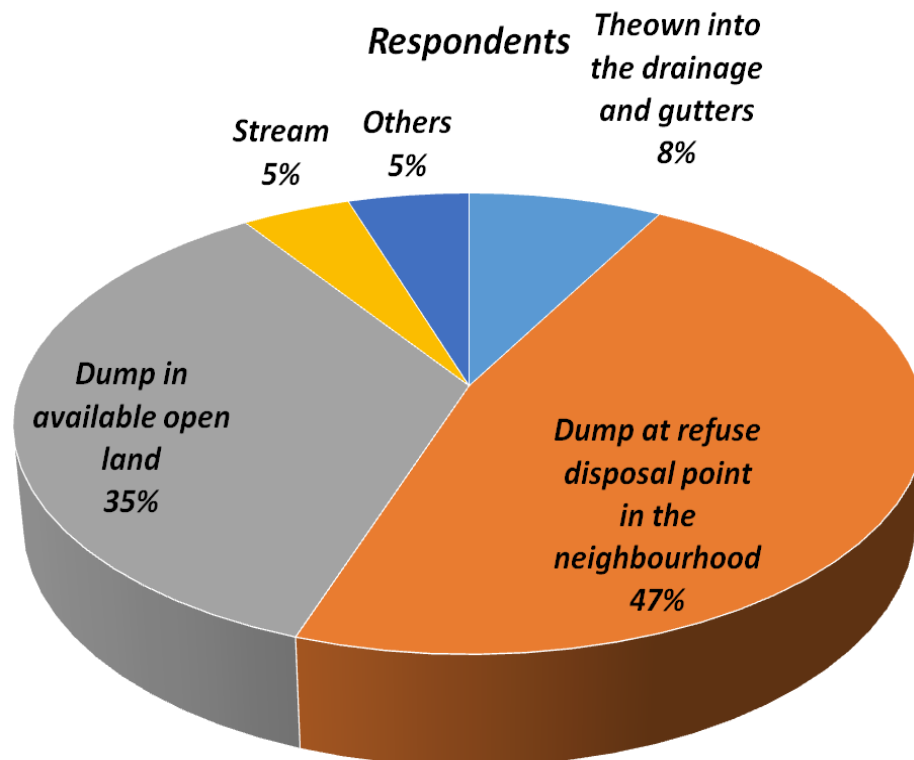

Figure-5. Waste disposal sites.

Source: Authors fieldwork 2019.

Figure-6. Indiscriminate household waste disposal in Jalingo.

Source: Authors fieldwork, 2019.

Figure-7. Household waste dumps on open land at Kona ward, Jalingo, Taraba State.

Source: Authors fieldwork, 2019.

Household waste generation and method of disposal in the study area is very high as seen from result shown in the findings. Cooking is the highest source of refuse generation in the study area which constitutes food wastes, garbage and rubbish. The finding revealed that there are designated waste site, thrown into the drainage system and dumping in any available open land pose more environmental hazard and endangered human health includes tuberculosis, malaria as a result of open dumping of wastes on the available land.

Waste handling and evacuation in the area is said to be done by government but the services render by the government are said to be inadequate because of lack commitment to their work and inadequate funding, and the attitudinal behaviour of the public in respect of disposal of their household waste.

2.3.4. Test of Hypothesis

Analysis of variance of waste generated and collected in Jalingo L.G.A between years 2000-2013

Hypothesis:

H0: There are no significant differences between waste generated and collected in Jalingo L.G.A

Table-3. Analysis of variance of solid waste generated from 2000 to 2013.

Year	N	Mean Annual Generated (Tons)
2000	12	2017.35
2001	12	2068.17
2002	12	2122.05
2003	12	2186.44
2004	12	2252.95
2005	12	2310.38
2006	12	2375.51
2007	12	2442.99
2008	12	2519.01
2009	12	2523.02
2010	12	2618.04
2011	12	2671.79
2012	12	2710.01
2013	12	2781.08

Source: Ministry of environment and urban development jalingo (2019).

The Analysis of variance (ANOVA) of waste generated and collected in Jalingo L.G.A between thirteen years 2000-2013 (Appendix 2). Shows that F Calculated value ranges between 5.53 are greater than the F table value (Critical value) of 4.75 at 0.05 alpha levels. This implies that the null has been accepted and the research hypothesis thus: there is no significant differences between waste generated and collected in Jalingo L.G.A, due to several factors; there is increase in population growth in Jalingo L.G.A which led to increase in consumption of food materials and which resulted in generation and collection of waste in the study area.

3. CONCLUSION

This research examined the household waste generation and method of disposal in Jalingo L.G.A of Taraba State, with particular emphasis on the method of disposal in the study area. One of the bases of the data obtained from the field as well as interview conducted, the findings or conclusion were drawn:

1. Inadequate of infrastructure effects the sanitary condition of the area as demonstrated in indiscriminate dumping of waste in the study area resulting to bad smells, making areas impassable which affects the townships social and health lifestyles.
2. Types of solid waste generated in study area are such that can propagate vectors that produce disease which affect the town.
3. There is lack of environment consciousness by residents of the township and also lack of implementation of sanitation laws.

The study finally concludes that household waste disposal is not properly managed in Jalingo L.G.A as household waste is seen all over open space. Open dumping is the common method of household waste disposal in Jalingo L.G.A. Waste collection, storage and transportation is done occasionally by the ministry of environment and urban development, Jalingo, Taraba State. Many problems arise as a result of poor household waste

management in Jalingo L.G.A such as drainage blockage, environmental pollution, odour etc. There is great need for Taraba State Government to improve waste management practice in Jalingo L.G.A and promote ways of waste recycling.

4. RECOMMENDATION

Recommendations are made here based on the conclusion drawn above: The following recommendations are made:-

1) The Taraba State Government should provide adequate fund to all the government agencies responsible for waste management in Jalingo L.G.A. This is to enable the agencies to procure adequate equipment such as pay-loaders, compactors, trucks etc. that will improve the rate of household waste disposal in Jalingo L.G.A.

2) Besides, the city managers should as matter of urgency increase the rate of refuse collection and disposal to ten times more than its currents rate in Jalingo L.G.A.

3) The State Government should privatize the refuse collection and disposal system in Jalingo L.G.A. The use of closed containers and incinerator should be introduced to complement dump disposal method, which is in operational in Jalingo L.G.A. The methods of incinerator and landfills need to be complemented with new technologies to household waste namely; reduction, recycling and reuse (3R). The (3R) will not only reduce the heaps of household waste common in Jalingo L.G.A. but, also will serve as source of income and employment to the people.

4) The State Government should prohibit street trading in Jalingo L.G.A. and provide adequate alternative sites as the periphery of the city for street traders. This will reduce the commercial activates that take places on the streets and major road in the study area.

5) The policy maker is required to identify and distinguish between the day time and official population in Jalingo L.G.A. and use the statistics as a basis for planning in the study area.

6) Apart from enlightenment, government should also acquire more delivery vans, public skip buckets, dust bins, machines and equipment and recruit more personnel. The vans could go about periodically to collect household waste at various designated location within the township, while the skip buckets would be placed in strategic location that covers a certain wide range. The dust bins on the other hand are quite small and could be distributed at short intervals for effective use.

7) Refuse collected at dumps have to be cleared and disposed frequently.

8) More loyal waste deposit should be made available in every ward which reduce act of dumping waste carelessly on the environment.

9) It's also best to ensure NGOs and general public to participate in sanitation activities.

Lastly, each household should co-operate with board officials in ensuring that there are no refuse dumps around their premises

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