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ASSESSMENT OF DOMESTIC SOLID WASTE TRANSPORTATION TO APPROVED DUMPSITE IN CALABAR, NIGERIA

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ABSTRACT

Domestic solid waste generation by its nature is inevitable hence the need to ensure that appropriate and effective arrangements are made to facilitate it's transportation to final dumpsite. The cardinal focus of the study was to assess domestic solid waste transportation to approved dumpsite in Calabar metropolis. In this study, data were collected through observations, interviews and questionnaire administration. A total of 156 copies of questionnaires were administrated and 134 copies were returned and used for analysis. Two hypotheses were formulated and tested using different statistical techniques. Hypothesis 1 was tested with regression analysis while Hypothesis 2 was tested using analysis of variable (ANOVA). The result of hypothesis 1 showed that there was no statistical significant relationship between the number of vehicles and the frequency of transporting domestic solid waste to approved dumpsite in Calabar. From the result, it was deduced that factors such attitude to waste disposal by residents in the study area as well as the quantity of waste generated determined the number of times wastes were transported to final dumpsite. The result of the second hypothesis shows that there was a statistically significant difference in the frequency of transporting domestic solid wastes to approved dumpsite and the number of waste collection points in Calabar. The study recommended the following among others; government should improve on the funding of the Ministry of Environment and agencies responsible for wastes disposal and management for effective, efficient and regular conveyance of wastes in the city of Calabar. Adequate and effective environmental education should be given priority by the Ministry of Environment on wastes disposal consciousness of residents in Calabar.

Keywords: Domestic, Transportation, Solid waste, Dumpsite, Calabar Metropolis

INTRODUCTION

Domestic solid wastes generation, management and transportation have collectively become a subject of concern particularly in developing countries where urbanization and population are rapidly increasing (Singh, Gupta and Chaudhary, 2014). According to Shan-shan and Carlos (2004), generationof solid wastes is a natural consequence of human life. That means as human population increases, there is bound to be a corresponding increase in the volume of solid wastes generation. Consequently, this will give rise to increase in domestic wastes evacuation. Generally, domestic solid waste means waste generated from house-holds comprising of garbage and rubbish that originates from private homes or apartments. Hakami and El-Sayed, (2017) gave examples of domestic solid wastes to include plastics, papers, glasses, metalsand wood.

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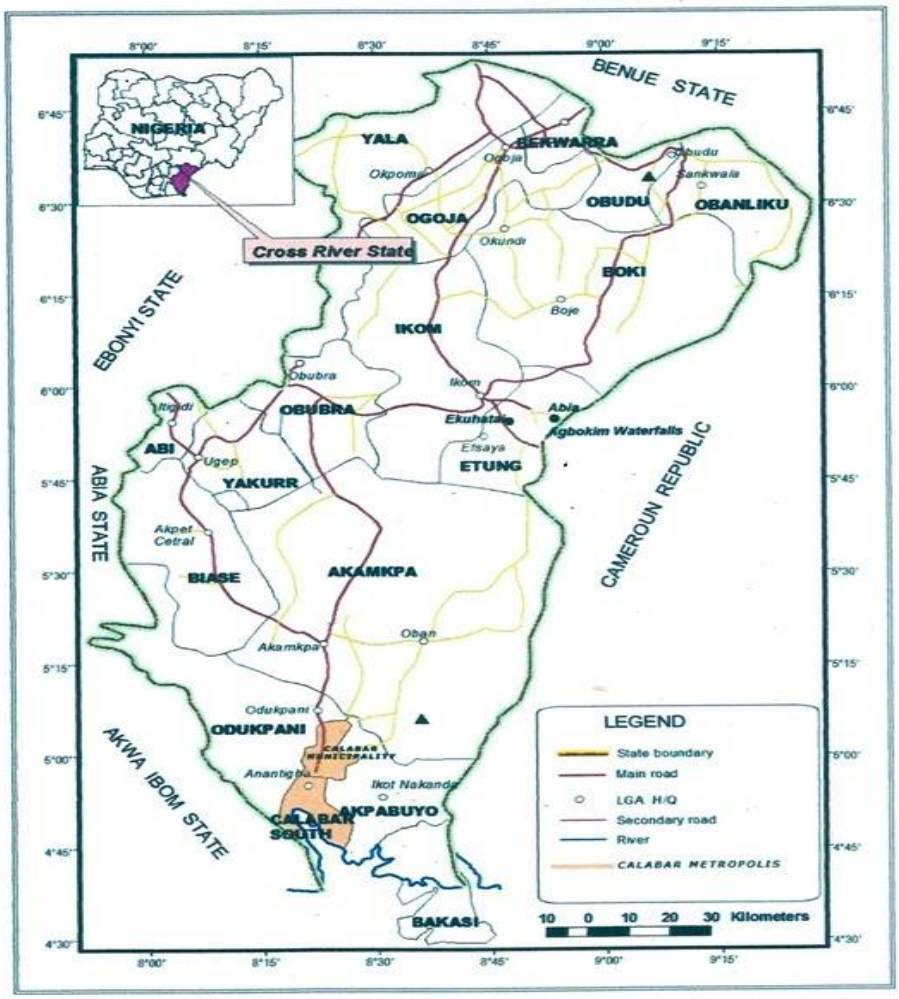
Other wastes generated from domestic sources arebottles, cans, clothing, food packaging, papers including newspapers and magazines, yard trimmings, furniture, toys, ashes, and other waste materials generated in the course of residential living (Binafeigha and Enwin, 2017). However, domestic solid waste management is a complex and multidisciplinary environmental problem that should be considered from technical, economic, environmental and social aspects on a sustainable manner. Achu, Nyong, and Ndiyo (2015) identified waste management activities to include generation, collection, disposal, transportation and recycling. Similarly, Eleje, Anienwelu and Adebayo (2017) identified waste management processes to include the generation, storage, collection, transportation, recycling, recovery and disposal of solid waste in a sanitary, aesthetically acceptable and economical manner. Abdulahi, Ajibike, Man-Ugwueje and Ndububa (2014) defined solid waste management as the generation, prevention, characterization, monitoring, treatment, handling, transportation, reuse and residual disposition of solid wastes. Among the above definitions, it is obvious that waste transportation forms a part of it. Consequently, transportation of waste is a salient feature in the waste management approach and process. Eleje et al., (2017), observed that the problem of solid waste management arising from transportation has become a debilitating factor towards sustainable development in Nigeria. Domestic solid waste transportation simply refers to the activities concerned with the conveyance of disposed solid wastes from stored sources/places to final dumpsites. Waste transportation by its nature is aimed at facilitating the existence of a clean, serene and safe environment through ensuring effective and regular evacuation of these wastes.However, approaches have been adopted by various governments in ensuring effective conveyance of wastes from bins, where there are temporarily stored, to final dumpsites.
In Cross River State and Calabar in particular, Calabar Urban Development Authority (CUDA) was concerned with transportation of wastes to the final dumpsite at Ikot Effangha Mkpa axis. The authority was assisted by the Cross River Waste Management Agency (CRWMA) and the Ministry of Environment with funding from the government, International Agencies and Organizations such as the European Union and United Nations (UN) (Bassey, 2017). In the year 2015, CUDA paved way with the establishment of Green Sheriff and the later became the prime evacuator of wastes to the final dumpsite.

However, effective domestic waste transportation is still a challenge as a result of indiscriminate waste disposal by most residents in the city. The residents most often do not travel to the approved waste bins locations to dispose or empty their wastes and second, the agencies are often lackadaisical in ensuring prompt evacuation or transportation of the wastes.All of these call for serious concern from the academic and professional background yet, little has been done in this regard. From the foregoing, this study was thereforemeant to assess the practice of evacuating or transporting domestic solid waste to the government approved dumpsite in Calabar metropolis; with a view to properly identify the constraints and make appropriate recommendations for sustainable improvement.

The Study Area

The study area is Calabar Metropolis, the capital city of Cross River State. The Metropolis is situated between Longitudes 8°181 and 8°25'E and Latitudes 4°50'N and 5°67'N. It has a total surface area of 157.65square kilometres. It is bounded in the North by Odukpani Local Government Area in the South by the Atlantic Ocean, in the East by Akpabuyo Local Government Area and in the West by Calabar and Kwa Rivers respectively(Obia, Itam and Archibong, 2015). The rivers act as constraints tothe eastward and westward expansion of the city, while the swamps impede the southward expansion (see figure 1). The total number of persons residing in Calabar Metropolis was 371022 in 2006 (Bassey, 2017). With a growth rate of 3%, the projected population was 528988 in 2018. The topography of the area is low lying mass rising gradually upward towards Odukpani Local Government Area.

The study area has an annual rainfall ranging between 2891.1 – 3770.3mm. More than 30 percent of the rainfall is received between April and November. The ancient city of Calabar has a long history and a fascinating heritage. Nearly after a century of contact with European sailors, Calabar gained recognition as an International Sea Port in the 16th century. From 17th to 19th century, Calabar became a major slave trade port in West Africa. Calabar accounted for approximately 30 percent of Africans carted away to the new world (America) as slaves from Africa. This represented the largest exit of slaves from a single point in Africa (Eneji, Eneji, Ngoka and Abang, 2016).



Source: *CRS Geographic Agency, 2018.*

Description of the Final Dumpsite

The final dumpsite for wastes disposal in Calabar is LEMNAarea in IkotEffanghaMkpa. The size of the final dumpsite is 10 hectares (see figure 2). Currently, there are 385wastes collection points in the metropolis and 48 trucks. The agencies in charge of waste management and evacuation in Calabar are Green Sheriff, Patson Ltd., Handsome-kay Investment, Agug Triumphant Enterprise, Paconsa Limited andMadoxx Project Limited.

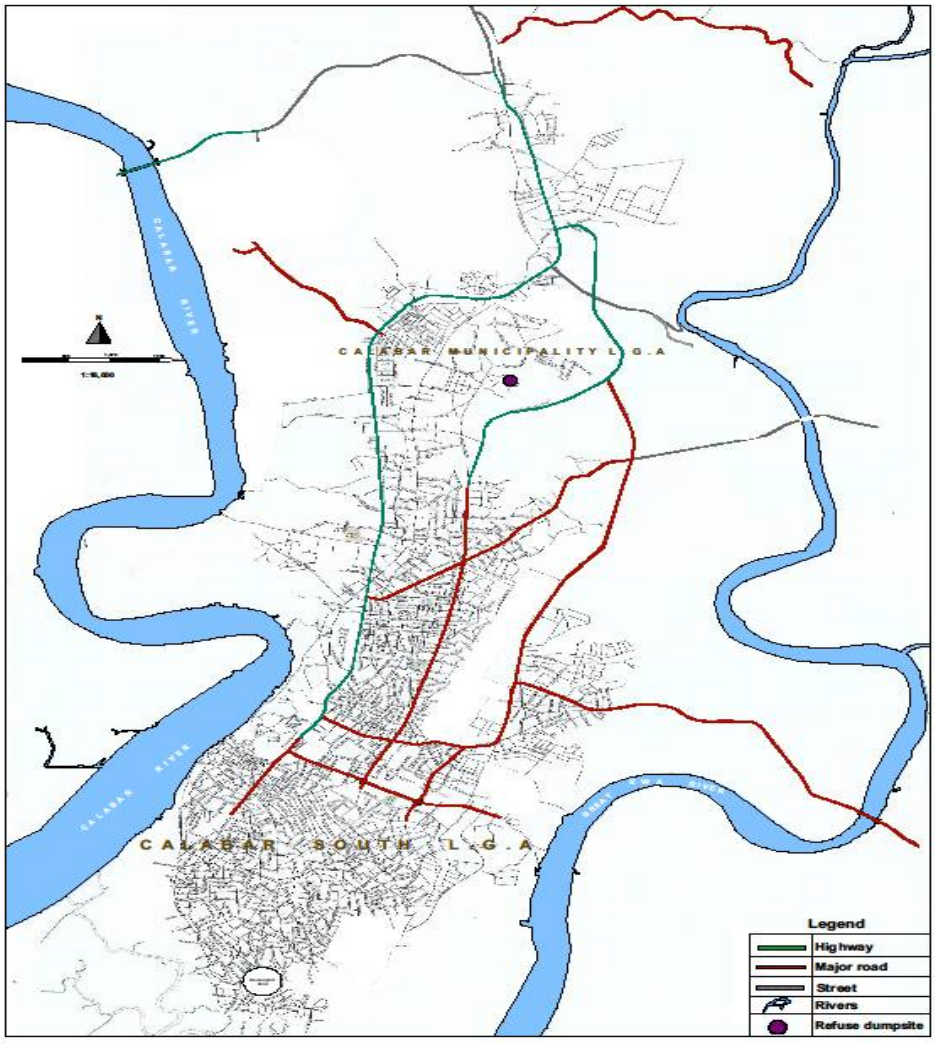


Fig 2: Map of Calabar Metropolis Showing the final dumpsite.
Source: *CRS Geographic Agency, 2019*

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

Concept of Waste Transportation

Waste transportation simply refers to the evacuation of waste and remains from points of generation to final approved sites in a particular area. It is also seen as the totality of the activities involved in the movement of remains that are no longer useful to their final dumpsites (Katju, 2006). While presenting a paper on the disposal of solid waste, Schmidt, Holm, Merrild and Christensen (2007) opined that disposal is the ultimate stage in solid wastes management system for those wastes that have no further use to society and therefore, needed to be properly collected and disposed of appropriately. The waste transportation concept as seen above is multidimensional. It involves waste transportation by residents to refuse collection bins and further transporting it to final dumpsites by refuse disposal authorities. For waste transportation to be effective and efficient, the availability of equipment like vehicles, staff and expertise cannot be over emphasized. With this understanding, the concept is adopted in this study to explain that effective waste transportation through the provision of the needed equipment and staff among other variables can go a long way in facilitating waste transportation in Calabar.

Concept of Domestic Waste Management

Domestic waste management simply refers to the totality of the processes involved in the collection, evacuation and disposal of domestic wastes. This according to Kinobe, (2015) involves the collection,storage, transport and disposal of wastes to final dumpsites that are approved by the government in a particular place.Solid waste management is a comprehensive, integrated, rational and systematic approach towards the achievement and maintenance of acceptable environmental quality (Kothari and Kyagi, 2010). Waste management is the purposeful, systematic control of the generation, storage, collection, transportation, recycling, recovery and disposal of solid wastes in a sanitary, aesthetically acceptable and economical manner (Afon, 2007). As observed in literature, waste management involves a wide range of stakeholders who perform various functions to help maintain a clean, safe and pleasant physical environment in human settlements in order to protect the health and well-being of the population and the environment (Sankoh, Yan and Tran, 2013). Nnorom, Ohakwe and Osinbanjo (2009), observed that modern methods of wastes disposal has emerged in response to the recognition of environmental impact of uncontrolled wastes disposal. Ekpoh, Ekpoh and Bassey (2008), explained that simple dumping and burning of wastes is no longer fashionable because of the environment and health concern. This, drive the present generation to effective approaches in ensuring adequate management of wastes including transportation to approved dumpsites.

LITERATURE REVIEW

The Number, Quality of Machines and Staff Available for Transportation of Refuse

The number and quality of machines for transporting domestic solid wastes differ clearly among cities of the world. However, most cities are assigned with more machines to facilitate waste disposal to final dumpsites than others. Achu, Nyong and Ndiyo (2015) observed that different vehicles are used for waste collection. They outline the vehicles to include compactor truck, rear loaders, open back and mini trucks and tippers. They noted that in urban areas of Nigeria, most often, a large number of vehicles used for waste collection are always at different states of disrepair. This is a management problem, which may result to inadequate service delivery. Similarly, Momodu, Dimuna and Dimuna (2011) revealed that the number and quality of machines employed in the waste management and transportation process are determined by the volume of waste generated, the waste type(s) and the distance travelled to final dumpsites. Some scholars are of the view that population of humans, volume of wastes generation, distance travelled to final dumpsites and others should not affect the quality of machines purchased, hence, the best machine quality should regularly be bought to ensure sustainability (Momodu et al, 2011; Singh et al, 2014). Another school of thought are of the opinion that due to the financial and economic cost of maintaining waste transporting machines, the quality of machines should differ. However, Taminu, Jaafaru and Suleiman, (2010) observed that if the final disposal site for waste is too far from the city centre, the time spent by the crew of the pickup trucks and other machines used for transporting waste becomes excessive. Coupled with the deplorable state of the roads, good quality machines are needed in the waste transportation process to final dumpsites (Okecha, 2000). In other to come up with decisions on the number and the quality of machines to use in the transportation of domestic solid wastes, Binafeigha and Enwin (2017) established that important considerations relating to planning and designing of dumpsites should be considered. That is, the location, type of station, access, and environmental effects should be given credence. Having in mind that household wastes consist of a variety of materials, the need to transport it with several waste workers is inevitable. Egunjobi (1993) reported that household waste consists of garden waste (20% of the total), paper and board (18%), wood and furniture (5%), kitchen waste (17%), general household sweepings (9%), metal packaging (3%) glass (7%), wood (5%), scrap metal (5%), soil (3%), textiles (3%), and 2% being disposable nappies.

Waste transportation therefore requires both skilled and unskilled labour in the handling process. According to Cunningham (2009), domestic solid waste handling method involves; control of waste at source, waste storage and separation at source, collection, transportation and disposal. Therefore, if disposal must be rightly done and the objective of maintaining a clean and serene environment achieved, several waste handlers and staff are expected to collaborate in the transportation of wastes to final dumpsites (Mohammad, 2013). Marden (2009) asserts that the number of waste workers in urban areas should be reviewed periodically because of population growth which manifest in waste generation and therefore its transportation to final dumpsites.

Frequency of Transporting Refuse to Final Dumpsites

The number of times wastes are transported varies between countries, cities and towns. Basically, it is a function of several variables including population (Idowu, 2013), volume/quantity of waste generated, available services for disposal and collection (Abila and Kantola, 2013), government policies and financial involvements (Kinobe, 2015). According to Kinobe (2015), cities in developing counties are facing challenges that are brought about by the ineffective waste management agencies to regularly transport wastes to final dumpsites. He observed that in Kampala, Uganda,the frequency of transporting refuse to final dumpsites was a function of the city size and the tons of wastes generated. For instance, in Kampala, waste dumping to final dumpsites was done on daily basis as long as the containers were filled up. This therefore triggered cleanliness and an environmentally healthy Kampala city. He further noted that the number of times for transporting refuse to final dumpsites in the city were triggered as perishables with the possibilities of emitting unpleasant odour constitute 92.7 % of the waste generated in Rwanda. It was also observed thatrecyclables and other special wastes constitute only 7.3 % of the total waste generated in Rwanda ((Okumu and Nyenje, 2011). With this observation, solid waste pickers are discouraged from being involved in waste recycling thus mounting the burden of waste transportation and management on the government and its agencies ((Zurbrugg, 2002).

In the same vein, the rate of generating solid wastes on average from poor to wealthy areas, business centres and market areas was 582, 169, 105 and 90 tonnes/day respectively in Kampala as observed by Kinobe, (2015). The implication is that waste generation is high and as such, demand multiple times for waste to be transported to final dumpsites if the city is to be serene and healthy. Areas that are tickly populated and experience a mix through the growth of commercial activities, waste is transported twice to final dumpsites. Momodu, *et al* (2011) observed that the frequency of transporting wastes in Nigerian cities to final dumpsites varied across settlements and towns. For instance, waste transportation in metropolitan Lagos, Abuja and Port Harcourt was identified to be more frequent than in less populated cities despite the fact that waste generation is inevitable.

In Lagos, waste transportation since 2015 had been given concern to the extent that core commercial areas experience a daily transportation of waste to final dumpsites for about two times daily (Idowu, 2013). This number is not fixed as the markets and commercial areas are experiencing a shift due to the nature of activities. Consequently, the number of times that refuse is transported to final dumpsites is deduced from the volume and quantity of wastes generated daily. This means that once the refuse collection bins are filled up, waste are transported to final dumpsites immediately (Babatunde, 2016). Other cities in Nigeria with a minimum of daily transportation of solid wastes to final dumpsitesinclude Port Harcourt, Asaba, Ado Ekiti, Onisha and Abuja (Abubakar, 2013). In the same vein, Maton, Dabi, Dodo and Nesla (2016) noted that waste transportation to final dumpsites in Nigeria was directly due to the amount of waste generated. They observed that waste generation in Nigeria is 25 million tons per year, at a daily rate of 0.44-0.66 kg/capita/day, while the density of the country ranges from 280-370 kg/m3.

Agency(s) Responsible for Transporting Domestic Solid Wastes

Studies have presented different agencies that are responsible for waste and refuse transportation. In Kampala, Uganda, Kinobe (2015) reported that the waste management and transportation agency is the Kampala Capital City Authority (KCCA). The agency is responsible for the collection, disposal and transportation of wastes to final dumpsites and landfills that are approved by the government of Kampala. Waste in the area is collected from homes by the staff of the KCCA to the trucks and vans for onward delivery to approved dumpsites (Black and Wettberg, 2012). The agency is empowered by the government to collect revenue from the residents and those generating waste and refuse before collecting waste from homes for disposal. Similarly, Eleje, *et al* (2017) observed that waste agencies in Anambra State were formed and controlled by the government. The agencies were maximally working in Akwa, Nnewi and Onitsha. They observed that waste management generally by the agencies has significantly increased internally generated revenue (IGR) and youth employment in the state. In the same vein, Imo, Enugu, Ebonyi and Abia have waste management agencies that are financed, sponsored and directed by their state governments. In Lagos state,the Lagos State Waste Management Agency (LAWMA), is concerned with all activities that relate to wastes collection and transportation in the area (Olawepo, 2009). In Ikom, Cross River State the agency responsible for managing and transporting wastes to final dumpsite is the Ikom Urban Development Authority (IUDA). Eja, Atu, Otu and Inyang (2011) observed that the agency in Ikom collects generated wastes from homes and dispose same to the final dumpsite. Other urban areas of Cross River State like Calabar,Ugep, Ogoja and Obudu experience similar practices (Sule, 2013).

Factors Working against Effective Transportation of Domestic Solid Wastes to Approved Dumpsites

Several factors are working against effective transportation of domestic solid wastes to approved dumpsites, mostly in cities of the developing world.

- **Funding:** Funding to facilitate effective transportation of domestic solid wastes by the waste management agencies has been reported as a problem. Eleje et al., (2017) observed that the government are usually unwilling to commit resources and funds to facilitate the purchase of vans, trucks and other equipment necessary in ensuring that domestic solid wastes are effectively and efficiently transported to approvedumpsites within the shortest possible time and regularly. Singh, et al (2014) reported that the financial involvement in transporting waste is high as such, governments of the developing world most times lack the financial ability to ensure effectiveness. Unlike in the developed countries where residents are made to pay minimal sum before wastes could be collected from homes, developing countries are of the view that waste transportation is the social responsibility of the government and as such are usually unwilling to pay for waste transportation when such arrangements are made (Momodu, Dimuna and Dimuna, 2011).
- **Urbanization and Population Growth:** Urbanization and population growth is a predominant feature of the 21st century environment (Eja et al., 2011). The population of Nigeria and other countries have been rising steadily over the years. For example, the population of Nigeria according to the 2006 population census result was 140 million persons (Abubakar, 2010). By the end of 2017, it was estimated that over 200 million persons were residing in Nigeria (NPC, 2018). According to Bassey (2017), population growth plays an indelible role towards increasing the volume/quantity of wastes that are generated. Idowu (2014) observed that waste generation in districts with increased population is inevitable. Eja et al., (2011) further pointed out that population growth is a limiting factor in waste transportation due to increase in its generation without corresponding availability of funds/resources, man power and expertise to ensure prompt and regular waste transportation to final dumpsites in Nigeria. The result is seen in the litters of wasteson the streets and open spaces in major urban areas of Nigeria (Amalu and Ajake, 2014).

- **Waste Disposal Practices by Urban Residents:** It has been reported that wastes in major urban areas are stored in available bins located at strategic points, from where they are disposed to final dumpsites by the waste management agencies (Ogbonna, Amangabar and Ekere, 2007). Sadly, most residents in urban areas choose to dump their household generated wastes indiscriminately making waste assemblage for onward transportation by appropriate waste management agencies difficult. In Sierra Leone, it was observed that over 21% of the residents' burn their wastes generated from domestic sources while others through them indiscriminately on drainage channels and river bodies (Sankoh, *et al* 2013). Binafeigha and Enwin (2017), revealed that consistent dumping of refuse at sea could cause a reduction in the aquatic life and biodiversity of a water body. In Malaysia, attitude and behaviour of residents affect household solid waste management and transportation. Chamhuri (2009) noted that households that stored their wastes appropriately for onward transportation to final dumpsites were only 15%. The important and significant factors that affect households' attitudes toward waste storage for transportation include household size, source reduction, reuse and recycling measures, frequency of waste collection, participation in training programmes and waste disposal method(s) (Pereira, 2008).
- **Accessibility Problem:** Accessibility plays an inevitable role in the development of areas/districts generally and in ensuring urban sustainability to a large extent (Dimuna and Omatsone, 2010). Refuse are usually transported to final dumpsites with the use of transportation equipment such as vans, vehicles and trucks. Sadly, the deplorable state of urban roads in Nigeria, limit largely the activities of waste management agencies in reaching inaccessibleareas and as such, waste transportation in such areas suffer setbacks (Iwena, 2003). Inaccessibility also encourage residents to dispose wastes indiscriminately even on water bodies like rivers thereby making waste gathering uneasy for waste management agencies.
- **Lack of Effective Legislations and Enforcement:** Developing countries lack effective legislations and adequate enforcement towards ensuring that domestic solid wastes are managed and transported effectively to appropriate dumpsites(Scotia, 2002). The legislature should include penal codes for those that indiscriminately dump wastes, those that refuse to pay their fees (where applicable) to facilitate refuse transportation and overall management and other associated issues. As pointed out by Offiong(2006) and Jiboye (2006), even when such legislations are made, their actual implementation is never felt and as such, the problems associated with waste management or transportation are obvious and cause serious concern and limit development of the urban landscape generally (Agbola, 2011).
- **Other Factors:** Other factors that militate against effective waste transportation from domestic sources are summarized as found in literatures. Yusuf (2013), assert that absence of collaboration between the government and citizens, resulting in the lack of participatory approaches to waste management and transportation in Nigeria urban areas, constitute a major problem to domestic solid waste transportation. Mohammad (2013) agreed with the assertion above and buttressed that the citizens should not only be thought on how to dispose and store wastes appropriately, they should also be involved in the waste transportation and management process. For instance, they can make financial donations to waste management agencies and at times offer themselves in waste gathering for transportation to final dumpsites.

Man power shortage is another factor that is hitting hard in waste management across different sectors of the economy (Umoh, 2013). Shortage of man power could be traced to the absence of the needed funds for sanitization by the government. In the same vein, most places designated as refuse dumpsites are poorly chosen. Okoi (2016) argued that the choice of the Ugep site for the disposal of wastes is highly contentious in terms of site suitability. As well, most sites are getting filled up while there are no arrangements by the government or their agencies to recommend new sites for final dumping.

It is further contended that the open dumping practice approach in the final disposing of wastes by developing countries is detrimental to health and well-being of the residents of such areas (Rana, 2011).

METHODOLOGY

The surveyresearch design was employed in this study and a representative sample was drawn from the study population in the collection of data. Two main sources of data were employed; primary and secondary sources. The primary sources were the administration of questionnaires, interview and observation. While the secondary sources include official reports, journals, past projects etc.Two main types of data were also collected; the primary and secondary data. The primary data include the socio-economic characteristics of respondents (age, monthly income, and educational qualification of the respondents). Others include the frequency of transporting waste to the approved dumpsite. Thesecondary data include thelocation and the number of refuse collection bins available, the number of staff concerned with the transportation of refuseamong others.

The sample frame for the study was the total staff strength of the agencies responsible for the transportation of refuse to the final dumpsite in Calabar. The agencies including their staff strength are shown in table 1 below. From the table, 308 staff formed the sample frame for the study.Furthermore, 50 percent of the staff in each category was chosen as sample size; giving a total of 156 staff. The last column represents the response rate of respondents during the data collection exercise.

Table 1: Agencies Responsible for Transportation of Refuseto Approved Dumpsite in Calabar

S/N	Agencies	Staff Strength	50%Sample Size	Response Rate
i	Green Sheriff	109	55	42
ii	Patson Limited	45	23	20
iii	Handsome-kay Investment	39	20	18
iv	Agug Triumphant Enterprise	32	16	16
V	Paconsa Limited	28	14	14
vi	Madoxx Project Limited	55	28	24
Total		308	156	134

Source: Ministry of Environment, Calabar (2018)

The Statistical Techniques used in testing the two hypotheses were: simple linear regressionanalysis and analysis of variance (ANOVA). Simple linear regression was used to test thefirst hypothesis which states that ‘there is no significant relationship between the availability of standard vehicles and the frequency of transporting domestic solid wastes to the approved dumpsite in Calabar’. It is mathematically represented as follows:

$y = a + b x + e$

Where:y = dependent variable; x = independent variable; a = intercept; b = slope; e = residual error. The dependent variable was the frequency of transporting domestic solid waste to the approved dumpsite (table 9), while the independent variable was the number of availablestandard vehicles (table 10).

Analysis of variance (ANOVA) was used to test the second hypothesis which states that ‘there is no significant difference in the number of times domestic solid wastes were transported to the approved dumpsite among the wastes collection points in Calabar’.

The dependent variable (y) was the number of times domestic solid waste were transportedto the approved dumpsite (table 9), while the independent variables (x) were the wastes collection points as factors of location (table 8).It is mathematically expressed below:

$$SST = \sum x^2 - \frac{(\sum x)^2}{N} \quad \text{(i)}$$

$$SSB = \frac{(\sum x_1)^2}{N} + \frac{(\sum x_2)^2}{N} + \frac{(\sum x_3)^2}{N} + \ldots \frac{(\sum x_n)^2}{N} \quad \text{(ii)}$$

$$SSW = SST - SSB \quad \text{(iii)}$$

Where SST = Total variation (total sum of square)
SSB = Variation between squares (sum of squares between)
SSW = Variation within groups (sum of squares within) (Nwachukwu, 2012)

DATA ANALYSIS AND RESULTS

Sex Distribution of Respondents

In table 2, it was observed that 206 (67.5 percent) respondents were males while 99 (32.5 percent) respondents were females. Having in mind that the respondents were drawn from waste management/transportation agencies in the study area, it was deduced that male workers in the waste transportation process dominated the female workers in Calabar.

Table 2: Sex Distribution of Respondents

Sex	Frequency	Percentage
Male	108	81
Female	26	19
Total	**134**	**100**

Source: Field Survey, 2019

Age Distribution of Respondents

Table 3 shows that 64 respondents representing 21.1 percent were between 18 to 30 years old while 107 respondents representing 35.1 percent were between 31 to 40 years old. However, it was observed that 77 (25.2 percent) respondents were between 41 to 50 years old while 57 (18.6 percent) were 51 years and above. From the table, it was clear that waste workers in the study area that are between 31 to 40 years old formed a greater percentage of the waste workers in Calabar.

Table 3: Age Distribution of Respondents

Age Distribution	Frequency	Percentage
18 – 30	42	31
31 – 40	45	34
41 – 50	26	19
51 & above	21	16
Total	**134**	**100**

Source: Field Survey, 2019

Educational Qualification of Respondents

Table 4 revealed that 64 (21.0 percent) respondent were FSLC holders while 96 (31. percent) respondents were SSCE/GCE holders. However, 84 respondents were undergraduates representing 27.5 percent and 39 respondents representing 12.8 percent respondents were graduates. Further, 22 (7.2 percent) respondents had no formal education.

Table 4: Educational Qualification of Respondents

Educational Qualification	Frequency	Percentage
FSLC	31	23
SSCE/GCE	56	42
Graduates	32	24
Non-Formal Education	15	11
Total	**134**	**100**

Source: Field Survey, 2019

Monthly Income of Respondents

The data in table 5 shows that 33 (10.6 percent) respondents earn below ₦18,000 while 88 (29.0 percent) respondents earn from ₦18,001 to ₦36,000 as their monthly income. The table also shows that 79 (26.0 percent) respondents earn between ₦36001 to ₦54,000 and 105 (34.4 percent) earn from ₦54,001 and above monthly. This implies that those that earn between ₦18,001and ₦36,000 dominated during the survey.

Table 5: Monthly Income of Respondents

Monthly Income (₦)	Frequency	Percentage
Below 18,000	46	34
18001 – 36,000	56	42
36001 – 54000	20	15
54,001 & above	12	9
Total	**134**	**100**

Source: Field Survey, 2019

Quality of Vehicles for Waste Evacuation

Table 6 presents the views of respondents about the quality of vehicles used for the evacuation of waste to final dumpsite in Calabar. The table shows that 10 (7 percent) respondents were of the opinion that the vehicles were in excellent condition, 16(12 percent) respondents said the vehicles were of very high quality. In the views of 46 (34 percent) respondents, the quality of vehicles was high, while 37(28 percent) posited that the quality was low and 25(19percent) said that the quality was very low. This generally implies that the quality of vehicles used for the evacuation of refuse was relatively high.

Table 6: Quality of Vehicles for Waste Evacuation

Quality	Frequency	Percentage
Excellent	10	7
Very high	16	12
High	46	34
Low	37	28
Very Low	25	19
Total	**134**	**100**

Source: Field Survey, 2019

Weekly Quantity of Wastes Transported to Final Dumpsiteacross Neighbourhoods in Calabar

Table 7 shows that 22.4 tons of wastes were transported to final dumpsite from Big Qua Town, while evacuation from Ikot Omin amounted to 14 tons weekly. The table further revealed that 15.4 tons of wastes were transported to the dumpsite from Ikot Ansa and 12.6 tons from Ikot Effanga Mkpa.

In the same vein, 16.1 tons were from Ikot Uduak and 14.7 tons from Ikot Eneobong, Edim Otop had 2.6, while 2.9 tons were conveyed to the dumpsite from Anantigha on weekly basis. Also13.3 tons were from Cobhom Town, 23.1 tons from Mbukpa, 11.9 tons from Henshaw Town, 11.2 from Archibong Town, and 12.6 tons were from Duke Town respectively. This shows that the total quantity of waste evacuated to the approved dumpsite in per week in Calabar is 182.7 tons. Their equivalents on daily basis are shown in the second column of the table.

Table 7: WeeklyQuantity of Wastes Transported to Final Dumpsite according to Neighbourhoods in Calabar

Neighbourhood	**Quantity in Tons**	
	Daily	**Weekly**
Big Qua Town	3.2	22.4
IkotOmin	2.0	14
Ikot Ansa	2.2	15.4
IkotEffangaMkpa	1.8	12.6
IkotUduak	2.3	16.1
IkotEneobong	2.1	14.7
EdimOtop	2.6	18.2
Anantigha	2.9	20.3
Cobham Town	1.9	13.3
Mbukpa	3.3	23.1
Henshaw Town	1.7	11.9
Archibong Town	1.6	11.2
Duke Town	1.8	12.6
Total	**29.4**	**182.7**

Source: Ministry of Environment, 2019

Number of Waste Collection Points According to Neighbourhoods

Interviews with the staff of the Ministry of Environment and Green Sheriff revealed that there were 39 waste collection points in Big Qua Town, 24 in Ikot Omin, 36inIkot Ansa and 41 in Ikot Efanga Mkpa. Furthermore, 14 waste collection points were in Ikot Uduak, 31 in Ikot Eneobong, 19 in Edim Otop and 27 in Anantigha. Cobham Town had 18 waste collection points, Mbukpa had 47 collection points. The total number of waste collection points in Henshaw Town were 39, while Archibong Town had 28 collection points and Duke Town had 22 collection points. From table 8, the neighbourhood with the highest number of waste collection points is Mbukpa while the area that has the least number of wastes collection points is Ikot Uduak.

Table 8: Number of Waste Collection Points according to Neighbourhoods

Neighbourhoods	Number of Wastes Collection Points
Big qua	39
IkotOmin	24
Ikot Ansa	36
IkotEffanga	41
IkotUduak	14
IkotEneobong	31
EdimOtop	19
Anantigha	27
Cobham Town	18
Mbukpa	47
Henshaw Town	39
Archibong	28
Duke Town	22
Total	**385**

Source: Ministry of Environment, 2019

Weekly Transportation of Wastes to Approved Dumpsite

During interviews with the staff of the Ministry of Environment as documented in table 9, it shows that wastes is usually evacuated 46 times from BigQua Town to the approved dumpsite in a week. The number of time the same process occurs in Ikot Omin is 38, while Ikot Ansa is 64 times, Ikot Effangha Mkpa 53 times and 65 times in Ikot Uduak. Waste evacuation to the dumpsite in a week from Ikot Eneobong is 49 times, 51 times from Edim Otop, 34 from Anantigha, while it is 44 times from Cobham Town. The number of times wastes is transported from Mbukpa to the approved dumpsite stood at 77 times per week and 59 times from Henshaw Town. It is 28 times in Archibong Town, and 22 times in Duke.

Table 9: Weekly Transportation of Wastes to Approved Dumpsite According to Neighbourhoods in Calabar

Neighbourhood	Weekly Transportation of Wastes
Big Qua Town	46
IkotOmin	38
Ikot Ansa	64
IkotEffangaMkpa	53
IkotUduak	65
IkotEneobong	49
EdimOtop	51
Anantigha	34
Cobham Town	44
Mbukpa	77
Henshaw Town	59
Archibong Town	46
Duke Town	46
Total	**672**

Source: Ministry of Environment, 2019

Number of Vehicles Allocated to Neighbourhoods for Wastes Transportation in Calabar

Table 10 shows that 3 of the total vehicles were allocated to Big QuaTown for transporting wastes to the approved dumpsite in Calabar, Ikot Omin 3 vehicles, while 2 vehicles were allocated to Ikot Ansa. A total of 4 vehicles wentto Ikot Effanga Mkpa, Anantigha, Cobhom Town and Henshew Town respectively. While 3 vehicles went to Ikot Uduak, 5 vehicles each to Ikot Eneobong, Mbukpa and Duke Town. Finally, Archibong Town was allocated 3 vehicles for wastes transportation.

Table 10: Number of Vehicles Allocated to Neighbourhoods in Calabar for Waste Evacuation

Neighbourhood	**Number of Vehicles**
Big Qua	3
IkotOmin	3
Ikot Ansa	2
IkotEffanga	4
IkotUduak	3
IkotEneobong	5
EdimOtop	3
Anantigha	4
Cobham Town	4
Mbukpa	5
Henshaw Town	4
Archibong	3
Duke Town	5
Total	**48**

Source: Ministry of Environment, 2019

Problems working against effective Waste Transportation in Calabar

The problems associated with ineffective evacuationof domestic solid wastes to approved dumpsitein Calabar as revealed during the interview session are discussed below:

Poor Financing: During the interview with staff of Cross River Ministry of Environment, Green Sheriff and Private Waste Companies, it was reported that poor funding by the state government hasaffected the waste transportation process in Calabar. During the interview it was revealed that the inadequacy of funds has led to the availability of fewer vehicles than needed as well as man power availability in the waste transportation process. Also, materials such as tarpaulins which are needed to cover wastes to prevent them from falling off from the vehicles during the transportation process are not purchased due to paucity of funds.

Constant Breakdown of Vehicles: Another constraint to effective waste transportation in Calabar is the constant breakdown of vehicles that are needed for the transportation of the wastes. As a result, some areas where wastes are supposed to be evacuated regularly and promptly are not, thereby causing visual pollution and bad odour especially within the vicinity of the wastes collection points.

Waste Disposal Practices by Residents: The attitude to which waste is disposed by the residents in the study area is making the waste transportation process cumbersome. For example, most residents in the city dump their wastes indiscriminately on the ground around the wastes collection points, rather than properly disposing them in the street bins. In most cases, the waste heaps up on the ground while the bins are not filled, causing excessive littering to the main carriageways and delays when the transport agencies come to carry the wastes to the final dumpsite. This attitude demands extra energy in properly removing the littered wastes into the vehicles, thereby making the job of those involved in evacuating the wastes unattractive.

Results of the Hypotheses

The two hypotheses formulated for the study were tested using the appropriate statistical techniques. The result of the first hypothesis using regression analysis as presented in table 11 shows that the calculated significant value of 0.948 was greater than 0.05. Based on this, the null hypothesis was accepted and the alternative hypothesis was rejected. This statistically implies that there was no significant relationship between the number of vehicles and the frequency of transporting domestic solid wastes to the government approved dumpsite in Calabar. On a general note, it means that other factors such as attitude to wastes disposal, quantity of wastes generated etc. may be responsible for the frequency of transporting wastes to the final dumpsite other than the availability of vehicles.

Table 11: Regression Results (Model Summary)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. value
1	.948[a]	.898	.894	8.415	. 948

a. Predictors: (Constant), y

Source: Statistical Computation, 2019

For the second hypothesis, ANOVA was used for the test. However, the result of the test as presented in table 12shows that the calculated significant value of 0.001 was less than 0.05. From the result, the alternative hypothesis was accepted while the null hypothesis was rejected. This implies that there was a statistically significant difference in the frequency of transporting domestic solid wastes to approved dumpsite and the number of waste collection points in Calabar.

Table 12: ANOVA

	Sum of Squares	Df	Mean Square	F	Sig. Value
Between Groups	2693.354	1	2693.354	23.239	.001
Within Groups	2665.686	23	115.899		
Total	5359.040	24			

Source: Statistical Computations, 2019

DISCUSSION OF FINDINGS

i The result of the interview conducted with staffof the Cross River State Ministry of Environment revealed that a total of 48 vehicles wereallocated, according to neighbourhoods, for the transportation of wastes from the 385 collection points to the approved dumpsite in Calabar (see table 10 and 8). For instance, 3 vehicles were allocated to Big Qua Town, Ikot Effangha Mkpa 4, while 5 vehicles were allocated to Mbukpa. In all, a total of 48 vehicles were allocated to all the neighbourhoods in the study area,with 385 wastes collection points. On the average, each collection point was allocated 8 vehicles. The findings of Eleje, *et al*(2017) revealed that the number and quality of vehicles assigned to transport solid wastes to final dumpsites in cities and towns is directly related to the population of the city/town, the quantity of wastes generated, among others. This, to an extent agrees with the result of the field study.

ii On weekly basis, wastes are transported 672 times to the approved dumpsite in Calabar. Most often, this number depends on the quantity of wastes generated,the availability of vehicles and manpower. Table 9 shows the frequency of transporting wastes to the final dumpsite in Calabar. From the table, the weekly highest frequency of wastes evacuation was recorded at Mbukpa area axis, being one of the thickly populated areas of Calabar. The difference with other neighbourhoods may be due to the socio-economic activities in these areas.

iii The Ministry of Environment, Green Sheriff and several private wastes management organizations are involved in the transportation of wastes to the final dumpsite in Calabar. Among the private wastes companies are Patson, Handsome-kay Investment, Agug Triumphant Enterprise, Paconsa Limited, Madoxx Project Limited. The same observation was made by Essien (2016) in his study.

iv The main problems identified as militating against effective domestic wastes transportation to the approved dumpsite in Calabar were poor or inadequate funding andman- power shortage. Most of the vehicles were broken down and repairs are not regular. Eleje, et al (2017) identified poor funding/inadequate financingas the major problem in the transportation and management of wastes in Nigeria major cities.

Also, the unwholesome attitude by residents while disposing wastes at refuse collection points in Calabar makes the process of transporting wastes difficult. For instance, most residents are in the habit of dumping or littering wastes on the ground near the wastes collection points or bins and on water drainage channels including nearby bushes. Ogbonna, Amangabar and Ekere, (2007) equally observedthat residents in urban areas of Nigeria dump their household generated wastes indiscriminately making waste assemblage for onward transportation by appropriate waste management authorities complex. The study equally noted that waste transportation process in the study area is the sole responsibility of the government. Residents that generate wastes do not pay nor contribute to the waste transportation/management process.

RECOMMENDATIONS AND CONCLUSION

Based on the findings of the study, the following recommendations were made for improvements;

- For effective, efficientand regular conveyance of wastes in the city of Calabar, government should improve on the funding of the Ministry of Environment and agencies responsible for wastes disposal and management. This will give rise to the purchase of new quality vehicles, regular maintenance of the old ones and employment of qualified technical staff like drivers and other allied workers. To complement government's effort, residents could be made to pay minimal sum as appropriate through neighbourhood organizations.
- Effective study(s) should be carried out by the supervisory Ministry in order to identify more wastes collection points and allocation of waste bins. This will reduce the distance residents have to travel to the nearest collection point(s). The study should also incorporate the population and level of socio-economic activities of each neighbourhood for a more efficient allocation of wastes bins and vehicles.
- There should be effective monitoring in the wastes disposal process by the government through the Ministry of Environment for improved performance by the private agencies responsible for the conveyance of these wastes to the approved dumpsite. Community surveillance should be put in place for effective monitoring.
- Adequate and effective environmental education should be given priority by the Ministry of Environment on wastes disposal consciousness of residents in Calabar. This will minimize the act of littering the streets, dumping of wastes in drainage channels. In addition, the quantity of wastes to be transported to the dumpsite should not exceed the carrying capacity of the trucks to avoid littering of wasteson the streets while on transit.

CONCLUSION

The study shows that wastes transportation in the study area is facilitated by the Cross River State government through the Ministry of Environment and private wastes collection agencies. It was equally observed that the city has a total of 385 wastes collection points and 48 trucks distributed randomly within the neighbourhoods. The adequacy of this distribution is an issue of concern. However, wastes transportation plays an inevitable role in the wastes management process and should therefore be given proper attention. It should also be incorporated into the general environment planning practice.

REFERENCES

Abdullahi, I., Ajibike, I. Man-ugwueje, A. and Ndububa, O. (2014) Environmental impact of indiscriminate waste disposal "A case study of Nigerian Air force Base, Kaduna". *International Journal of Engineering and Applied Sciences (IJEAS),* 1 (1), 25 – 33

Abila, B and Kantola, J (2013) Municipal solid waste management problems in Nigeria: Evolving knowledge management solution. *International Journal of Environmental and Ecological Engineering* 7 (6), 303 -308

Abubakar B. (2013) Characterization of municipal solid waste in the federal capital Abuja, Nigeria. *Global Journal of science frontier research, environmental and earth science* 14 (2), 1-6

Achu, A. C., Nyong, I. M and Ndiyo, N. A (2015) Public waste management systems and tourism development in Calabar, Cross River State, Nigeria. *Multi-Disciplinary Journal of Research and Development Perspective,* 4 (2), 185 – 194

Afon, A. O (2007) Informal sector initiative in the primary sub-system of urban solid waste management in lagos, Nigeria. *Habitat International* 31, 193–204.

Agbola, E (2011) Household solid waste disposal practies of women in two Nigeria urban towns, *Journal of Environment and Ecology* 5 (2), 1-9

Amalu, K and Ajake, E (2014) Solid wastes generation in Covenant University, *Journal of Environmental Science* 3 (2), 419-424.

Babatunde T., (2016) Review on the environmental impacts of municipal solid waste in Nigeria, challenges and prospects greener *Journal of environment and public safety* 2354-2276

Bassey I. U., (2017) Analysis of municipal solid waste in Kano metropolis. *Journal of human ecology 31 (2), 111-119*

Binafeigha T and Enwin, A (2017) The State of solid waste management in Port Harcourt City, Nigeria. *American Journal of Civil Engineering and Architecture,* 5 (4), 160-166

Black, J and Wettberg A. (2012) Evaluation of chronological aspects of collection and transportation of municipal solid waste system in Urmia. *Iran Journal of environment health science.* 24 (4) 267-272

Chamhuri, A (2009) Lining of waste impoundment and disposal facilities, *Journal of environmental protection agency*

Cunningham, J. (2009) Defining entrepreneurship. *Journal of small Business Management,* 29 (1) 15-23

Dimuna K. O., Omatsone, M (2010) the problem with the management of environmental pollution in Nigeria. *Journal and basic sciences,* 2 (1 and 2), 5-9

Egunjobi, L (1993) Issues in environmental management for sustainable development in Nigeria. *The Environment,* 13 (1), 33-40

Eja M. E., Atu, N. O., Otu, J. E.andInyang I. O (2011) Environmental and public health-related assessment of solid waste management in Uyo, AkwaIbom State, Nigeria. *World Journal of applied science and technology* 2 (1), 110-123

Ekpoh, I. J., Ekpoh, U. I and Bassey, N. U (2008) The role of environmental education and public enlightenment in urban waste management in Calabar, Cross River State of Nigeria. *Africa Journal of Environmental Pollution Health* 6 (1), 7-12

Eleje, E., Anienwelu P and Adebayo, P (2017) Financial and economic implications of solid waste management in Nigeria. *JORIND,* 15(1), 330 – 340

Eneji, C. O., Eneji, J. O., Ngoka, V.N. and Abang, M (2016). Attitude towards waste management and disposal methods and the health status of Cross River State, Nigeria. *SCIREA Journal of Agriculture.* 1 (2), 231 – 247

Essien C. k (2016)Sustainable manaegement of solid waste in Nigeria urban centres. *A journal of contemporary research 15 (3), 1-10*

Hakami, B. A and El-Sayed S. A. (2017) Household solid waste Composition and Management in Jeddah City, Saudi Arabia: A planning model. *International Research Journal of Environment Sciences,* 4 (1), 1-10

Idowu O. O. (2013) Management of sawmill waste in Nigeria, case study of Minna, Niger state. *Journal of sciences, engineering and technology research* 3 (2), 34-41

Iwena, A. (2003) Assessment of urban air pollution and its probable health impact, *Journal of environmental biology* 31 (2), 913-920

Jiboye, J., (2006) Characterization and management of solid hospital waste in the Federal capital territory. Abuja. *Journal of health sciences* 6(1), 58-63

Katju C. V., (2006) Solid waste management at community level. *World*bank web page, hht://www.devalt.org/newsletter/juno6/lead.htm

Kinobe, J. R (2015) *Assessment of urban solid waste logistics systems:* The case of kampala, Uganda. An Unpublished Doctoral Thesis. Swedish University of Agricultural Sciences Uppsala

Kothari R, and Tyagi V.V., (2010) Waste-to-energy: a way from renewable energy sources to sustainable development. *International Journal Sustainle Energy* 14 (9), 3164–3170

Marden A (2009) Municipal solid waste management in puclong new area, china *Journal homepage:www.elseviericom/locate/wasman 29 (4), 1227-1233*

Maton, S. M., Dabi, D. D., Dodo, J. D and Nesla, R. A., (2016) Environmental hazards of continued solid waste generation and poor disposal in municipal areas of Nigeria. *Journal of Geography, Environment and Earth Science International* 6 (3), 1-10

Mohammed, N. (2013) Waste management programme *Journal of the open waste management*

Momodu, N. S., Dimuna, K. O and Dimuna, J. E., (2011) Mitigating the impact of solid wastes in urban centres in Nigeria. *Journal of Human Ecology*, 34(2), 125-133

National Population Commission (2018). *Population Census Forecast Report.* Lagos: University of Lagos Publishers

Nnorom, I. C., Ohakwe, J and Osibanjo, O (2009) Survey of willingness of residents to participate in electronic waste recycling in Nigeria: A case study of mobile phone recycling. *Journal of Cleaner Production,* 17 (2), 1629-1637

Nwachukwu, M. U. (2012) Analysis of consumption pattern of highway transportation fuel in Nigeria. OPEC Survey Review.

Obia, A. E., Itam, E. B and Archibong, A. E. (2015) Urban development in the third world and threat to wetlands: The case study of Calabar, Nigeria. 1 (14), 33 – 45

Offiong V. O. (2006) Strict liability as a pancea for toxic waste disposal problem in international law. *Journal of law and judicial system* vol 1 (4), 17-24

Ogbonna, A., Amangabar, D and Ekere, A (2007) An effective solid waste management system Enugu, Nigeria. *Journal of Transactions on Ecology and the Environment* 180, 293-301.

Okecha, S. A. (2000) *Pollution and conservation of Nigeria environment.*Owerri: TAfrique International Associates

Okoi, A (2016) Waste disposal problems and management in Yakurr, Nigeria. *Journal of Environmental Protection* 4 (3), 4-11.

Okumu O. J and Nyenje R (2011) Municipal solid waste management under decentralization in Uganda. Article in *habital international* 35 (4), 537-543

Olawepo, L (2009) Globalization and municipal solid waste management in Africa. *Journal of development alternatives.*

Pereira (2008) selecting transfer station locations for large solid waste systems. *European journal of operational research 38, 339-349.*

Rana R. (2011) waste management in chandigarh. *Journal of civil engineering and environmental technology 1 (4), 67-70*

Sankoh, F., Yan, X. & Tran, Q. (2013) "Environmental and health impact of solid waste disposal in developing cities: A case study of Granville Brook dumpsite, Freetown, Sierra Leone, *Journal of Environmental Protection,* 4(7), 665-670.

Schmidt J.H., Holm P., Merrild A. and Christensen P (2007) Life cycle assessment of the waste hierarchy–A Danish case study on waste paper. *Waste Management,* 27 (3), 1519-1530

Scotia N (2002) violation analysis for solid waste management systems. *Journal of environmental management* 4 (10), 1-16

Shan-Shan C and Carlos WHL (2004) Waste management in Guangdong cities: The waste management literacy and waste reduction preferences of domestic waste generators.*Journal of Environmental Management,* 33(5), 692-711

Singh, G., Gupta, K and Chaudhary, S (2014) Solid waste management. Its sources, collection, transportation and recycling. *International Journal of Environmental Science and Development,* 5 (4), 347 – 351

Sule, K (2013) Solid waste management, its sources. Collection, transportation and recycling, International *Journal of environmental science and development* 5 (4), 347-351

Tanimu M. A and Jaafaru, A, Suleiman S. M. (2010) Solid waste energy generation: A case study of Kaduna polytechnic. *International Journal of Environmental Issues.* 7 (1), 152-161.

Umoh, A, A (2012) recycling demolition waste sandcrete blocks as aggregate in concrete. *Journal of engineering and applied sciences* 7 (9), 1111- 1118

Yusuf C. O., (2013) pollution and waste: issues and management strategies A paper delivered at a conference organized by the Federal ministry of environment in Abuja

Zurbrugg C (2002) Under solid waste management in law-income countries of Asia. *Journal of scientific committee of problems of environment.*

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APPENDIX

Plate 1: Wastes Collection Point along Ekpo Abasi Street, Calabar South.

Plate 2: A Typical Truck used for Evacuation of Waste in Calabar.

Plate 3A: A section of the approved Dumpsiteshowing wastes deposit in Calabar

Plate 3B: A section of the approved Dumpsiteshowing wastes deposit in Calabar