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Rural Waste Generation and Management in Nigeria: A Potential Environmental Hazard

Wekpe, V.O*[#] and Lawal O*.
**Department Of Geography and Environment Management, Faculty of Social Sciences, University of Port Harcourt, Port Harcourt*
[#] School of Environment, Geography and Geosciences (SEGG) University of Portsmouth, Portsmouth United Kingdom

Abstract: The problem of solid waste management in rural areas is a topic that has been inappropriately overlooked and constantly underestimated. The rural populace in Nigeria accounts for over 50% of the country's population. Despite having more than 50% of the population, the characteristics, contribution and volume of waste generated from the rural areas are not adequately understood. This study is an attempt to provide an answer to this important knowledge gap in the waste generation capacity and composition of the waste generated by households in rural areas in Nigeria. Data were generated from three rural communities in three different states in the southern part of Nigeria. A simple random sampling technique was used to identify ten households per community that constituted the sample. Direct measurements of the daily waste generation of each sample household were carried for one week. The most abundant waste type were putrecibles (organic waste) which accounted for 41.65 percent of all the waste generated. This was followed by plastic waste which accounted for 22.13% while metal and paper waste had 18.89 and 17.32 percent respectively. Results revealed that the complexity of expected rural wastes composition is changing as the goods and materials available in the rural areas becomes more sophisticated and contemporary. Essentially, there is no framework for collective waste disposal across the rural areas examined. Arising from the findings of the work, it is recommended that local government authorities establish am arm to undertake the development of a unified waste collection framework.

Keywords: Waste Management Practices, Sustainable Waste Management, Waste Management Hazard.

1. Introduction

The problems of waste generation and management in most places especially in the developing countries have become one of the most intractable environmental problems facing rural areas. This prevailing condition have arisen due to the relatively low level of technology that is not sophisticated enough to handle the high rate of waste generation especially in developing countries (Baum, 1973). The problem of waste management occupies an important place in the discussion of issues that relate to sustainable development matters such that the UN (2015) recognized the importance of waste management in its goal 12 and target 12.5 which looks at ways to substantially reduce waste generation.

Rural regions or areas have been neglected in matters and discussions that relate to waste management and regulation efforts belying the fact that rural regions constitute an integral component of a larger country or commune. This statement becomes increasingly glaring and terrifying when viewed against the backdrop that the bulk of the population in Nigeria is rural based. An attempt to define Rural areas have been attempted by various scholars over time depending on their points of departure or need. Coburn *et al*, (2007) state that "there is no single, universally preferred definition of rural that serves all policy purposes. The choice of rural definition affects who benefits from a policy and who does not". In an attempt to define the term rural, Adisa (2012) opined that the term 'rural' does not have a conventional definition. The term rural has seemed to evade consensual and conventional definition to the extent that even within some countries, there are deferring definitions of 'rural' (Adisa, 2012). This inability to adopt a unified and conventional definition led to the suggestion that it is now necessary for each country to have its own rural threshold, using its self-determined criteria to define and conceptualize the term (Ekong, 2010; Adisa, 2012). Thus in very simple terms, a rural area represents a geographic area that is outside a city or a town, usually characterized with open spaces of land and very low population densities. Adisa (2012) contends that in most parts of the world, the areas designated as 'rural' share a number of common attributes. These attributes include extensive and overwhelming involvement in primary production activities (agriculture mostly) that supply food and needed raw materials for the day to day functioning of the larger society. In the same light, Ekong (2010) inferred that, rural centers are the seed beds of national population and therefore constitute an enviable conservatory of pristine national culture, manpower, patriotism and tradition. The Federal Statistics Office in Nigeria classifies a neighborhood that has a population of 20,000 people or less as rural (Abdulateef et al., 2017). Afolayan (1995) identified rural areas by

criteria such as low infrastructural development level i.e. roads, little or no water supply, insufficient or no electricity among others. Rural areas can be said to be a direct opposite of urban areas whose population mainly engages in agriculture as well as the basic rudiment of tertiary activities. Rural population in Nigeria is reported at 52.22% (Abdullateef, 2017).

Rural areas are often exposed to bad practices in the waste management sector and more research should focused on these areas as suggested by Mihal and others in 2014 when they looked at waste management problems in rural Romania (Mihai, Oiste & Chelaru, 2014). Today, the rate at which waste is being generated is about 70% as compared to the total rate of its disposal which is 30% (Edu, 2003). Darban Astane & Hajilo (2017) contend that the ever increasing rural and urban population as well as rural and urban development efforts juxtaposed against dynamic lifestyle changes and the consequent changes in household consumption patterns have created problems in modern societies.

Waste management globally is beset by several factors which is predetermined by the composition of the waste concerned. The majority of substances composing solid waste include paper, vegetable matter, plastics, metals, textiles, rubber, and glass (USEPA 2013). Solid waste disposal is an enormous concern in developing countries across the world, as poverty, population growth, and high urbanization rates combine with ineffectual and under-funded governments to prevent efficient management of wastes. There are several factors that set waste management in developing countries apart from management in industrialized countries. First, the types of materials that compose the majority of the waste are different. In developing countries, there is a much higher proportion of organics, and considerably less plastics (Cointreau 1982). The large amount of organic material makes the waste denser, with greater moisture and smaller particle size (Cointreau 1982). A second difference is that technologies used in industrialized countries are often inappropriate for developing countries. Even garbage trucks are less effective because of the much heavier, wetter, and more corrosive quality of their burden (Cointreau 1982). Commenting on the topic of waste management problems, (Nenković-Riznić, 2011) succinctly presented the truth that the problem of waste management in rural areas has not been the subject of detailed specific researches; this came to be because most enquiries in this direction focused attention towards the study of means, mechanisms and procedures of waste elimination in urban settlements. The reason for the reduced scope of research in this field lies in the fact that rural settlements cannot be considered as "grateful" subjects due to usual deficiency of specific data (population number, fluctuations, amount of waste, waste composition, methods of waste elimination, etc.). In addition, for several decades the villages have primarily eliminated waste spontaneously. This has proven difficult to research because of the variations of methods applied to each specific locale, as well as different environmental variables.

The poor attention given to rural waste management practices in the developing countries such as Nigeria is manifested in the paucity of available data and literature on the waste generation, composition and waste disposal options available to rural inhabitants, hence the locus of this research work is the assessment of rural waste generation capacities as well as rural waste management strategies and what it portends for sustainable development and continued social and environmental viability for rural areas in Nigeria.

2. Materials and Method

2.1 Study area

This study used one rural area each from Rivers State, Akwa Ibom State and Delta State in the South South geopolitical zone of Nigeria. These communities include Ohaji in Rivers State, Idumogo in Delta State and Ibiaku Issiet in Akwa Ibom State. The communities fall within the same climatic and weather conditions as well as have similar socio economic considerations. The consumption pattern and waste generation capacities were therefore considered to be similar. A simple random sampling technique was used to select ten households in each rural community to sample.

2.2. Data

Data for this study was generated by sampling thirty households in the three selected rural communities of Ohaji, Idumogo and Ibiaku Issiet in Southern Nigeria. The waste generated by the individual households was measured on a daily basis using a calibrated weighing machine. After the wastes were collected, there were sorted into four broad categories which include food waste (organic or putrecibles) which constituted any material that comes from food left over's, vegetables and meat. The second broad category looked at were plastic waste, metal and paper waste made up the third and fourth categories.

3. Results and Discussion Table: ANOVA Statistics Summary

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	55176.65	11	5016.059	5.971877	1.55E-07	1.878388
Within Groups	90714.25	108	839.9468			
Total	145890.9	119				

Variation significant at 0.05 level of significance.

3.1 Waste Generation Capacity and Composition

Waste types in the study area were grouped into four broad categories. These include; plastic, paper, putrecibles and metal materials. From the data generated from the field work and measurements, the most abundant waste types in the rural areas is putrecibles (food waste and organic products). The average per capita putrecible waste generation per household in the study area was 0.98kg. This agrees closely with the result of a similar study done for the whole of Kano Municipal by (Nabegu, 2012), obtaining a total biodegradable waste of 66%. This indicates that composting/biodegradation can be used for the disposal of this 43.0% of the waste and the product can be sold as fertilizer. This was followed by plastic waste comprising of disposed water containers, plastic packaging, polyethene bags, sachet water bags and all forms of plastic materials. This class of waste was generated by the rural households at a mean rate of 0.91kg per day. The mean per capita waste generation of the paper and metal categories were 0.89kg and 0.85kg respectively. When viewed against the backdrop of urban households' per capita waste generation capacity, this presents a frightening picture. These findings are in tandem with the works of Mihai et al., (2014) in rural Romania where the mean per capita waste generation per person per household is 0.04kg per day.

Darban and Hajilo (2017) found that in Iran, much of the weight changes observed in wastes generated by rural households are as a result of changes in socio-cultural and economic factors including cultural traditions. This assertion is true because the rural waste generated in Nigeria will normally be perceived to be in the region of 85-90% organic. But results have shown that even though the bulk of waste generated is still organic, it accounts for less than 50% of the total waste generated by rural households. This changing complexity in the composition of rural waste is surely a concern for policy makers and rural planners in the context of environmental viability and sustainability.

3.2 Waste Sources and Waste Disposal Methods

Waste products in the rural areas emanate from discarded used items such as packing and wrappings for things bought in the market. Other sources of waste include food preparation and processing extracts, such as yam and cassava peels, maize cubs, food wrappings, plantain peels, spoilt food and bones. Milk tins, canned food containers. As shown in Fig.1, the most common method of waste disposal in the rural areas is burying of the waste. The household often excavate a portion of land and simply put their waste materials inside and cover it with soil. This method of waste disposal is adopted by 30% percent of the households. This is followed by dumping of waste products in borrow pits. This method of waste disposal is adopted by 23.3% of the sampled households. Households also dispose of wastes by burning with 20% of households favouring this method. Those that can't burn can be observed to be predominantly disposed of at dumpsites. Non-combustible substances are also buried by a number of households. 'Other' methods of disposal pre-dominate food scrap disposal which they claim also to be fed to animals. This is in line with the findings of Sichaaza (2009), who observed that wastes are disposed of by burying and burning. In terms of which method is best option for waste, Over 50% of the respondents agreed that the methods currently practiced in their own opinion, remains the most ideal for them and consequently the best. These responses were based on the fact that no alternative methods of modern waste disposal options are available to the people in these rural areas in Nigeria, hence to resort to the ways they have been doing it for years. The danger in this approach is the fact the previously, most of the waste generated in rural areas were predominantly organic emanating from farm produce, food and animal waste which could either be burnt or buried and would decay over time. However, the complexity of waste products generated in the rural areas are becoming more dynamic and sophisticated because of the availability of more complex materials finding their way into the daily lives of rural dwellers. It is this awareness that poses great and potent danger that if the waste management concerns are not adequately dealt with immediately, the rural areas in Nigeria will be facing an imminently disastrous occurrence of severe environmental damage resulting from poor waste management practices in these areas.

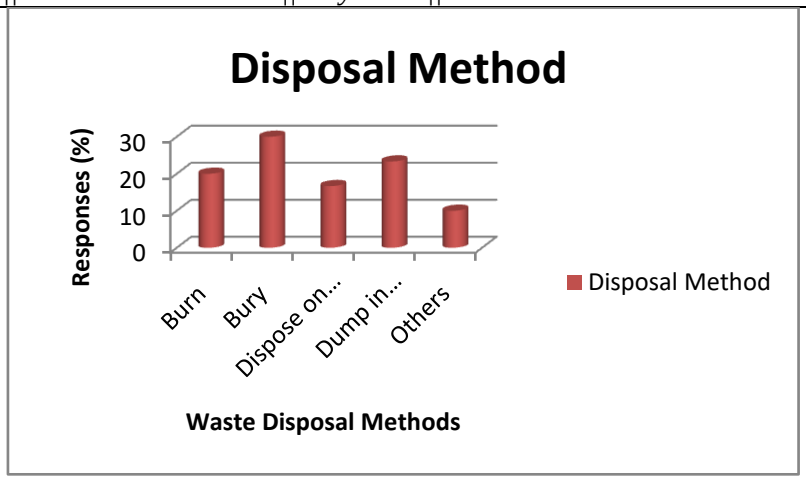

Fig.1: Waste Disposal Methods Adopted in Rural Areas in Nigeria.

3.3 Waste Storage, Segregation and Frequency of Disposal

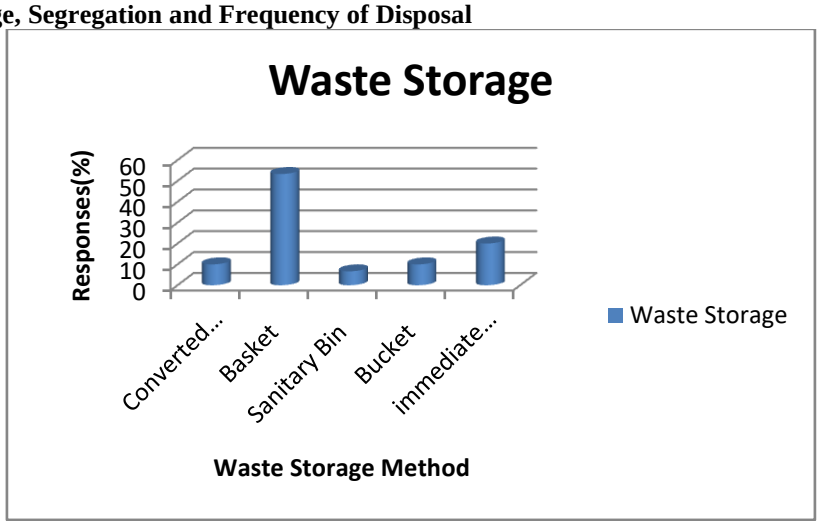

Fig.2: Waste Storage Methods before Ultimate Disposal in the rural areas.

The household adapted varying methods in temporarily storing their waste until they are ready to ultimately dispose of them. The frequency of waste disposal was observed to be a function of household size as larger household with 5 to 7 members disposed of their wastes more frequently compared to households that have less than 4 members. From the field work and questions asked, no household consciously attempts to segregate their waste. This brings to the limelight the poor awareness on the need to segregate waste as the first step in the management of waste generated. This agrees with the findings of Mihai et al., (2014) who found that rural areas have very poor waste management practices.

4. Conclusion

From the results of the study, it is quite clear that the characteristics of the waste types generated in rural areas is changing and becoming more complex in that the expected bulk of waste type (putrecibles) is much smaller than anticipated for a rural area.

Arising from this specific findings, the under listed recommendations are offered;

1. Waste segregation should become an integral part of waste management in the rural areas in view of the changing complexity of rural waste.
2. More rigorous and robust studies on rural waste generation and management strategies need to be explored to further give a clearer picture of what is obtainable in the rural areas.

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