An Integrated Assessment of Waste Materials Generation and Waste Minimization Strategy Appraisal in Ikogosi Township, Nigeria

Opeyemi Aniramu[1], Olusola-Ige Adetoro[1], and Ayobami Salami [2]

[1]*Space Application and Environmental Science Laboratory, Obafemi Awolowo University, Ile-Ife, Nigeria*
[2]*The Technical University, Ibadan, Oyo State, Nigeria*
Corresponding Author: Opeyemi Aniramu

Abstract:-The assessment of waste management in Ikogosi Ekiti was investigated vis-à-vis its current convectional waste practices and its implication on the environmental conditions. Three sampling techniques were employed to select sample population for this study. Purposive sampling method was used to select 200 respondents of the Ikogosi community; accidental and availability sampling method was used to select 50 tourists from the Warm Resort Centre and random sampling method was used to select 20 respondents from the Ekiti State Waste Management Board. In all 264 copies of questionnaire were successfully retrieved from the respondents and were analyzed for the study. The findings of the study established that waste materials were indiscriminately found everywhere in the study area as affirmed by 62.1% respondents; this is attributed to unavailability of waste management tanks (90.5%) in the study area. The study also revealed deplorable toilet facilities (62.1%) indicating the height of waste materials becoming worrisome to the community as affirmed by the respondent (60.3%). Indigenous respondent reported their failure to adopt zero waste management (62.1%) while they equally failed to participate in monthly environment sanitation as stipulated by Local Government Authority. The study concluded that lack of proper waste disposal has prone the Ikogosi inhabitants to live in filthy environment which pose a threat to their well-being and associated health risk factors. The paper therefore recommends that government and community leaders should be actively involved in the management of waste; aimed at achieving clean environment.

Keywords: *W*aste disposal; *E*nvironment; *S*anitation and *L*ocal community.

I. INTRODUCTION

Solid and liquid management system in Nigeria has been under serious watch in which organizations are trying to find a solution to the menace in which wastes material has pose to the serene environment. Solid waste management is a great challenge in Nigeria regardless the size of the mega-cities or village where human race exist (Hammed *et al.,* 2011). The generation and disposal of waste is an intrinsic part of any developing or industrial rose significantly in Nigeria over the past decades (Oguntoyinbo, 2012) As a matter of fact, the management of waste has become a matter of local, national and international concern. This menace of waste materials often times appears to be problematic when the constituted authority failed to provide a last solution to the challenge of proper waste management bringing about a filthy and untidy environment especially in public places (Zakariya, 2006). Unfortunately, Zain (2009) believed that dirty environment is capable of affecting standard of living; lowering aesthetic sensibilities and posing a threat to health conditions of the people and thus the reducing the quality of lives. In a related development, Yusuf and Shuaib (2012) posited that consequence of improper disposal and storage of wastes items had exposed the society to all forms of pollution; especially limiting water resources potentials. Oreyemi (2005) affirmed that increase in population growth has a geometric relationship in the amount of waste generated thereby leading to incineration of refuse (mostly in developing countries); this however, have amplified the rate of air pollution, increasing the volume of green-house gases and incidence of climate change in which Nigeria is not exempted.

Specifically, Ikogosi Ekiti has witnessed a steadily increase in waste generation in-around Warm Spring Centre and the entire community. This observed development was ascribed to the increase tourists' influx to the Resort Centre as well as local population growth owing to the socio-economic benefit of the Resort Centre. In no doubt waste material increase in proportional to human population as Adebayo et al. (2012) affirmed that the ecological footprint of people and their lifestyle is often a reflection of anthropogenic activities in term of luxury, social development and resources exploitation. Human activities on the environment have generated waste in diverse forms with its remarkable implication on the quality of environmental resources (Opara, 2008). Previous studies examine revealed that solid waste generation and compositions due to socio-economic factors have associated ecological effects on the quality under-ground and surface water especially in conventional landfill sites (Zakariya, 2006). In addition, Yusuf and Shuaib (2012) reported that waste material at conventional landfill site often caused foul odours and wind-blown litters around the neighborhood; this is peculiar to settlement in-around the landfill sites (Burnley *et al.,* 2007). Adebayo et al. (2012) opined that quantity of waste generated in places of natural attraction is proportional to the influx of population;

indicating the level spontaneous increase in the level of waste generated by people living in the Tourist area. This level of waste is measured based on the social-economic ability of the people in any locality; hence, individuals' income is a correlate of households' waste generation. It has become imperative to manage waste properly with respect to sustaining quality public health in rural and urban centre in Nigeria (Hammed *et al.,* 2011).

Numerous studies had revealed the accumulated effect of waste on the quality of the air, water and land. The study aimed at assessing the waste management strategy under practice by the indigenes and tourists taken into consideration the waste management strategy being put in place within the Ikogosi environment. Specifically the set out objectives were evaluate the perception of individual on waste management system in the community; awareness about zero waste management plan; appraisal of the waste management practices exhibited by the community; and finally to rate the level of community participation in the monthly environmental sanitation exercise stipulated for general cleaning of their surroundings.

The Study Area: Ikogosi Township

Ikogosi Ekiti is in Ekiti State, South Western, and Nigeria (as shown in Fig. 1). It lies between Latitude $7°35'$ N and $7°34'$ N, Longitude $4°58'$ E and $4°59'$ E and the elevation of Ikogosi ranges from 457.0 - 487.5m above sea level (Olorunfemi and Raheem, 2008). Ikogosi Ekiti, the study area was selected based on her natural warm and cold springs which attract visitors to the tourist center for leisure, vacation, conference and educational research. Ikogosi Ekiti is located in the tropical rainforest and is characterized by a nearly uniform high temperature throughout the year with an annual mean temperature ranging between 21° C and 28°C with high humidity (Ojo *et al.,* 2011; Hairul *et al.,* 2013). The natural vegetation of the area is characterized by emergent forest with canopy layers and vines around the undulating terrain of the rocky region in Ikogosi. Also, Ikogosi Ekiti is a rural center with linear settlement, homogeneity in nature and total population of 3,594 (National Population Commission, 2006).

Local populace engaged in primary occupation like farming, fishing, crafting, among others. Numerous tourists visit the place to enjoy the luxurious warm and cold swimming pool provided for recreational needs; hence create a great chance of generating waste materials in-around the study area. Ikogosi is also the home of the 5-star chalets rooms and Gossy Water Bottling Industry, a subsidiary of United Africa Company, Nigeria. This has transformed Ikogosi to a renowned world class tourist centre with average visitor annually reported to be over a million. This great geometric increment in the number of tourists' visit to the Ikogosi Community has increased the amount of waste material generated in the study area. As ecological footprint of the tourists will multiply the amount of waste materials produced by the local populace; these waste materials are associated to items brought by adventure tourists and indiscriminate littering on the community.

II. MATERIALS AND METHODS

Two sources of data collection were employed to meet the objectives of this study. The first was the collection of data via existing documents and records on environmental sanitation edicts, maps, newspapers, etc. The second source of data collection was through field survey (Questionnaire Administration). This was done by conducting oral interviews augmenting it with questionnaire to the local populace and tourists in the study area. Purposive sampling method was used to select 200 residents of the Ikogosi community who are 15 years and above representing five percentage of the total population. Accidental and availability sampling method was also used to select 50 tourists from the Warm Resort Centre and random sampling method was then employed to select 20 respondents from the staff of Ekiti Sate Waste Management Board. A total of 270 copies of questionnaire were administered but a total of 264 copies of questionnaire were successfully retrieved from the respondents and analyzed was performed. The questionnaire was validated by the experts in the field of waste management techniques before its administration; chi-square statistical test was employed to analyze the data. Data collected through the use of questionnaire include the following variables: Places of waste disposal, availability of bins for storing waste, location of waste collection tanks, risk of improper waste management and monthly environmental sanitation exercise.

2.1 Data Analysis

Data collected for this study was subjected to descriptive statistics based frequency count, percentages and chi-square. The obtained information was graded as follows for statistical analysis in which: Agree = I, Disagree = II, No Idea = III. The formulated hypotheses were tested based on the respondents opinion and were analyzed using chi square to determine the level of significance.

III. RESULTS AND DISCUSSION

3.1 Individual Perception to Solid Waste Materials and Toilet Facilities Condition in Ikogosi

H_O: The Level of household attitude is not responsible for solid waste generation and poor   toilet facilities in Ikogosi Ekiti.

H_1: The Level of household attitude is responsible for solid waste generation and poor toilet   facilities in Ikogosi Ekiti.

Displayed   Equation   1:………………………

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Using chi square to determine the discrepancy between the observed value and the expected value: Mathematically; X^2

cal=Σ / Expected frequency; Therefore, X^2=Σ (O-E) ^{2} / E; $X^2_{0.99}$ = 384.58; 310.50 > table value @0.99

Decision: since X^2cal > $X^2$0.99, the null hypothesis is rejected therefore, we thereby conclude that Ikogosi household awareness and their attitude is responsible for the solid waste generated and the state of their poor toilet facilities in the community.

The finding in Table 1 showed that there is high level of waste material awareness and the problems it can caused their environment as 60.3% of the respondent affirmed to this. The study further revealed that were waste materials and sand debris around commonly found indiscriminately in the Ikogosi as agreed by 62.1% of the respondents. Also the poor state of the toilet facilities if any were in worrisome condition as confirmed by 68.9% of the respondent. This implies that the Ikogosi environment is posed with both solid and liquid waste material as Wilson et al. (2009) believed that waste is an inevitable material in our ambient environment.

However, Ikogosi is becoming famous and attractive hence, waste generation cannot be avoided. On this note, the condition of waste material littering the ambient surrounding is capable of indicting the serenity of the tourist centre and the whole community. This agrees with Atsegbua (2003) that domestic and construction waste management in Nigeria does appeal to be problem of absence legislative framework. Adebayo et al. (2012) cited that ecological problems associated with the waterway blockage are capable of damaging lives and properties if sensible solution is not proffer. Unfortunately, the study revealed that majority of the household in Ikogosi lack proper toilet facilities; this implies that indigenes have resolved to passing faece and other human excreta into waterbody and nearby bush around their household as Olanrewaju and Ilemobade (2009) suggested that sanitary facilities pave way for collection and disposal of human waste which is proper handled and disposed.

3.2 Appraisal of Waste Management Techniques under Practice in Ikogosi Ekiti

H_O: Level of household perception is not responsible for poor waste management practices in Ikogosi Ekiti

$H_{1:}$ Level of Household perception is responsible for the poor waste management practices in Ikogosi Ekiti.

Decision: since X^2cal > X^2 0.99, the null hypothesis is rejected; therefore, we thereby conclude that household attitude is responsible for low level of waste management practices adopted in Ikogosi community including the Tourists within the Ikogosi Warm Spring Resort Centre (IKWSRC).

Results shown in Table 2 revealed that the level of waste management strategy been adopted by individual household in Ikogosi. The study revealed that zero waste management techniques been practiced by Ikogosi community is low as 62.1% of the total respondent attested to it. Although the indigenes are partially informed of the zero waste

management like reuse, reduce and recycle; their level of adoption is dependent on certain factors like socio-economic and awareness level exhibited by the community populace. The study further considered the availability of waste collection tanks with the entire community; 90.5% of the respondent reported low level of waste containers within the Ikogosi community therefore is it easy to easily found waste material indiscriminately littering the land surface of the entire community. By implication, collection and proper disposal of waste were poorly coordinated therefore waste constitutes an eyesore to the whole community. On this note, Opara (2009) reported that seepage from refuse dumps often pollutes the underground water and surface water.

Similarly, Daramola (2012) opined that access to basic environmental amenities is decreasing in the urban centre while it is totally not available in rural areas. Absence of good waste management in Ikogosi community has availed the people to live with cockroaches, rats, mosquitoes-infected and filthy environment. The traditional landfill pollutes the air, breeding ground for pathogen to survive thus outbreak of disease is inevitable as noted by UNEP (2005); Adedibu (2008) that waste material which include garbage, construction debris, commercial refuse, and sludge from water pollution pose a threat to human and aquatic creatures. This barbaric attitude from the Ikogosi population is attributed to limited level of awareness on proper waste management techniques (Hasan *et al.,* 2009). Therefore suggesting the need to enlighten the people on better ways of collecting and dispose waste generated within the household including the IKWSRC.

3.3 Ikogosi Community Responses to Monthly Environmental Sanitation Exercise

H_O: There is no significant relationship between monthly sanitation exercise and maintaining a clean environment

H_1: There is a significant relationship between monthly sanitation exercise and maintaining a clean environment

Decision: since X^2cal > $X^2$0.99, the null hypothesis is rejected therefore, we thereby conclude that observing monthly environmental sanitation is a factor to clean and neat environment.

The results revealed that the level of sanitation involvement by indigenous respondents is low (32.2%) while they also affirmed that government compliance is responsible for their participation in maintaining a clean environment (see Table 3). Environmental sanitation needs the participation of local community, it should be noted that majority of the residence in Ikogosi failed to adhere to monthly sanitation exercise. This is attributed to early rise to farm and return late in the evening when the exercise would have been over. Such negligence attitude toward environmental sanitation is tantamount to causing detrimental effect on the environment (Armijo *et al.,* 2008). This is connected to Hammed et al. (2011) that community populaces are not aware of good waste management practices perhaps because of their non-chalant

attitude towards waste management techniques. Hence, it has become imperative to create an avenue for public education, community and individual involvement, regulation and legislation toward sanitation compliance (Smyth *et al.,* 2010).

The level of awareness will therefore encourage individuals in embracing zero waste management strategy as advocated by environmentalists minded scholars (Adedibu, 2008); (Wilson *et al.,* 2009). Ekiti State Government should also make available waste management tanks both in cities and villages within the state in order to properly manage their waste because a clean environment means good health. This provision according to Oreyemi (2005) will help to prevent the malaise of environmental pollution and immensely reduce enormous solid waste generated within the entire community.

IV. CONCLUSION AND RECOMMENDATION

This paper concludes that waste materials were more pronounced in Ikogosi with the method of waste management technique reported to be inadequate. In addition, waste disposal method practiced by the Ikogosi community has been conventional open dumpsites and this is done without any regard water and air pollution. Consequentially, this has posed a great implication on the surface and underground water quality in the community. Beside it has also created a lot of respiration disturbance and affected the nature of organism in their ecosystem. It has become imperative for the individuals and government imbibe good practices of waste management and device more improved techniques for solid waste minimization; hence. There is need for strict compliance to stipulated monthly environmental exercise to lessen the ecological effects of waste materials on the quality of human life and environmental resources

The study recommends that all stakeholders to be involved in the process of maintaining a cleaning environment; community leaders should be given additional roles to play in ensuring environmental sanitation and cleanliness. Likewise, individual household and shop owners are enjoined to have a proper waste bin for proper collection of waste on a daily basis. Also, the public should be educated on solid waste management and its related issues. Strict enforcement should be ensured on community participation in the monthly environmental sanitation with penalties for all forms of violation should be taken with no partiality. The byelaws on sanitation should be structured in a way that every landlord is required to monitor and ensure that their house/houses are clean.

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Table 1: Individual Perception to Solid Waste Materials and Toilet Facilities Condition in Ikogosi

Variables	Agree (%)	Disagree (%)	No Idea (%)	Cal-Value	Tab-value
Waste material is problematic	159(**60.3**)	87(**32.9**)	18(6.8)	310.62	20.08
Solid waste and sand debris	164(**62.1**)	92(**34.8**)	08(**3.0**)	314.58	20.08
Poor state of toilet facilities	182(**68.9**)	68(**25.7**)	14(**5.3**)	384.50	20.08

Note: Figures in parentheses are row percentages

Table 2: Appraisal of waste management techniques under practice in Ikogosi Ekiti

Variables	Low (%)	Moderate (%)	High (%)	Cal-Value	Tab-value
Adoption of Zero Waste management (3Rs)	173(**62.1**)	87(**36.4**)	14(**1.5**)	35.32	13.82
Availability of Waste tanks in Ikogosi	239(**90.5**)	22(**8.3**)	03(**1.1**)	264.0	13.82
Usage of Waste container within IKWSRC	11(**4.2**)	236(**89.4**)	17(**6.4**)	45.29	13.82

Note: Figures in parentheses are row percentages

Table 3: Ikogosi Community Response to Monthly Environmental Sanitation Exercise

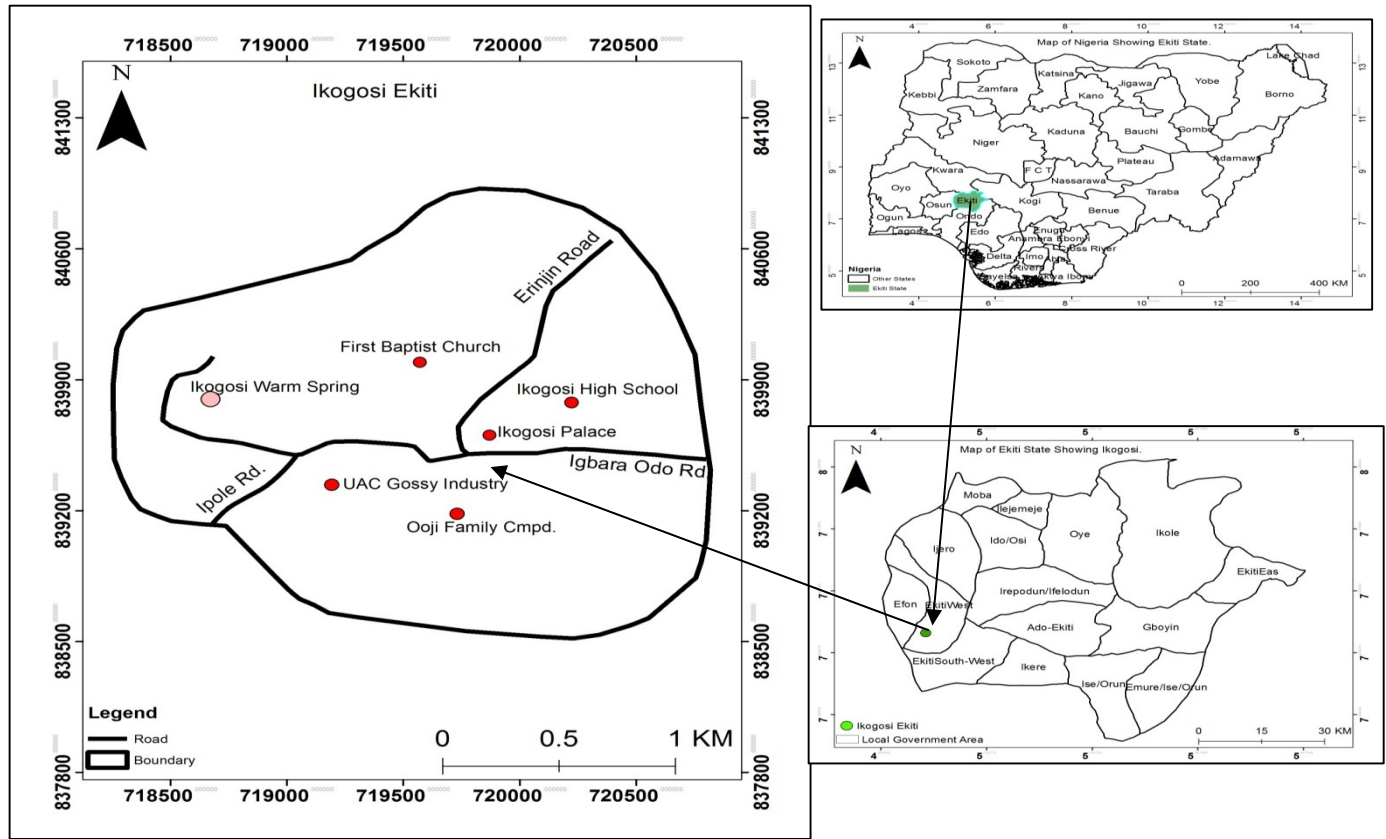| Variables	Low (%)	Moderate (%)	High (%)	Cal-Value	Tab-value
Level of sanitation exercise involvement	85(**32.2**)	141(**53.4**)	38(**14.4**)	88.76	13.82
Individual compliance to sanitation exercise	85(**32.2**)	163(**61.7**)	16(**6.1**)	116.37	13.82

Note: Figures in parentheses are row percentages

Figure 1. Ikogosi Ekiti, Ekiti State, Nigeria