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Full Length Research

Environmental impacts of indiscriminate dumping of solid waste disposal in Wukari Local Government Area, Taraba State, Nigeria

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ABSTRACTS: The environmental impact of the indiscriminate dumping of solid waste is a huge environmental problem that needs to be addressed. This study aims to assess the environmental impacts of indiscriminate dumping of solid waste in Wukari Local Government Area, Taraba State, Nigeria. The sample size of this study consisted of 400 household heads in Wukari who were sampled for the study. The data collection was sequential using field observation, interviews and questionnaires. The data obtained was analysed (using descriptive statistics with the aid of Statistical Package for Social Sciences (SPSS) version 25.0). The result shows the composition of waste materials, which reveals the total percentage of waste materials in the entire ward. Polythene had a total of 22.5%, followed by Agricultural/food remains waste with 21.3%, cartons/ papers waste 20.5%, clothing/shoes waste constituted 19.8% and the least was plastic/cans/bottle waste, constituting 16.0% respectively. The common waste item observed was polythene, 33.4% which constitutes the largest component of solid waste generated by the residents; this was followed by carton/paper and clothes, 27.3%, Crop residue/food remnant, 18.0%. The Shoes, tins/cans waste was only 5.4% while plastic was 15.9% of the total waste generated. The survey revealed that 43.1% of the households, which constitute the majority, dumped their waste in open space. The study recommended that residents should contribute to environmental cleanliness by adopting an attitudinal change from indiscriminate refuse dumping along the street and the median strip of the highways.

Keywords: Environment, impacts, indiscriminate, disposal and waste.

INTRODUCTION

Issues of waste management are on the increase. This has attracted the attention of scholars in developed and developing countries in recent times (Guerrero *et al,* 2013). However, while waste generation in the developed world is properly managed with effective implementation of consistent waste policies, waste generation in developing countries of the global south, especially Nigeria, is not properly managed due to a lack of effective implementation of consistent waste policies (Di Maria *et al,.*2015). This has made solid waste management the most pressing environmental challenge faced in Nigerian cities. Nigeria, among other developing countries, is witnessing an unprecedented growth in urban centres (Butu and Mshelia, 2014). The rate of this growth is one of the highest on the planet, exceeding 6.5% per annum. This growth rate has a series of implications on every aspect of people's socioeconomic and cultural lifestyle. Among these implications are pressure on urban amenities, poor housing conditions, unemployment, crime and violence, traffic congestion, and environmental problems. One of the most relentless ecological issues in most urban centres, especially in Nigerian urban centres, is municipal solid waste management. The evidence of this is the piles of uncollected waste indiscriminately disposed of on vacant plots, open spaces, and in channels (Kayode and Omole, 2011). These open waste collection points create

significant environmental problems, for example, contamination of water resources, production of methane due to decomposition of organic waste, which contributes to global warming and generation of solid leachates because of the organic procedure, which pollutes groundwater resources.

Urban waste generation in Nigeria was reported to be in the range of 14,000 to 255,556 tons per month in Lagos, the commercial hub in the country, generating the highest, followed by Kano (Ogwueleka, 2009). Population growth, increasing urbanisation, changes in consumption patterns, and rapid developments in technology have all contributed to an increase in demand for goods and services, which has led to the introduction of different products to meet consumer needs and demand (Odum and Odum, 2006). These factors, together with a lack of effective recycling activities, resulted in an increase in both the quantity and the variety of solid wastes generated and disposed of as waste. The management of solid waste is as important as people's perception and willingness to participate in best waste management practices (Adekunle *et al.,* 2012).

Municipal solid waste management (MSWM) encompasses activities in which materials are identified as either being of value or being thrown away or gathered together for disposal. This involves management at the waste generation level, storage at the source of generation, primary collection, street cleansing, temporary storage at the locality level, regular and periodic transport-tation of this temporarily collected waste to disposal sites and treatment plants. (Guerrero, *et al.,* 2013).

Waste generation in the developed world is properly managed with effective implementation of consistent waste policies, waste generation in developing countries of the global, especially Nigeria, is not properly managed due to a lack of effective implementation of consistent waste policies (Di Maria *et al.,* 2015; Olukanni and Nwafor, 2019). This has made solid waste management the most pressing environmental challenge faced in Nigerian cities. Nigeria, among other developing countries, is witnessing an unprecedented growth in urban centres (Butu and Mshelia, 2014).

One of the most relentless ecological issues in most urban centres, especially in Nigerian urban centres, is municipal solid waste management. The evidence of this is the piles of uncollected waste indiscriminately disposed of on vacant plots, open spaces, and in channels (Kayode and Omole, 2011). These open waste collection points create significant environmental problems, for example, contamination of water resources, production of methane due to decomposition of organic waste, which contributes to global warming and generation of leachates, which pollute groundwater quality (Anomanyo, 2004). Notwithstanding, this could be attributed to the low capacity of Local Governments and Municipal Authorities to deal with the expansion in solid waste generation resulting from population growth, urbanisation, and industrialisation. These processes have placed so much demand and have created major environmental and public health problems in urban areas (Turan, 2016).

According to Mansoor *et al.* (2019), "proper solid waste disposal is an important component of environmental sanitation and sustainability." A sustainable environment and improved waste management offer opportunities for income generation, health improvements and reduced vulnerability. This could hardly be attained in some of the developing countries, most especially in Nigeria, because of non-readiness, uncoordinated and laissez-faire attitude toward better ways of solid waste disposal methods in spite of their high rate of urbanisation and growth in commercial and industrial activities (Asuquo *et al.,* 2012). The situation of solid waste disposal methods in some of the Nigerian cities leaves more to be desired as garbage of waste litter all the nooks and crannies of the towns and cities.

Even though laws and regulations were formulated and presented in the past, there has not been any functional infrastructure for their implementation. However, the regulations set for operations were unsuccessful because of the absence of effective sanctions, coupled with economic considerations that are a deficit of knowledge of interdependent linkages among various processes involved in both human and environmental resources to mitigate the myriad of waste management challenges (Olukanni and Akinyinka, 2012). Suitable policy and organised mechanisms for execution are vital for sustaining a sound waste management system. Where the policy is weak, or there is no legitimate implementation of laws and controls or the general society is not appropriately enlightened, waste management becomes a critical challenge. Given the circumstances depicted above in numerous urban territories, diverse Nigerian urban areas have been portrayed as filthy and unsanitary (Mabogunje, 2014). Solid waste disposal method remained a serious environmental and public health-associated risk in the Southern Senatorial District of Taraba State, Nigeria (John and Shimfe, 2025). It is, therefore, apparent that solid waste management remains a significant issue that requires urgent attention in Nigeria.

Therefore, this study serves as an eye-opener to the households and entire local community leaders, that indiscriminate dumping of solid waste disposal is a serious environmental problem which need to be addressed through a proper waste disposal mechanism. All households should take it upon themselves as a duty to participate in environmental cleaning in Wukari Local Government Area, Taraba State, Nigeria.

MATERIALS AND METHODS

Description of study area

The study area was the Wukari Local Government Area of Taraba State, Nigeria. Its headquarters are in Wukari on

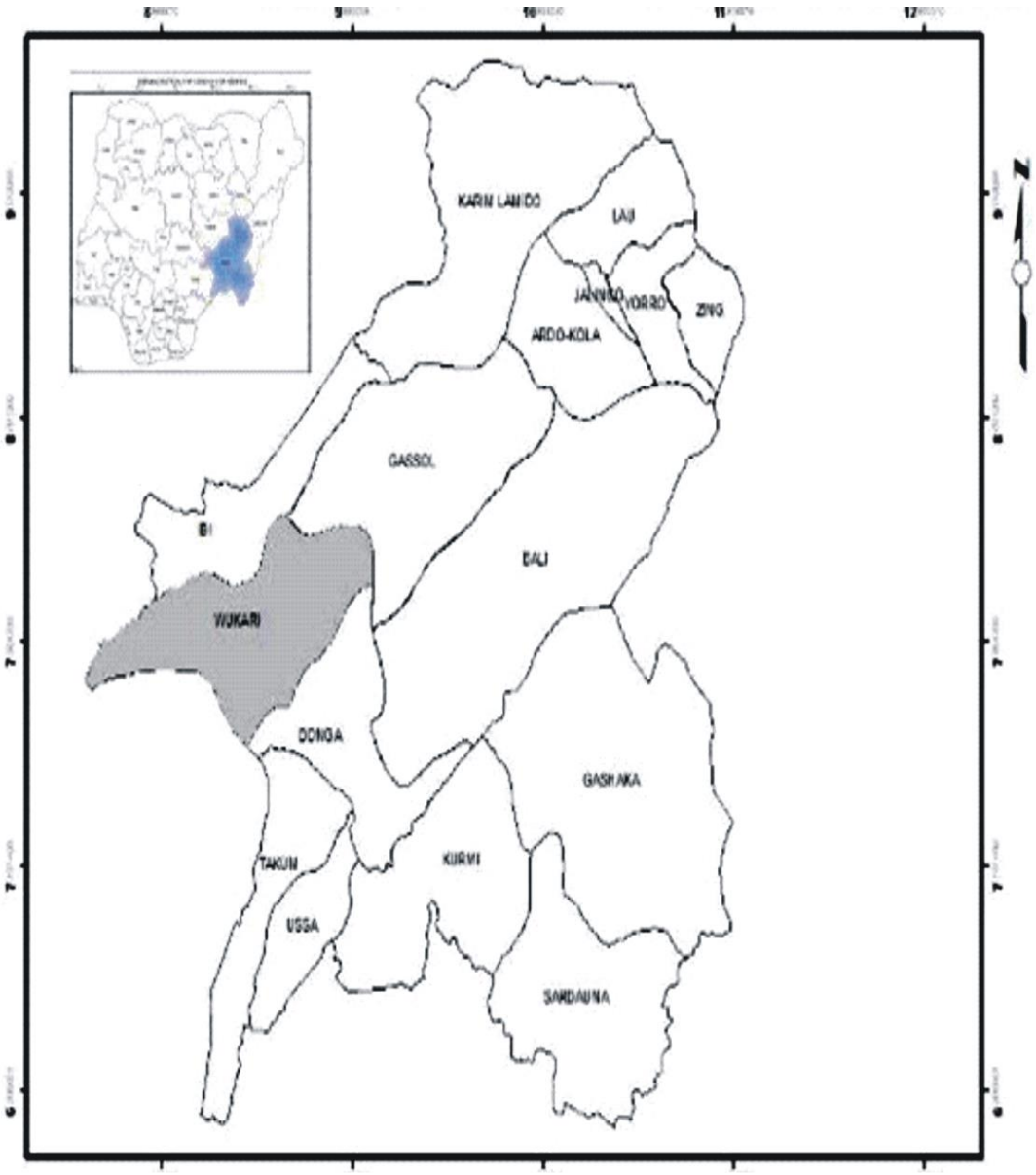

Figure 1. Map of Taraba State showing Wukari Local Government (Source: Google).

the A-4 highway. It is located on latitude 7°51'N to 7°52'00''N and longitude 9°45'00''E to 9^{0}47'00''N. It covers an area of about 4308 km^2. Wukari Local Government has a total Population based on the 2006 National Population Census of 241,546. Wukari Local Government is a Jukun land, and they are an ethno-linguistic group or ethnic nation in West Africa. The Jukun are traditionally located in Taraba, Benue, Nasarawa, Plateau, Adamawa, and Gombe States in Nigeria and parts of North-western Cameroon. They are descendants of the people of Kwararafa. Most of the tribes in the North Central of Nigeria trace their origin to the Jukun people and are related in one way or the other to the Jukuns. Until the coming of both Christianity and Islam, the Jukun people were followers of their Traditional Religions. Most of the tribes, Alago, Agatu, Rendere, Goemai in Shendam, and others left Kwararafa when it disintegrated as a result of a power tussle. The Jukuns are divided into two major groups: the Jukun Wanu and Jukun Wapa. The Jukun Wanu are fishermen residing along the banks of the river Benue and Niger where they run through Taraba State, Benue State and Nasarawa State. Figure 1 shows the map of Nigeria at the top left-hand corner, indicating the map of Taraba State, then the map of Taraba State, indicating the map of Wukari (the larger one). Figure 2 shows the map of the Wukari Local Government Area, indicating the study area. This is the location where the sample collection and studies took place (Blench 2012).

Figure 2. Map of Wukari Local Government showing the study area (GIS LAB MAU).

Research design

The survey research designs used are field observations, interviews and questionnaires to gather data from residents, waste generators, and local authorities. Field observations, site visits to observe dumping practices and environmental conditions were also carried out.

Sampling techniques

The sampling technique used in this study was a random sampling method.

Data collection

Data was obtained primarily through field observations, interviews and administering a questionnaire to the waste generators. The data collected from households based on the following variables: In what type of waste container do you collect the waste, and the frequency of waste disposal? Place of disposal, method of disposal, and why do you prefer this method of disposal?

Sample size determination

The total population of Puje is 24059, Avyi 14534, Hospital 22826, Chunku 11581 and Rafinkada 19933 wards in Wukari was 92933 according to the 2006 National Population Census. To obtain the sample size, the study adopted Burley's sample size determination, using this formula.

$S = \frac{N}{(1+N)e^2}$ (Meeta, 2015).

Where: S = sample size, N = population, e = margin of error assumed (0.05% with 95% confidence level), and 1= the theoretical constant.

$$S = \frac{N}{(1+N)e^2}$$

$$S = \frac{92933}{(1+92933)0.05^2}$$

$$S = \frac{92933}{232.335}$$

$$S = 399.94$$

This, however, scaled to 400. Therefore, a total of 400 respondents in Wukari were sampled for the study.

Methods of data analysis

The data obtained was analysed using descriptive statistics with the aid of the Statistical Package for Social Sciences (SPSS) version 25.0. The statistical analysis was used to determine the frequency distribution, percentage ratio and mean. The result was presented in tables to facilitate a better understanding of the study.

Ethical consideration

An introductory letter was obtained from the Department of Zoology, Modibbo Adama University, Yola, in order to secure ethical permission from the Department of Environment, Wukari Local Government Area. Before administering the questionnaire, sensitisation was made to explain the aim of this study to the people. Thereafter, verbal consent of all individual/respondents was obtained.

RESULTS AND DISCUSSION

The composition of waste materials in Wukari Local Government Area, showed the types of waste identified in the study area were food remains, clothe/shoes, polythene waste, paper/cartons, plastics, batteries, plastic bottles, cans, wood, textiles, fruits and decayed yam seedlings, and this waste consisted of both biodegradable and non-biodegradable materials (Tables 1 and 2). Chunku ward had the highest composition of agricultural/food remnant waste, 27.5%. The reason is that Chunku ward is located at the border between Wukari and Benue, where most of the residents had relocated because of the crisis, leaving few people who are mostly farmers. Puje ward had 26.3% of polythene waste. Puje is located at the centre of Wukari town with a new market situated, which leads to a high generation of waste. Avyi ward had a high composition of plastics/cans/bottle waste (25.0%). This finding is in agreement with Ogungbade *et al*. (2020), who worked on the assessment of municipal solid waste management practices. Information on the nature and composition of urban solid waste in the study area showed that a greater part of the respondents (37.8%) created squander from vegetable and food remains. This was trailed by 28.3% of the respondents who produced polythene bags. Other waste generated included plastic, paper and metal waste. It could be deduced that vegetable and nourishment remain were the most widely recognised waste produced by the respondents in the study area. This study is consistence with the work of Zarma (2017), which stated that the predominant type of solid waste generated in Jimeta is polythene bags, commonly called “Leather bags”, a commonly used household material.

Furthermore, Oladepo *et al.* (2015) noted that all types of food waste, raw materials waste, rated highest in Nigeria. The composition of waste materials in terms of physical characteristics will give a clear idea of the consumption pattern and waste disposal in an area. It is also important for the reduction, reuse and recycling of waste. Higher income and economic growth will also affect the composition of waste. Whether individuals consume more packaged products, which results in a percentage of inorganic materials – metals, plastics, glass and textiles, etc., in the waste stream. Large waste with a higher content of inorganic materials could have a significant impact on human health and the environment.

As shown in Table 3, the study revealed that the majority of the respondents used old buckets/drums (52.2%) as the most common waste container for their disposal in the study area. While 25.0% of the respondents used plastic bags as a means of disposal, the remaining 22.8% used cartons as a means of disposal. This finding agrees with the finding of Buba (2013). The survey revealed that the majority of the households, representing 40% made use of open ground; 25% used polythene bags; 13% used baskets; 10% used drums, while 8% and 4% made use of cartons and sacks, respectively. The majority of the respondents practice surface dumping (43.1%). Surface dumping is the term used to describe all forms of dumping on the soil surface, which include gutters, roadside, nearest bush or simply anywhere outside one's house. This attitude could explain why there are heaps of waste on every corner in the environment (Buba, 2016). Disposal of household solid waste is one of the functional elements in the management of waste. The survey revealed that about 39% of the household heads, which constitutes a majority, dumped their waste in open space, 27% dispose of their waste in nearby drainage and vacant plots. Though some respondents in the study area indicated that surface waste disposal is a means of landfills in order to reduce the rate of erosion around their surroundings, since there is no drainage that can reduce such environmental problems.

Another waste disposal method is burning (Table 3). This is an act of setting fire to the waste to burn (incineration). This type of burning is endorsed by 29.6% of the study population. Incineration is the process of burning waste in a controlled manner. According to USAEPA (2018), the US incinerates approximately 10% or approximately 30 million metric tons per year of the municipal solid waste (MSW) stream. Incinerators drastically reduce the volume of MSW by 90% and the weight of MSW by 70%. Thus, incinerators are designed to utilise the generated heat to create electricity. Also, the Volume of refuse to be eventually sent to a landfill by 95% has been reduced. The attitude of surface dumping of waste and burning is a clear indication of indiscriminate waste disposal in the study area may be due to a lack of policy and regulation on waste disposal/management at

Table 1. Composition of waste materials in relation to wards of Wukari L.G.A, Taraba State.

Wards	No. of Responds	Agric/food No. (%)	Clothing /shoes No. (%)	Plastic/cans/ bottle No. (%)	Polythene No. (%)	Carton/paper No. (%)
Puje Ward	80	16(20.0)	16(20.0)	10(12.5)	21(26.3)	17(21.3)
Avyi Ward	80	10(12.5)	19(23.8)	20(25.0)	18(22.5)	13(16.3)
Rafinkada Ward	80	21(26.3)	14(17.5)	11(13.8)	16(20.0)	18(22.5)
Hospital Ward	80	16(20.0)	18(22.5)	12(15.0)	17(21.3)	17(21.3)
Chunku Ward	80	22(27.5)	12(15.0)	11(13.8)	18(22.5)	16(20.3)
Total	400	85 (21.3)	79 (19.8)	64 (16.0)	90 (22.5)	82(20.5)

Source: field survey, 2022

Table 2. Types of solid waste generated from households in Wukari L.G.A, Taraba State.

Variable	Frequency	Percent
Polythene waste	308	33.4
Can/tins, bottles	50	5.4
Agricultural/food remains	166	18.0
clothing/carton /paper waste	252	27.3
Plastic waste	147	15.9
Total	923	100.0

Table 3. Respondent types of waste collection containers, method of waste disposal and frequency of waste disposal in Wukari L.G.A, Taraba State.

Variable	Frequency	Percent
Type of waste collection container		
Carton	147	22.8
Old bucket/drum	337	52.2
Plastic bags	161	25.0
Total	645	100.0
Method of waste disposal		
Burning	145	29.6
Burying	134	27.3
Dumping	211	43.1
Total	490	100.0
Frequency of waste disposal		
Once a day	214	53.5
Once a week	186	46.5
Total	400	100.0

the Local Government level. This is similar to the findings of Kaoje *et al*. (2015), who reported that waste disposal methods showed that 49% of the respondents preferred to burn their combustible waste, while 35.7% used open dumping. This method was also observed by Al-Salem *et al*. (2009) to have a negative effect on the environment.

Most (53.5%) of the respondents in the study area disposed of their waste once a day (Table 3). According to the findings, this is to avoid the accumulation of waste that is littering the houses and the surroundings. 45.5% of the respondents disposed of their waste once a week after it had attained a certain level for evacuation to the dump site before burning or setting it on fire. Weekly disposal of waste could have a negative effect on the environment as it creates unsightly environment, environmental nuisance, stinky environment, storm or runoff may scatter the waste,

Table 4. Respondents' responses to waste disposal method and problems that exist over waste management in the neighbourhood in Wukari L.G.A, Taraba State.

Variable	Frequency	Percent
Do you think the waste disposal method is a problem in your neighbourhood?		
No	64	16.0
Yes	336	84.0
Total	400	100.0
What problems exist in your area regarding waste management		
Environmental Pollution	282	29.9
Odour	337	35.7
Mosquitos	163	17.3
Causes diseases	161	17.1
Total	943	100.0

Table 5. Respondents' perspective on the indiscriminate dumping of solid waste disposal impacts on the environment in Wukari L.G.A, Taraba State.

Variable	Frequency	Percent
Indiscriminate dumping of solid waste causes a negative environmental impact		
Agree	70	17.5
Strongly Agree	330	82.5
Total	400	100.0
Indiscriminate dumping of solid waste is a nuisance to the environment.		
Agree	91	22.8
Strongly Agree	309	77.3
Total	400	100.0
Indiscriminate dumping of solid waste pollutes the environment		
Agree	96	24.0
Strongly Agree	252	63.0
Undecided	32	8.0
Disagree	20	5.0
Total	400	100.0

littering the entire landscape before the collection time, forms conducive habitats for rodents, reptiles (lizards) and insects (flies, cockroaches, mosquitoes) as well as breeding of micro-organisms.

The responses to waste disposal method and problem that exist as for waste management in neighbourhood revealed that 84.0% of the respondents indicated YES, waste disposal method was a problem to their neighbourhood, while 16.0% of the respondents said NO, waste disposal method was not a problem to their neighbourhood (Table 4). 35.7% of respondents indicated that most of the problems that exist in their neighbourhood, as for waste management, were odours from the dumped sites, which created an un-conducive environment for them; 29.9% of the respondents reported environmental pollution, 17.3% said it increased breeding of mosquitoes in the study area, while 17.1% indicated one of the major problems that exist in their neighbourhood, as for waste management, that it caused diseases. Based on these facts, indiscriminate dumping of solid waste in the study area is a serious problem, as it creates environmental pollution.

The results presented in Table 5 show a higher percentage of the respondents (82.5%) strongly agree that indiscriminate dumping of solid waste causes negative environmental impacts in the study area. 77.3% of the total

Table 5. Contd.

Variable	Frequency	Percent
Indiscriminate dumping of solid waste blocks drainage, which can lead to floods in the environment.		
Agree	81	20.3
Strongly agree	290	72.5
Undecided	17	4.3
Disagree	12	3.0
Total	400	100.0
Do you think most environmental and health-related issues in Wukari LGA could be minimised if solid waste is managed properly?		
Agree	106	26.5
Strongly Agree	294	73.5
Total	400	100.0

population strongly agree that indiscriminate dumping of solid waste is a nuisance to the environment, it litters the surroundings and makes it look physically offensive, and 63.0% of the respondents strongly agree that indiscriminate dumping of solid waste pollutes the environment. 72.5% of the respondents strongly agree that indiscriminate dumping of solid waste blocks drainage, which can lead to floods in the environment. According to the findings, waste such as plastic battles, polythene bags, table water sachet, rags block drainages from free flow of water which lead to the flooding and also in most cases produces polluted stagnant water while 4.3% of the respondents showed undecided that they were not sure indiscriminate dumping of solid waste disposal blocked drainages which can lead to flooding in the environment. Based on this study, the higher percentage of respondents showed that indiscriminate dumping of solid waste is a big problem for the environment in the study area (Oluwaleye, 2012). Improper disposal of waste has various environmental impacts and it can cause huge problems to humans, animals, plants and the society at large. Therefore, household waste and other streams of waste have to be removed from the surroundings in order to avoid rubbish and pollution that can pose risks to public health. On the contrary, effective management of waste disposal can contribute to socio-economic development and a healthy environment for living things in general.

Conclusion

The findings of this study revealed that the majority of the household waste disposal practices were found to be unsatisfactory, as most of the respondents disposed of their household waste in a manner best described as “just throw away outside the house”. The key factor affecting waste management practice in the study area was ignorance of the health and environmental impact of indiscriminate dumping of solid waste, and also a lack of designated waste disposal mechanisms or regulations. Hence, contributing to poor waste management practice. This study will serve as an eye-opener to most of the residents using open dumping and burning as a method of waste disposal. Some undeveloped land had been taken over by a refuse dump, as this pollutes the air within the local environment, while this also gives the environment an unpleasant look.

Recommendations

The study recommends that public awareness campaigns be conducted on the dangers of indiscriminate waste dumping and that laws on waste disposal be enacted and enforced. Residents should adopt proper waste sorting at home and change their attitudes toward refuse disposal. Additionally, environmental sanitation awareness campaigns through local government and environmental departments should educate the public on environmental management, hazards, and sustainable development.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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