Socio-Economic Effects of Open Waste Dumpsite on Residents of Selected Communities in Rivers State, Nigeria

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Abstract:- Poor waste disposal practices are associated with enormous impacts. This research examined such impacts usingAluu open waste dumpsite in Rivers Stateas a case study. The essence is to obtain the socio-economic characteristics of residents close to the dumpsite. The research used Mixed Method Research approach and the cross-sectional survey research design. Purposive and simple random sampling techniques were adopted. The data wereanalysed using Univariate techniques. Findings indicates that some of the impacts of open waste dumpsite on residence living around include bad smell, unhealthy environment (breeding ground for disease vectors).Further analysis revealed that the location of waste dumpsites in the study area do not conform to any planning standards. There is need to discourage the use of burrow Pits as dump sites. Construction of engineered sanitary landfill is recommended to avert the negative consequences of open waste dump sites on both residents and property value in the study area.

Keywords:- Municipal Solid Waste, Open Dumpsite, Socio-Economic, Residents, Rivers State.

I. INTRODUCTION

Globally, cities are experiencing rapid urbanization with attendant consequences. The level of such urbanization in developing countries is becoming more hazardous. Among the hazards posed by urbanization is the difficulties in efficiently managing Municipal Solid Waste (MSW).In fact, the governments have huge problems of meeting the increasing demand for proper and healthy municipal services.

For a vigorous municipal service, the importance of waste collection, transfer and disposal cannot be overemphasized. Several techniques have been adopted in waste disposal such as incineration, composition/composting, transfer station, and landfilling, some of which have failed and are ineffective (Gobo, 2002). The regulated landfilling technique has proven to be more effective waste management, coupled with adequate waste collection networks and the triple R's of waste production (reuse, reduce and recycle). Currently in Nigeria, landfill only provides temporary solutions to waste disposal, when compared to waste management services at the global level;

this method of disposal is old and obsolete. Furedy (1992), observed that solid waste planning in developing countries does not focus on the concept of "resource recognition", i.e. treating waste as an unused resource. Effective management of municipal waste is required, but local authorities in many countries are constrained by limited finances and inadequate services. Wastes usually end up as illegal dumps on streets, open spaces and waste land.

The government-approved site or illegally created dumpsites are poorly managed, becoming a ready-made source of pollution with a great negative outcome on human health and the environment at large (Adewusi & Onifade, 2006). Physical planning aims at providing the right spaces for the right activity in a sustainable manner.Siting facility such as landfill away from densely populated area help in decreasing the likely impacts landfill has on the residents and environment. Landfills are generally considered nuisances since it involves activities like moving trucks to dump, filling, spraying wastes, and so on. It is accompanied by an offensive odour and a lot of noise, as a result of the operation of heavy equipment.

What are the residence's perception of landfill activities on the environment?Unravelling the situation in our research area requires curious inquiry, hence the study considers the socio-economic effect of open waste dump sites on residents.

II. STUDY AREA

Aluu is a settlement in Ikwerre local government area of Rivers State, Nigeria. Port-Harcourt was created by the British colonial administration of Nigeria between 1912 and 1914. It is located within Latitudes 4°44' 58.8" N and 4° 56' 4.6" N and Longitudes 6°52' 7.2" E and 7°7' 37.7" E (Wachukwu, Obinna, & Weje, 2020). Port Harcourt has experience Urban expansion that cut across eight local government areas of Rivers state including Ikwerre and Obio/Akpor. Geographically, the research area covers communities located within 3km of Aluu open dumpsite. These communities compriseof five settlements namely: Rumuosi, Rumuagholu, Rukpoku, Rumuekini in Obio/Akpor Local Government Area and MbodoAluu in Ikwerre Local Government Area.

Port Harcourt falls almost entirely within the lowland rain forest ecological zone and is flanked in the east, west and southern limits by mangrove swamp forest. The climate of Port Harcourtis under the influence of both the South-West and North-East winds. It belongs to the tropical climate zone which is characterized by high temperature and precipitation throughout the year. The area is marked by two distinct seasons- the wet and the dry seasons- with 70% of the annual rains falling between April and August, while 22% is spread over the three months of September to November.

The relief of the study area is a low-lying plain with the tidal disparity that influences the several rivers, creeks, and swamps with the Atlantic Ocean serving as a sole drainage system. The land surface slope is gentle (30m to 50m) in the average NW-SE direction. Topography is of low-lying planes, less than 20m sea levels (Wizor&Mpigi, 2020).
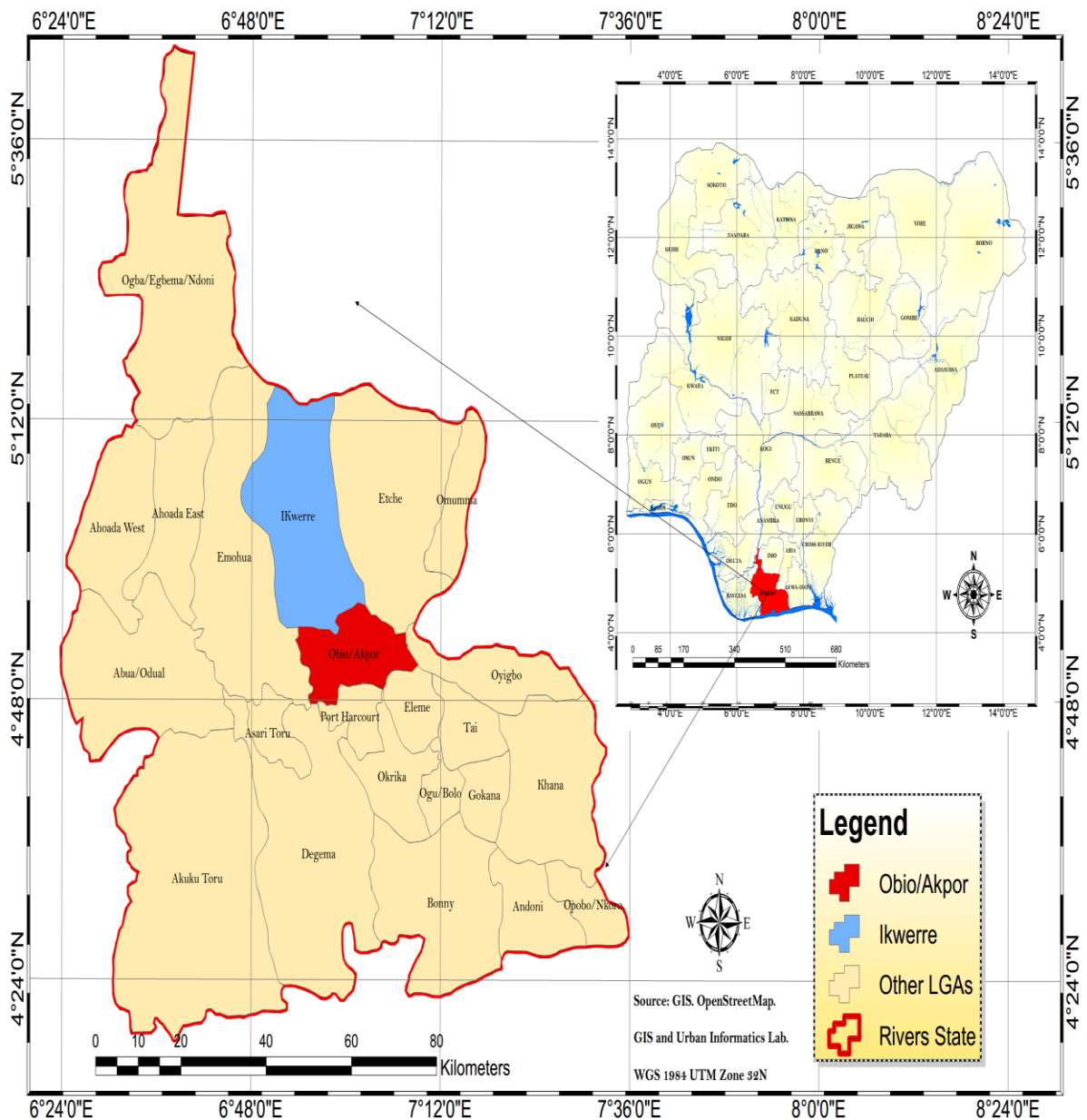

Fig. 1: Nigeria Showing Rivers State, Obio/Akpor & Ikwerre LGA
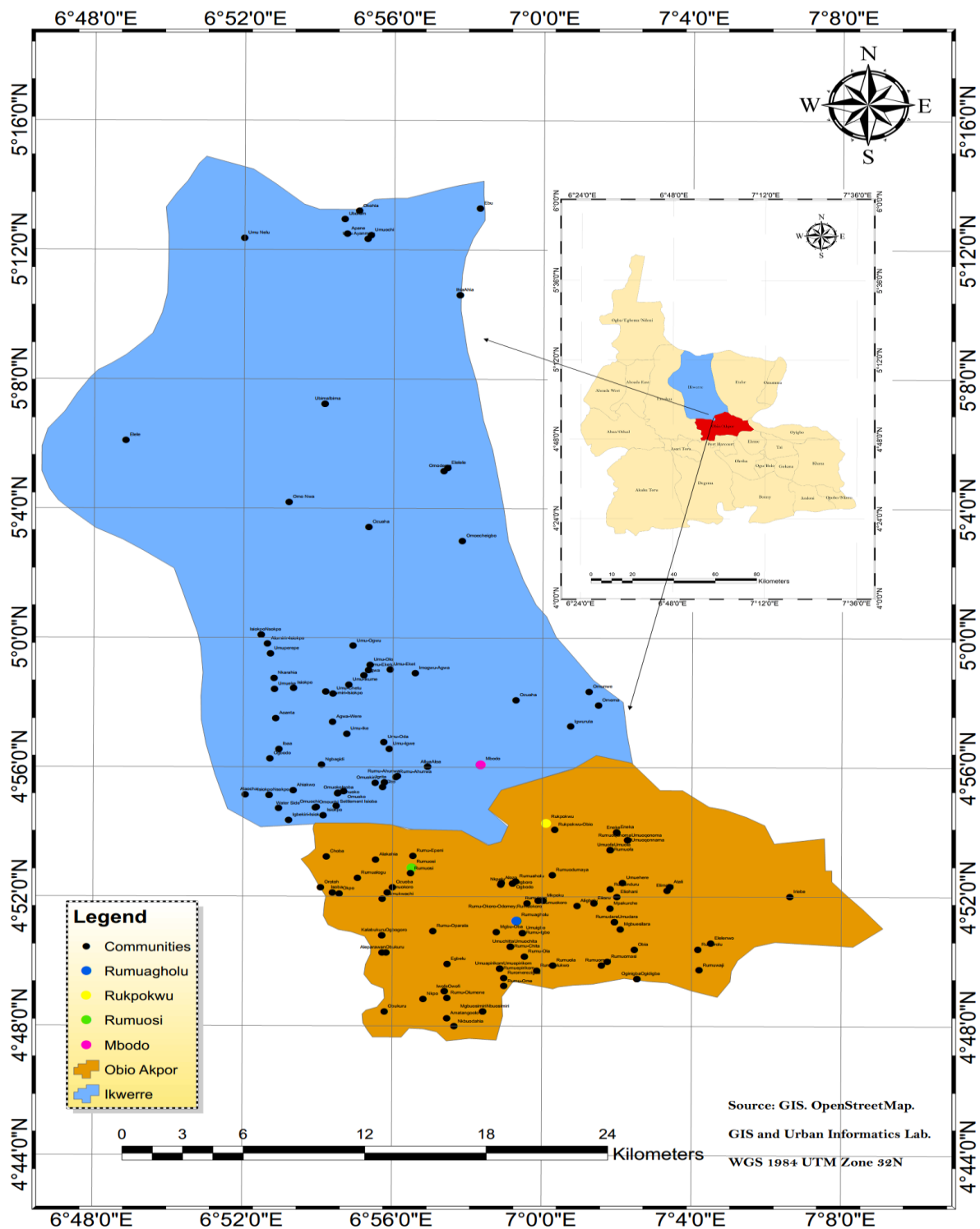Source: GIS Laboratory, URP Department, Rivers State University (2022)

Fig. 2: Obio/Akpor&Ikwerre Settlements Showing the Study Area
Source: GIS Laboratory, URP Department, Rivers State University (2022)

III. CONCEPTUAL/THEORETICAL FRAMEWORK AND RELATED STUDIES

A. Concept of Solid Waste

The term solid waste is used inter changeably with garbage. Garbage is mainly considered as a solid waste that includes wastes from market places, schools, offices, etc. (municipal wastes) and the wastes from industries and factories (Muhammad, 2003). Solid waste refers to unwanted or unusable materials, substances which are discarded after primary use(Sule, 2005).

These wastes may contain harmful substances and as theydecompose, they produce leachate which is organic liquid effluents(Ehirim, Ebeniro, & Olanegan, 2009).The decomposed and decomposing solid waste poses offensive odour to the residents of settlements close to the dumpsite.

B. Concept of Zero Waste

The idea of zero waste is closely related to the idea of waste to wealth which is mainly about converting wastes from environmental and economic liabilities to valuable resources that providesliveable jobs thereby developing communities.

According to DANS LA BIO (2020), there are five (5) "Rs" to zero waste, they are: Refuse, Reduce, Reuse, Recycle, Rot.The first R "Refuse" aim is to recognize what is redundant and decline it.The concept consists of surrounding oneself with very few objects, furniture and clothes so that they take on real meaning.The second "R" Reduce indicates that sometimes it is not possible to discard. But, it is possible to reduce ones' consumption, environmental impact and car use. The third "R" Reuse suggests that rather than throwing away an object and buy something new, it will be fine to repair, mend or reuse the item for another purpose. The fourth "R" Recycle suggests trying to use the object again after processing if there is no other choice rather than ending it in the garbage. While the fifth "R" Rot is of the view that you give back what the earth has given to you by composting. Meal leftovers, peelings and coffee grounds are just some of the foodstuffs appreciated by the compost bin, which will turn them into great fertilizer for your garden or plants. If the five Rs are fully implemented, there will be no need for such deteriorated open dump site, rather wealth will be made out of waste.

C. Theory of Distance Decay Function

It is a geographic theory which describes the effect of distance on cultural or spatialinteractions. The frictional effect of distance is one of the major factors affecting spatial interaction. It states that the interaction between two localities decline as the distance between them increases.Distance is a basic geographic dimension and the distance decay curve specifies the relationship which variable bear to distance(Akpotareno, Weje, & Ameme, 2021). Mmon (2018), defineddistance-decay function as a series of rectangular co-ordinates relating to a given variable with distance, and showing greater values of spatial variable for any smaller distance than for any greater distance.However, in most geographical studies, it is proved that spatial interactions decrease with increasing distance. The distance decay theory is relevant to the present study as it defines the level of socio economic effectof dumpsite on residence of the research area. By implication, the farther the distance, the minimal the level of effect of the dumpsite on residents of Port Harcourt.

D. Burgess Concentric Model

Ernest Burgess propounded a concentric model in 1925to understand the structure and growth of a city using American cities of which Chicago is an example(Park & Burgess, 1925). According to Rodrigue(2020), the model explains how cities grow outwardly in concentric zones. Burgess offers a descriptive framework in which physical land use patterns and human relationships are implicit. Burgess examined the interactions among the people and their economic, social, and political organizations which create radical expansion outwardly.Rodrigue (2020) classified the model into six (6) zones, namely:Zone I -

Central Business District, where most of the tertiary employment and urban transport infrastructure is located. Zone IIis a zone where many industrial activities locate to take advantage of nearby labour and markets. Zone III is gradually being reconverted to other uses by expanding manufacturing/industrial activities. It contains the poorest segment of the urban population, notably first-generation immigrants living in low-cost housing. Zone IV is a zone for the low income earners. It is actually a residential zone dominated by the working class and those who could move away from the previous zone. Zone V is a zone for the middle income earners. The zone represents higher quality housing linked with longer commuting costs. Zone VI is a zone for the high income earners.Mainly high-class and expensive housing in rural, suburbanized settings, with the highest commuting costs. As cities grow from the core (CBD) to the periphery, wastes are generated. The research area falls within Zone VI which is a suburbanized area with the highest commuting cost, it is supposed to be the zone for high income earners but the presence of the dump site can make it almost impossible.

E. The Case of Freetown Muncipality, Sierra Leone

Mansaray-Pearce (2019) studied the environmental and socio-economic effect of solid waste on local livelihood in Sierra Leone. The study revealed that respondents residing close to dump site are involved in diverse economics activities such as pretty trading, agricultural activities and construction works. Poor waste management contributed to diseases outbreak resulting in high risk and hazardous to human health in the city. Mansaray-Pearce (2019) recommended that the government of Sierra Leone should sensitize the public on waste reduction and separation, encourage waste recycling to minimize waste disposal and in order to encourage environmentally responsible behaviour. Solid waste can be used to generate fuel which in turn is used to produce electricity within the city thereby creating more job opportunities for engineers, biologist and others.

F. The Case of Siliguri, West Bengal, India

In open landfill site and the threat to the proximity residents by addressing perceived consequences of unscientific solid waste dumping using GIS techniques. Roy, Bose, Basak and Chowdhury (2022), examined the socio-demography of residents living 1km from the landfill. He assessed the age, sex, gender, education, occupation, duration of residence. The study adopted purposive sampling technique because the study emphasis primarily on the cases of exposed population to the landfill. Furthermore, the study examined the risk perception of the residence close to the landfill site, the negatives consequences the land fill has on their health and environment. The study reveal that due to lack of suitable land availability and personnel numbers, the Siliguri dump demonstrated a lack of effective management techniques which led to negative consequences and enhance the risk of health problems among the people in the area. They recommended that in order to maintain environmental sustainability, and equitable public health, the waste management practice must be modified. Sensitization via media, newspaper advertising, pamphlets and leaflet to

raise awareness about the negative consequences of uncontrolled solid waste disposal.

IV. METHODS AND MATERIALS

The study adopted the cross-sectional survey research design. The unit of interest relevant to this study is the population of households within 3 km from the dumpsite area, purposive sampling was used to pick the 5 communitiesthat falls within the 3km, they are: Mbodo Aluuin Ikwerre Local Government Area, Rumugholu, Rumuosi, Rumuekini, Rukpokuin Obio/AkpoLocal Government Area (see Figure 3), while simple random sampling was used to select households that were interviewed.
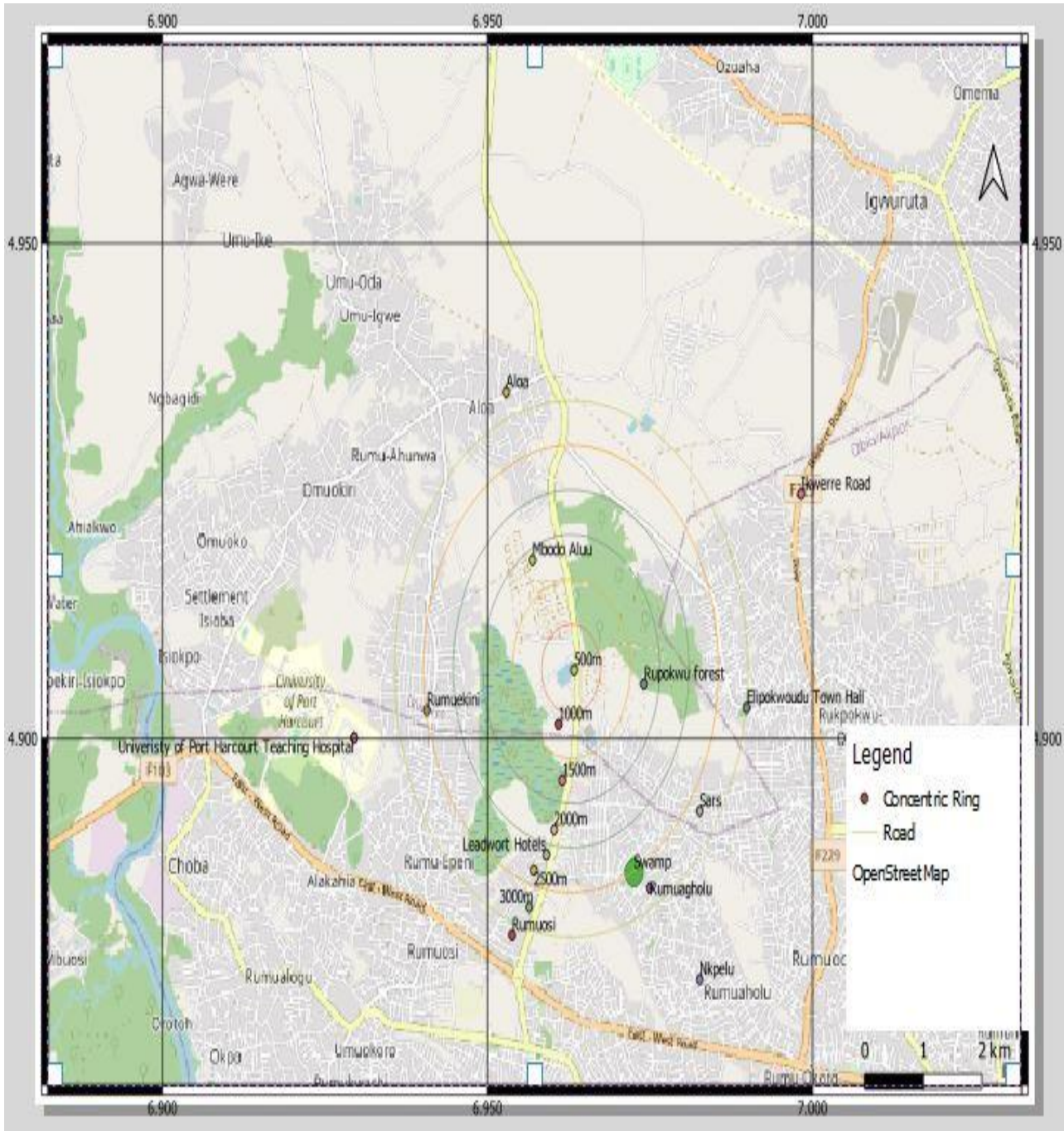

Fig. 3: Proximate Communities within 3km of Dumpsite
Source: GIS Laboratory, URP Department, Rivers State University (2022).

V. RESULTS AND DISCUSSIONS

A. Gender of Respondents

Presented in figure 4 is the gender distribution of respondents in the study area. Findings from the study revealed that, 65% were male while 35% were female. It can be deduced that there were more male respondents sampled in the study area.
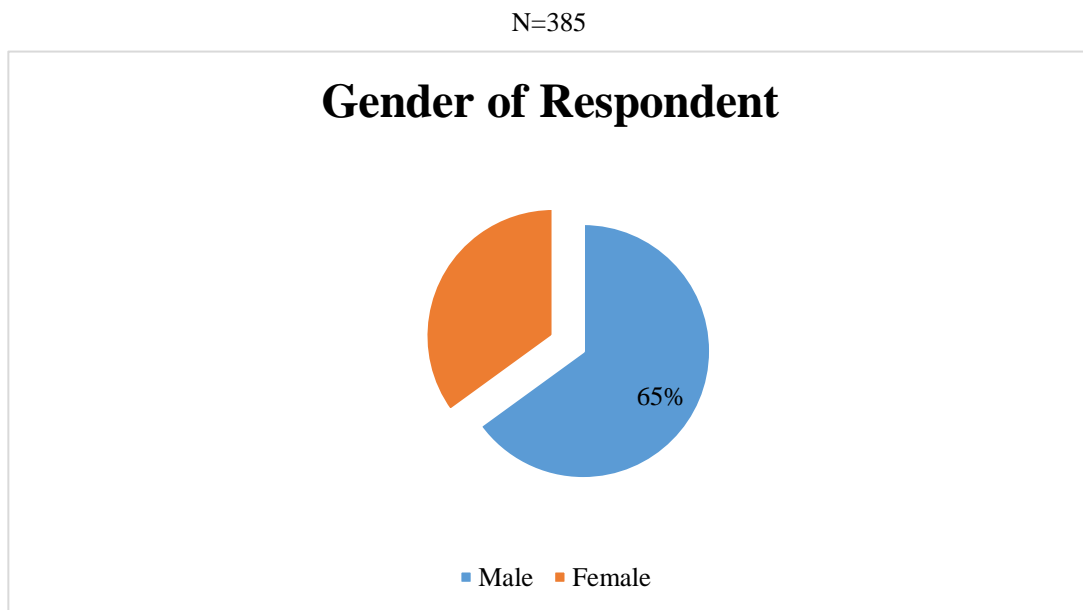
N=385

Fig 4: showing the Gender of Respondents
Source: Researchers' field survey, 2022

B. Age of Respondents

The age distribution of respondents is shown in Figure 5. The highest age bracket was 40-49 which accounted for 32.4%. Age brackets of 20-29 years, 30-39, 50-59, 60-69 and 70+ accounted for 21.1%, 31.0% 11.3% 2.8% and 1.4% respectively.
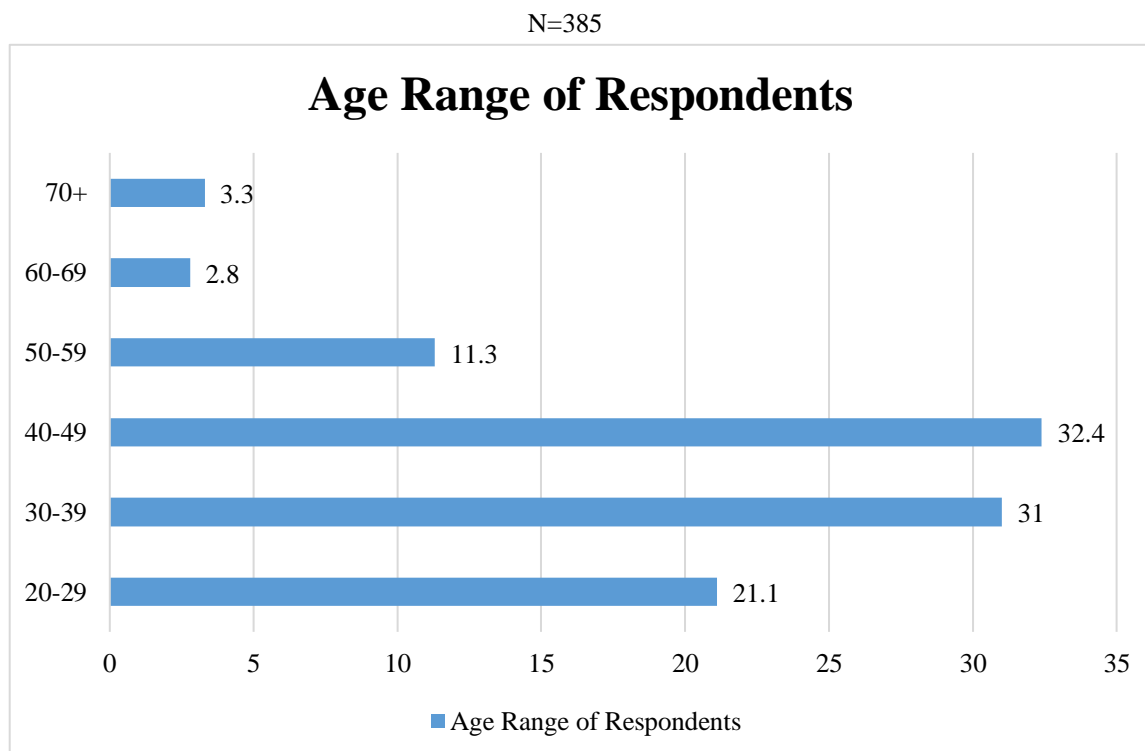
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Fig. 5: showing the Age of Respondents
Source: Researchers' field survey, 2022

C. Monthly Income Category of Respondents

The monthly income category of respondents is shown in Table 1. The modal income category was ₦60,001-₦90,000, this represented 39.4% of the distribution. Other categories were less than ₦30,000; ₦30,001-₦60,000; ₦90,001-₦150,000; ₦150,001- ₦210,000; ₦210,001-

₦270,000; ₦270,001- ₦330,000; and not applicable representing 15.5%, 24.3%, 11.3%, 4.2%, 0%, 1.4% and 3.9% respectively. Not applicable are several people who do not have income such as the unemployed and the house wives. It can be induced that about 39.4% earned ₦60,001-₦90,000 in a month.

Table 1: Percent Distribution of Monthly Income Category of Respondents

S/N	Monthly Income	No	%
1	Less than ₦30,000	60	15.5
2	₦30,001- ₦60,000	93	24.3
3	₦60,001- ₦90,000	43	11.3
4	₦90,001- ₦150,000	152	39.4
5	₦150,001- ₦210,000	16	4.2
6	₦210,001- ₦270,000	0	0
7	₦270,001- ₦330,000	6	1.4
8	Not Applicable	15	3.9
	Total	**385**	**100**

Source: Researchers' field survey, 2022

D. Educational Level of Respondents

Household members who had completed tertiary education accounted for 56.3%. Those who had completed secondary education and primary education represented

35.2%, and 4.2% respectively. The least was no formal education with 1.4 % as shown in Figure 6. The respondents were educated and enlightened.
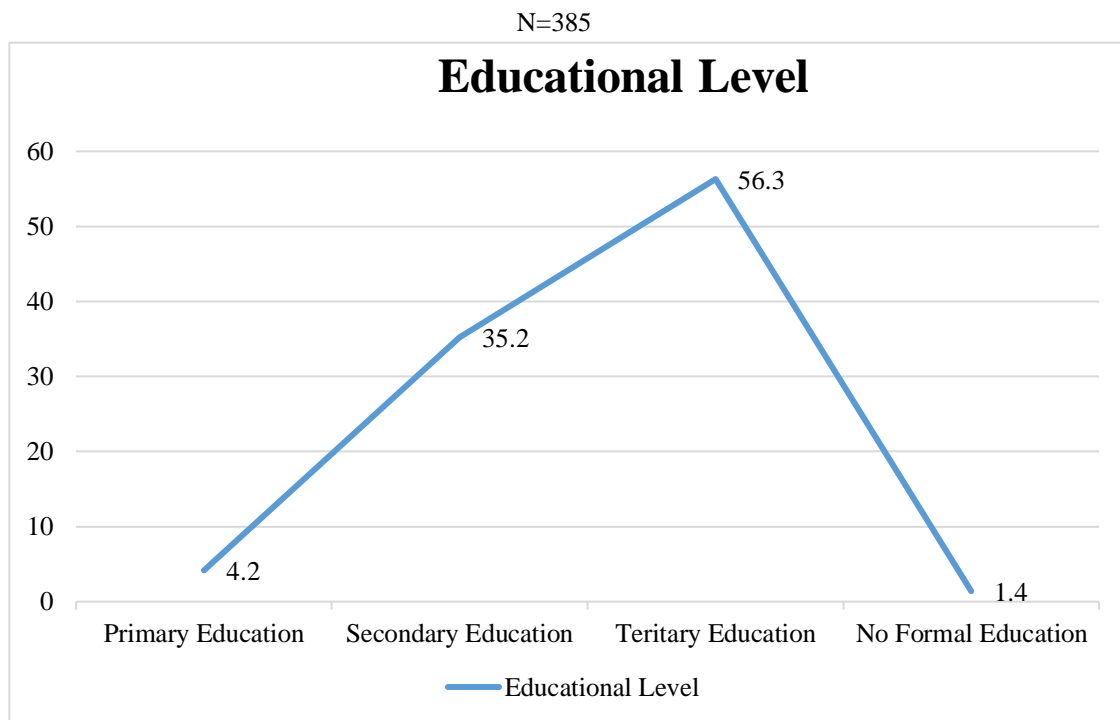
N=385

Fig. 6: showing the Educational Level of Respondents
Source: Researchers' field survey, 2022

E. Marital Status

The marital status of the respondent is shown in figure 7. 64.8% represented married and 25.4% were single 5.6%

were divorced and 4.2% were widow/ widower. It can be inferred that the majority of respondents were married.
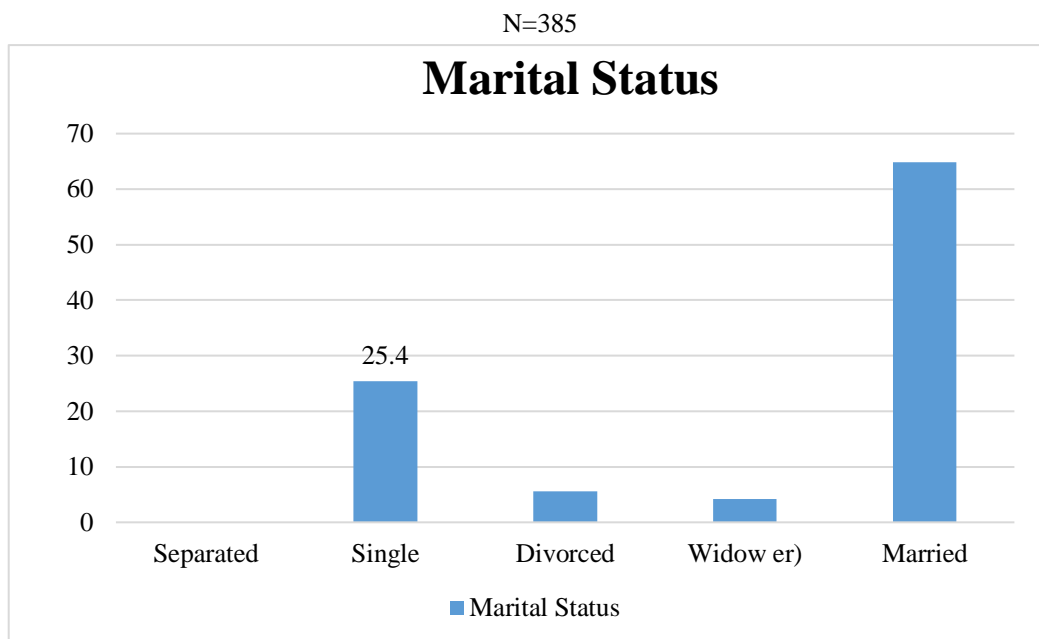
N=385

Fig. 7: Showing the Marital Status of Respondents
Source: Researchers' field survey, 2022

F. Employment Status of Respondents

Figure 8 shows the employment status of respondents in the study area. The modal employment status was employed including government workers accounted for 28%; 'self-employed' accounted for 65%. Other categories were unemployed, retired, and housewives which accounted for 4.2%, 2.8%, and 0% respectively. The distribution had a total response of 435 instead of 385 because there were multiple responses to the options.
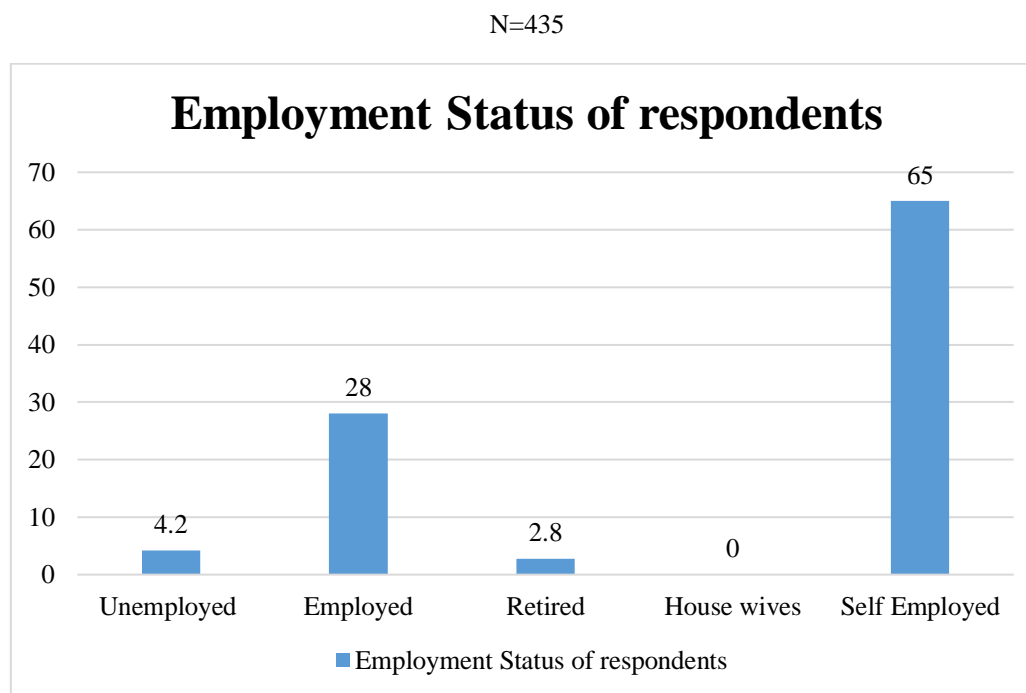
N=435

Fig. 8: Showing the Employment Status of Respondents
Source: Researchers' field survey, 2022

G. Occupation of Respondents

Table 2 presents the occupation of respondents in the study area. The modal occupation of respondents was 'business/ contractors' accounting for 39.5% followed by 'trading' accounting for 23.4%. Self-employed was classified as trading, farming, artisan, and business/contractors. Other categories are represented in the table below. The distribution has a total response of 435 instead of 385 because there were multiple responses to the options.

Table 2: Occupation of Respondents

S/N	Occupation of Respondents	No	%
1	Retired	12	2.8
2	Unemployed	18	4.2
3	Housewives	0	0
4	Teaching	50	11.5
5	Civil Service	41	9.4
	Self- Employed		
6	Trading	102	23.4
7	Farming	25	5.7
8	Artisan	15	3.4
9	Business/ Contractors	172	39.5
	Total	435	100

Source: Researchers' field survey, 2022

H. Indigenous Status of Respondents

Figure 9 below shows that 70.4% of the respondents were non-indigenous, and 29.6% of the respondents were indigenous. This implies that more of the respondents were non-indigenes in the study area.
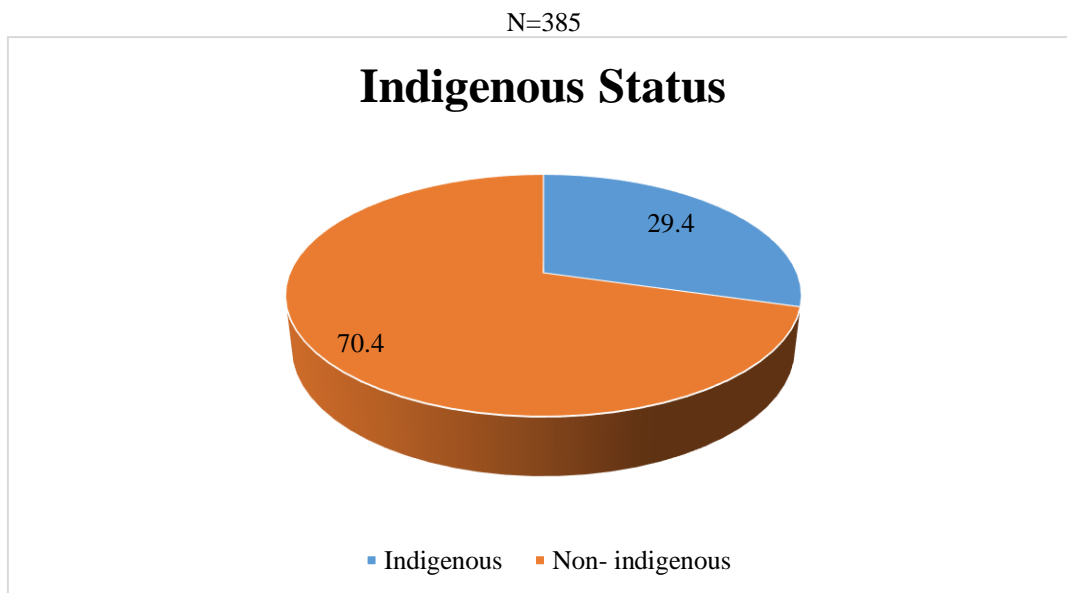
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Fig. 9: Showing the Indigenous Status of Respondents
Source: Researchers' field survey, 2022

I. Length of Stay in Community

Respondents were asked to state the length of time they have lived in the community. Most respondents said '6- 10 years' representing 43.7% of the distribution. Those who had lived in the settlement for '0-5', '11-15', '16-20', and 'over 20'years are presented in Table 3.

Table 3: Percent Distribution of length of stay of Respondents in the study Area

S/N	Length of Stay in Years	No	%
1.	0-5	60	15.5
2.	6-10	168	43.7
3.	11-15	33	8.5
4.	16-20	32	8.5
5.	Over 20 years	92	23.8
	Total	385	100

Source: Researchers' field survey, 2022

J. Impact Assessment of Dumpsite on the Neighbourhood

In the neighbourhood, 84.5 % of respondents agreed to negative effect of the dumpsite as against 15.5% that agreed there was no negative effect of dumpsite on the neighbourhood. Table 4 shows the negative effect of the dumpsite as perceived by the respondents.

Table 4: Showing the Effect Dumpsite had on the Neighbourhood

S/N	Effects	No	Percent (%)
1	Respiratory Problems such as catarrh and cold	30	9.2
2	Pollution makes people feel uncomfortable	46	14.2
3	Constant inhale lead to Sickness such as lung dysfunction, malaria	61	18.8
4	Uncontrolled bad smell	72	22.2
5	Breeding Ground for flies	35	10.7
6	Distort Vehicular movement	10	3.1
7	Building collapse	5	1.5
8	Unclean Environment	66	20.3
	Total	325	100

Source: Researchers' field survey, 2022

K. Challenges Encountered with the Presence of Dumpsite within the Neighbourhood

Figure 10 shows the challenges encountered by the residents as regards the likely factors that affected the price of land within the neighbourhood. 36.6% were of opined that dumpsites caused offensive odour, and 11.3% was of opined that dumpsites cause a high level of environmental pollution.
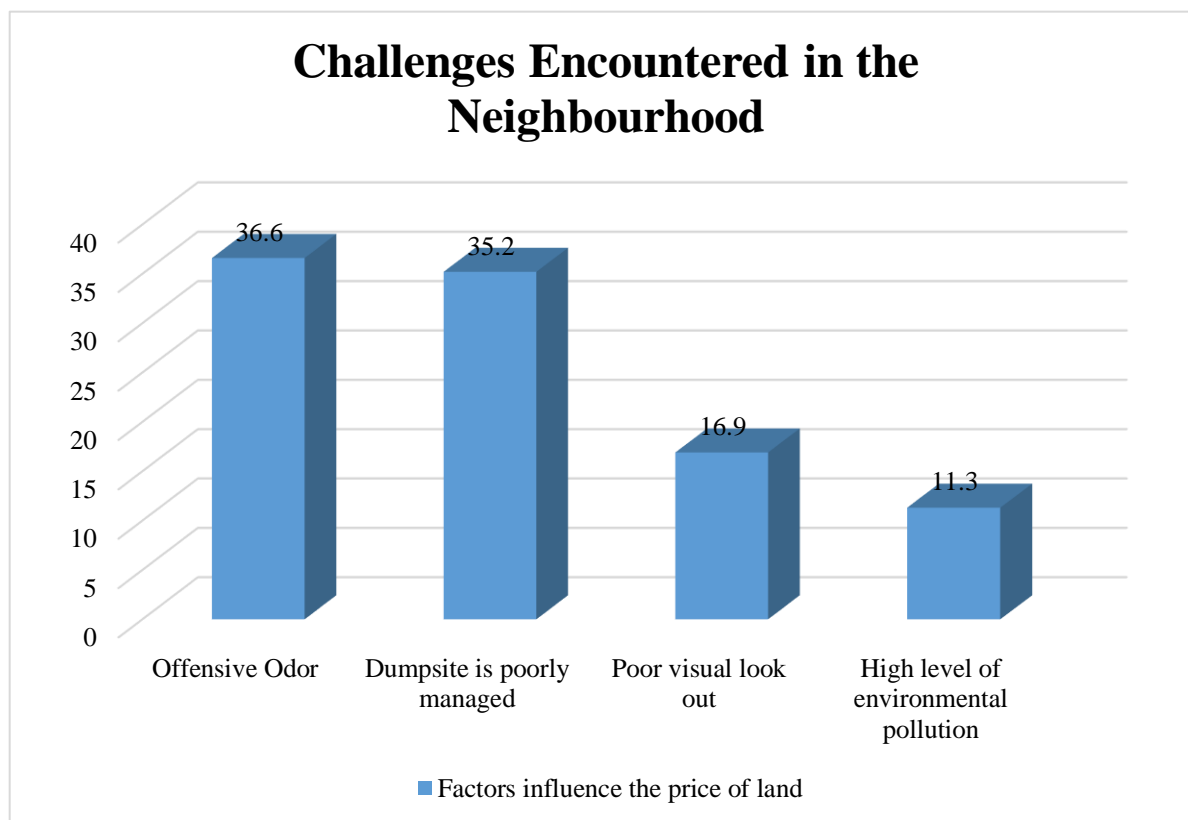
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Fig. 10: Challenges encountered in the neighbourhood
Source: Researchers' field survey, 2022

L. Assessment of the Quality of Water in the Neighbourhood

Figure 11 shows the effect dumpsite has on private borehole water. 77.5% were of the option that the dumpsites do not affect the water and 22.5% said it does.
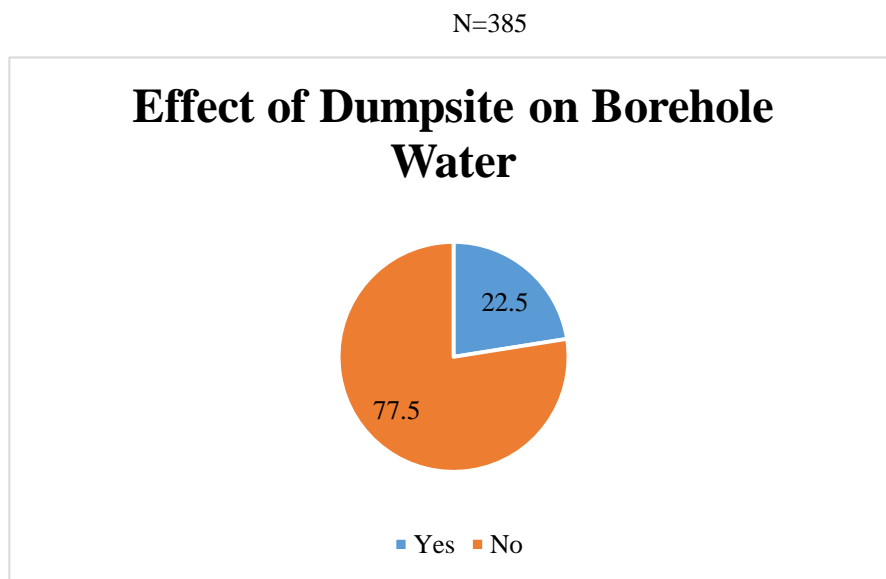
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Fig. 11: Showing Effect of Dumpsite on Borehole Water
Source: Researchers' field survey, 2022

M. Approved Planning Regulation and Distance from the Dumpsite

This section addresses planning standards and regulations regarding the location and operation of dumpsites. Table 5 illustrates the landfill siting guidelines of selected geographic areas which include India, Malaysia, USA, China, the Middle East, Europe, Australia, World Bank (An Asian urban infrastructure note), and researcher findings.

India, being one of the selected countries, set the criteria for landfill standards to the nearest residential area to be 500m. The nearest habitable residential building to the dumpsite is 500m. Therefore, it can be said that Aluu Dumpsite conforms to this requirement. Concerning the nearest water bodies, the siting guideline was 100m. Greater Port Harcourt identify the minimum distance to be observed regarding the location of the landfill to the nearest water bodies however, this was not put into consideration when locating the Aluu dumpsite as the distance of the dumpsite to the water body was 50m. This does not conform to the standard for sitting landfill as the site used for the landfill in the study area is a swamp area.

The nearest distance from sources covered the transfer station, India specify 20- 25m from the transfer station to the landfill. Waste Transfer and Transportation were established although not adequate in terms of size and were poorly designed and cited in inappropriate locations at the time of the research.

Regarding the nearest road line, the USA specified 50 - 100m, the study area however fail to conform to this criteria, as there were no emergency response services available on the dumpsite. Maximum slope deals with appropriate terrain conditions suitable for the construction of a landfill site. India set the standard to 15m, and the maximum slope for the Aluu dumpsite is 10 feet which are poor when compared to the standard set for other selected countries. Regarding soil permeability and nearest fault line is <10-6 and 500 respectively for India. The scope of the study does not cover these parameters.

According to the Greater Port Harcourt City Development Master Plan (2009), it was planned that two central engineered landfills must be developed following engineering standards to provide adequate airspace. The engineered landfills would accommodate future hazardous waste disposal facilities. Technical criteria regarding the proposed location were stated according to Greater Port Harcourt City Development Authority (2013). Such criteria include Central location to collection routes. Access to major transportation routes. Minimum site size requirements include the potential for expansion, a buffer zone, space for recycling, composting, public education, a material recovery facility, internal roads, and a depot. Truck and Traffic compatibility. Gently sloping topography. Compatibility with planned surrounding land- use. Exclusion from a zone is defined as within 3000m of a flight path or runway or 500m from the Airport boundary and 500m on either side of flight paths. Current Surrounding land uses (at least 500m from the residential area) Distance from water bodies (at least 500m from surface water bodies). Presence of clay soils and access to suitable cover material. Identification of the closest borehole used for drinking purposes. Sensitive heritage site, vegetation, and faunal species.

Table 5: Landfill Siting Guidelines of Selected Geographic Areas and in comparison with GPH Master Plan and Researcher's Findings

Parameters	Country									
	Malaysia	World Bank (an Asian Urban Infrastructure note)	India	Australia	USA	Europe	China	Middle East	GPH Master Plan	Researchers' Findings
Nearest Residential Area(m)	1000	1000	500	250	500-2000	500	500	300	500	500
Nearest Water Bodies(m)	100	500	100	100	300-500	500	500	200	500	50
Nearest Groundwater Line(m)	1000	1500	1000	100	1000	1000	1500s	50	-	-
Nearest Distance from Sources(km)	25	25	20-25	15-20	25-40	25	25	30	-	3
Nearest protected Forest(m)	100	500	100	500	50-100	100	100	100	-	1000
Nearest Airport Location(km)	3	3	20	8	4	3	3	3	3	3
Nearest Road Line(m)	500	3000	200	100	50-100	500	100	300	-	50
Maximum Slope(m)	10	20	15	20	15-20	10-20	10	20	-	10feet
Soil Permeability (cm/s)	$<10^{-6}$	$<10^{-6}$	$<10^{-7}$	$<10^{-6}$	$<10^{-6}$	$<10^{-7}$	$<10^{-7}$	$<10^{-6}$	-	-
Nearest Fault line(m)	100	500	500	100	100	100	100	100	-	-

Source: Researcher's Compilation(2022)

VI. CONCLUSION AND RECOMMENDATIONS

As cities grow, the quantity and intricate nature of solid waste generated in the given city increases.Solid waste breeds pollution and the forms of pollution identified within the dumpsiteinclude uncontrolled bad smell, unhealthy environment which forms breeding ground for flies and other harmful insects, rodents, reptiles and pests.

Based on the findings in the research, it is imperative that the following be considered in order to aid and improve socio- economic state of the residents and waste disposal system in the study area and in Rivers State at large.

- Burrow Pits should not just be converted to landfill, rather sanitary landfill is recommended in order to put in place all necessary planning standard and regulation.
- Landfill should not be found within the neighbourhood, and a minimum setback of 1,000m should be observed which serves as Buffer zone if need arises.
- Eliminate scavenging at dumpsites in order to control illegal activities within landfill site and neighbourhood. A proper and functional waste management services (waste to wealth) should be provided.

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