Appraisal of The Impact of Slum Environment and Water Availability On Residents of Bulbula Slum, Jos, Nigeria

*Onuoha, D. C.; *David, D.; Ukah, C. & **Iloerika-Okafor, A. C.
**Environmental Management Department, Nnamdi Azikiwe University, Awka.
**Anambra State Ministry of Lands, Awka.

ABSTRACT: *This study appraised the impact of slum environment on the residents of Bulbula Slum in Jos, Plateau State, Nigeria and determined the standard slum deprivation index (SDI) for this area. The survey research design was adopted with questionnaire and interview serving as the instruments of data collection. 200 households were purposively selected and sampled while 14 community leaders were purposively selected according to the number of streets in Bulbula and interviewed. The study also utilized the WaSH (Water, Sanitation and Hygiene) and DPE (Dwelling and Physical Environment) as the measurement scale for the assessment (with the scale code of 0 = no access and 1 = access; 0 value for SDI meaning not deprived at all and 1 meaning 100 percent deprived). It was found that the study area was deprived in both the WaSH and DPE. The average SDI for Bulbula is 0.58 and the test of hypothesis also established a relationship between the SDI and attitude of the residents to environmental issues and the relationship model is y = 0.41175 + 2.979742x, where x is SDI and y is the attitude of the respondents to the environment. It was established that the relationship is positive on the average and more deprivation will lead to bad attitude of residents towards environmental issues. The study suggests that it is important to enhance the educational opportunities for slum dwellers in order to increase their awareness of the health risks associated with living in an unsanitary environment. Furthermore, there should be a greater effort to raise awareness in the slum area through collaborative initiatives with non-governmental organizations. It is important to prioritize environmental sanitation and promote poverty alleviation projects to enhance the socio-economic conditions of the area for the inhabitants.*

KEYWORDS: evaluation, impact of slum environment, residents of Bulbula Slum.

INTRODUCTION

The global assessment of slums undertaken by the UN Habitat (2010) shows that 828 million or 33% of the urban population of developing countries resides in slums. In sub-Saharan Africa, 62% of the urban population resides in slum settlements. Such large concentration of slums in which inhabitants live in, is in life-threatening conditions and it poses enormous burden on city authorities

that are often cash-strapped and lack the institutional and technical capacity to provide even the most basic of urban services.

Slum proliferation is pronounced in all the geopolitical zones and sessions of Nigeria. There is barely a state without a slum area in Nigeria (Badmus, Rienow, Callo-concha, Greve and Jurgens, 2018), especially in the urban areas due to rapid urbanization with limited development.

The impacts of slum proliferation on the slum areas are numerous according to Adadeji and Eziyi (2010); Nduka (2012); Onweluzo (2017); Orewere and Martins (2020); among other early researchers include but not limited to filthy environment, environmental pollution, increase in water and air borne disease, overcrowding, environmental decay, poor social wellbeing, inadequate availability of facilities and increase in the rate of deterioration of the few available facilities amongst other negative impacts. For instance in Bulbula, Orewere and Martins (2020), pointed out that buildings are erected anyhow, there are no signs of effective development control or regulation, poor water supply, constant traffic congestion and indescribable filth.

Many earlier researchers considered the causes and general effects of slum on the environment but the impact on the inhabitants and the slum deprivation index has been given little or no attention. It is against this background that this study was conceived to assess the impact of slum environment on the residents in Bulbula slum.

Statement of the Problem

Ajanlekoko (2001), "the phenomenal rise in population and the number and sizes of our cities over the past few years have manifested in the acute shortage of dwelling units which resulted in overcrowding, high rents, poor urban living conditions, and low infrastructural services and indeed high crime rates" making slum proliferation common. This was buttressed in the work of Orewere and Martin (2020).

From the field observation, one can deduce that Bulbula slum is known for the broken rocks from which water gushes out amidst filth. According to Mahabir,et al., (2016) environmental deterioration in this slum area has negatively impacted on the landscape such as mountainous heaps of solid waste that deface the city, environmental pollution (poor sanitation, inadequate solid waste disposal, effluent discharge, rapid and unplanned urbanization, mining, and increasing use of chemical fertilizers and insecticides), lack of proper refuse dumps and sewerage system and physical exposure to natural and manmade disasters.

In Okpoko slum, the phenomenon of decay manifested more on the structures and characterized by acute shortages with demand always more than supply. For instance, the insufficient availability of quality housing and basic infrastructures such as waste disposal system, water supply, electricity

amongst others has led to the available ones being over stretched and over used by residents thus resulting in the decay of the available resource therefore causing degradation of the environment and environmental hazards. According to Okeke (2002), under such situation, available facilities deteriorate fast and decay sets in due to overuse, poor usage performance, lack of maintenance etc.

Many studies have been conducted in this slum area like those of Mahabir et al (2016) and Orewere and Martin (2020), but little attention was given to the impact of slum on residents and the Slum Deprivation Index (SDI) was partially neglected with only one of the studies handling it briefly outside. This is very important in exposing the social, economic and environmental deficiencies in the slum area to enable good policies on slum management and improvement. To this end, this work was conceived to assess the impact of slum on the residents of Bulbula Slum areas with a view to establish the slum deprivation index and recommend solution.

Aim and Objectives

The aim of this study is to appraise the impact of slum environment on the residents of Bubula, with a view to determine the standard slum deprivation index. To achieve this aim, the following objectives were pursued:

1. to identify the impacts of slum environment on the health, social and economic life of residents of Bulbula slum;

2. to determine the impacts of the slum environment on the attitude of the residents of the slum area to environmental issues and

3. to develop the slum deprivation index for the study area.

LITERATURE REVIEW

The findings of many scholars like Pawar & Mane (2013), Prasad & Singh (2009) and Sufaira (2013); shows that the slum environment affects the literacy level, family income and general social status of the slum dwellers as they have very poor and substandard living conditions, it generally affect elements like living standard of population, socio-economic status of population and their general development and progress. On the other hand, UN-Habitat (2003); Unger & Riley (2006) established that unhygienic water sources abound in slum locations. These, contaminated and inadequate water is a major characteristic of slums in developing countries which potentially brings about severe infectious diseases such as hepatitis and cholera.

Akinwale (2018) in his paper titled "Urban Slums in Nigeria: Ensuring Healthy Living Conditions" opined that the health effects of slum environments on the slum dwellers / slum inhabitants are numerous and increasing with increased neglect of the slum areas. Lawanson (2020) in his article

titled "Lagos' size and slums will make stopping the spread of COVID-19 a tough task", stated that economic inequalities have consequences for access to health and health seeking behaviour. Over 60% of residents of Lagos are poor and live in the over 100 slums and informal settlements scattered across the city. They lack water, sanitation and other basic services. This makes them particularly vulnerable during a health crisis.

The works of Funmilayo (2012); Owoeye and Adedeji (2013); and Yussuf, *et al* (2014) were all in agreement that lack or inadequate access to basic public services like health care facilities; and unhealthy living conditions in hazardous locations characterize slum environments and this supports poor health conditions of the slum dwellers. Akinwale (2018) and Lawanson (2020); affirmed that Urban slum dwellers are at a high risk of non-communicable diseases such as asthma, heart disease, diabetes, mental health problems including anxiety, depression, insomnia and substance abuse as they adopt an urban lifestyle while lacking knowledge and information regarding health and health care. Quality of health care in the urban slum is sometimes worse than what obtains in some rural areas and the slum dwellers are particularly vulnerable during a health crisis (Akinyinka, 2020).

Ezenwa *et al* (2013); Izobo *et al* (2014); Mahabir et al (2016) and Orewere and Martin (2020) among others, confirmed that there is crucial environmental effects of the slum area on the residents and their attitude towards the environment as there is lawlessness especially as regards indiscriminate waste disposal and negligence to environmental sanitation regulations. According to them, there is un-denied impact on the socio-economic lifestyles and the health of the residents, as well as the general outlook of the environment.

Study Area

Jos is a city in the middle belt of Nigeria. It has a population of about 900,000 residents based on 2006 census and it is the administrative capital of Plateau State. The Jos city is located on the Jos plateau at about 1,238meters or 4,062ft above sea level. Bulbula is located on Latitudes 09° 55'and 09° 43" N, and Longitudes 08° 55' and 08° 41" E. Bulbula is one of the major settlements in Ibrahim Katsina Ward in Jos North L.G.A. of Plateau State. Furthermore, it is a high density residential area dominated by Muslim and foreigners. It is accessed through the Nassarawa-Congo Junction and through Zololo junction from Bauchi road. One would cross a popular bridge called (Gadan Sugai Bridge) to get to the community. Their main occupation is trading in the formal and informal sector (Umar, 2020). Jos – North local government is located at the extreme north of Plateau State on Latitudes 09° 53'and 09° 59' N, and Longitudes 08° 51' and 09° 02' E. It shares boundary to the North with Toro Local Government Area of Bauchi State; to the South with Jos-South Local Government area; to the North-East with Jos-East Local Government Area; and to the West with Bassa Local Government Area (Aliyu, et al., 2019).

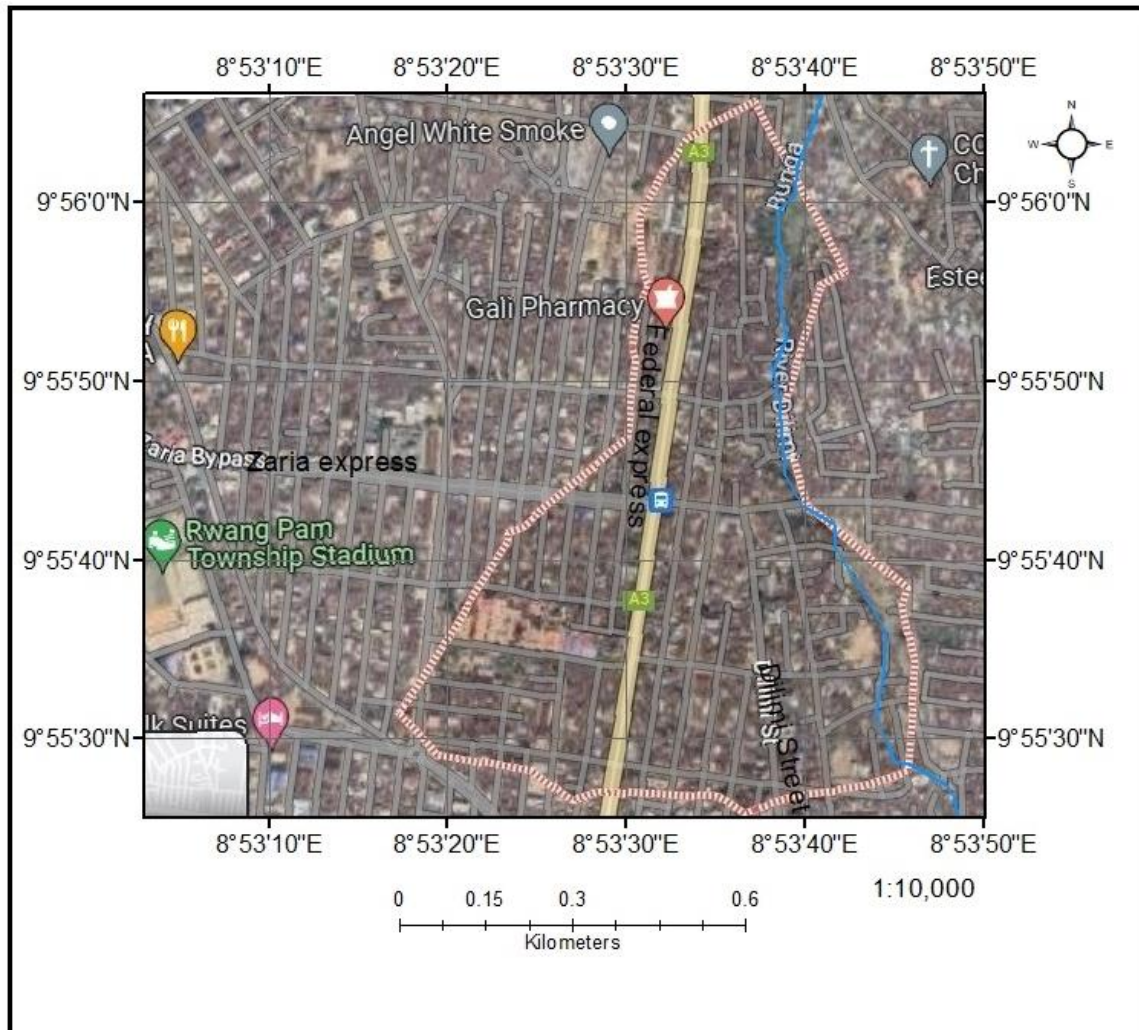Figure 3.3a: Map of Bulbula Slum (Source: National Geohazards, 2022).

Figure 3.3b: Map of Bulbula Slum (Source: National Geohazards, 2022).

Bulbula in Jos experiences a tropical Savanna Climate according to Koppen's Climate Classification closer to temperate than majority of Nigeria climate zones. It has an average monthly temperature range of 21 to 25^0C (70 to 77^0F); and from mid-November to late January night-time temperatures drop as low as 7^0C (45^0F). The precipitation arises from both conventional and orographic sources owing to the location of the city on the Jos Plateau. Hail sometimes falls during the raining season because of the cooler temperatures at higher altitudes. The average monthly relative humidity of Jos ranges from 21-23% in the Months of January, February to about 63% in May and 81-87% in July, August and September with its peak being mostly in the most of August. From field observation it is crystal clear that there is poor road network and the roads are in bad condition.

METHODOLOGY

This study adopted the survey research design using questionnaire as the main instrument of data collection.

To effectively conduct this study the following data were of essence:

1. Information on how far earlier researchers have worked on issues under study were obtained from secondary sources through literature review.

2. Maps and information about the study areas were obtained from National Geo-hazards Centre Anambra State office, Department of Survey and Geoinformatics, Nnamdi Azikiwe University, Awka, Excel research centre and other online sources.

3. The Population of the study areas were obtained from the National Population Commission, Anambra State Office, Awka and various online sources.

4. The data on the impact of slum environment on the residents, the slum deprivation index (SDI) and the attitude of residents of the selected slum areas to environmental issues were obtained through the use of questionnaire instruments, in depth interview and field observation.

The two major sources of data for this study are the Primary and the Secondary sources. The primary data sources adopted the use of questionnaire instrument and physical observation to obtain firsthand data from the study areas. According to data from National Population Commission, Jos has a population of about 900,000 residents with the population of Jos North Local Government area hosting the Bulbula slum being 437,217 as at 2006 population census. This was projected to 665,427 in 2021 using the approximately 2.8% growth rate given by the National Bureau of Statistics (NBS, 2017).

The main villages in Jos North include: Abba Na Shehu, Ali Kazaure, Gangare, Garba Daho, Ibrahim Katsina, Jenta Adamu, Jenta Apata, Jos Jarawa, Naraguta 'a', Naraguta 'b', Sarkin Arab, Tafawa Balewa, Tudun Wada - Kabong, Vanderpuye. Villages in Jos North LGA: Anglo Jos, Arim , Babelli, Barakin Babele, Barakin Dangurugu, Barakin Delimi Sabuwa, Barakin Lerawi, Barakin Naraguta, Barakin Rafin Gora, Barakin Sabawa, Barakin Yampita, Dangurugu, Dogon Karfi, Gamajigo, Farin Yashe, Gwafan, Gwong, Kabong, Laminga, Naraguta Hausawa, New Stadium, Passa Bonga, Radung, Rafin Gora, Rafin Jaki, Rafin Par, Rafin Sainye, Rukuba Road, Russo, Yelwa. *Jos* North LGA of *Plateau State* have 14 wards Viz: Abba Na Shehu, Ali Kazaure, Gangare, Garba Daho, Ibrahim Katsina, Jenta Adamu, Jenta Apata, Jos Jarawa, Naraguta 'a', Naraguta 'b', Sarkin Arab, Tafawa Balewa, Tudun Wada - Kabong, Vanderpuye. The main roads

in Bulbula are 14 in number most of which are not tagged and numbered. The whole area is highly deteriorated (Orewere and Martins, 2020).

Bulbula has a population of 665,000 persons hence about 110,833 households calculated with average Household Size = 6perons person.

The sample size of this study was determined using the Taro Yamaine formula, which is stated as

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

below:

Where n = Sample size;   N = Population of the study;   e = Limit of the tolerable error (5%).

For Bulbula n = 110,833 /1 + 110,833 (0.05)^2

= 110,833/278.0825

= 398.56.

Therefore, approximately 400 households as sample size for Bulbula and its environs. Considering the feasibility of this study after reconnaissance field observation, the researcher purposively limited the sample size to 200 households. The stratified random sampling was adopted, wherein the study area was stratified into the number of roads in the area with each representing a stratum. The researcher then sampled at least 10households from each stratum which was randomly selected. 14 community leaders in Bulbula were interviewed according to the number of roads in bulbula slum area.

WaSH (Water, Sanitation and Hygiene) and DPE (Dwelling and Physical Environment) were utilized in this work.A two-point scale measure was used to code WaSH variables (0 = no access and 1 = access). The DPE variables were measured on a scale of five points as 1 = Single room, 2 = room and parlor, 3 = flat, 4 = Self compound bungalow and 5 = duplex for dwelling type. The total number of residents per dwelling was measured as a continuous scale. The physical environment (presence of stagnant water and waste pile) and place for hand-washing was measured as no = 0, yes= 1. This was achieved by converting all strongly agreed plus agreed to yes, strongly disagreed plus disagreed to no.

The waste disposal method was measured on a scale of eight point as none = 0, burning = 1, burying = 2, dumping in the river/drain= 3, dumping along the road side/nearby bushes = 4, through accredited garbage truck vendor = 5, dumping in State Waste Management Agency depot

= 6 and through Private Sector Partnership (PSP) = 7. Sources of water supply were measured on a scale of 10 points as borehole= 1, public standpipe= 2, piped public tap= 3, protected dug well= 4, open dug well= 5, harvested rainwater = 6, water vendor= 7, bottled water= 8, sachet water= 9 and stream= 10. Sources of sanitation facility were measured on a scale of 11 points as connection to a public sewer= 1, connection to septic system= 2, pour-flush latrine= 3, simple pit latrine= 4, ventilated improved pit latrine= 5, public or shared latrine= 6, open-pit latrine= 7, bucket latrine = 8, pour-flush latrine without connection= 9, surface water = 10, and open space= 11. The material(s) for hand washing was measured on a scale of four points as water only= 1, soap with water= 2, use of sanitizer= 3, and disinfectant= 4.

Waste disposal methods, sources of water/sanitation facilities, and material for hand washing will all be transformed into binary measures as no access = 0, access = 1. For example, options, 0–4 will be regarded as no access while options 5–7 represents access for waste disposal method. For water and sanitation, all unimproved sources of water and sanitation facilities will be considered as no access while the improved source indicates access to those amenities. Regarding materials for hand washing, option 1 represents no access while options 2–4 indicate access based on the WHO & UNICEF (2014) benchmark for the definitions of access to improved water, sanitation, and hygiene. All the DPE and WaSH variables were used to compute the SDI in the study area as was applied by Akoteyon *et al* (2021).

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

To achieve the set objective of identifying the negative impacts of slum environment on the health, social and economic life of residents of the slum area; respondents were asked carefully structured relevant questions on the subject matter. Their responses are contained in table 1-3.

Table 1: Impacts of Bulbula Slum Environment on Health of Residents

S/N	Item	Bulbula	
		Mean	**Remark**
1	Outbreak of diseases due to filth	2.72	Agree
2	Increase in Health hazards (illnesses and diseases)	2.63	Agree
3	Increase in Heat stress, air pollution or carbon emission.	**3.50**	**Disagree**
4	Rise in Eviction / demolition causing depression and health issues	3.20	Agree
5	Water contamination causes dysentery, diarrhea, malaria, typhoid	2.46	Agree
6	High mortality rate as a result of inadequate health facilities.	2.54	Agree
7	Short life span	2.60	Agree
8	Overall poor living conditions	2.26	Agree
9	High degree of breeding and spread of pathogens	2.26	Agree
10	Frequent illness due to exposure to filth and poor environment	2.82	Agree

Source: Researcher's Field Survey, 2023

Table1 contains the impacts of the Bulbula slum environments on health of the residents.

The negative impacts of slum on the health of residents of Bulbula as can be seen from the table based on the responses of the respondents are:

a. Outbreak of diseases due to filth
b. Increase in Health hazards (illnesses and diseases)
c. Rise in Eviction / demolition causing depression and health issues
d. Water contamination causes dysentery, diarrhea, malaria, typhoid
e. High mortality rate as a result of inadequate health facilities.
f. Short lifespan
g. Overall poor living conditions
h. High degree of breeding and spread of pathogens
i. Frequent illness due to exposure to filth and poor environment

Table 2: Impacts of the Bulbula Slum Environment on Social Lives of the Residents

S/N	Item	Bulbula	
		Mean	**Remark**
1	There is high degree of restlessness	2.84	Agree
2	High level of insecurity	2.42	Agree
3	It is hard to bring children under control	**3.04**	**Disagree**
4	Possibility of recreational activity is limited	1.88	Agree
5	There is high level of moral decadence	2.38	Agree
6	Frequent threat of eviction / ejection	2.94	Agree
7	There is high level of Crimes and Social vices	1.96	Agree
8	Social hazards, Prostitution and anti-social activities are on the increase	1.88	Agree
9	Increased fear and tension due to violence	1.90	Agree
10	High level of apathy to government programmes	2.48	Agree

Source: Researcher's Field Survey, 2023

In Bulbula, the following were agreed to be the impacts of Bulbula slum environment on the social lives of the residents:

a. There is high degree of restlessness

b. High level of insecurity

c. It is hard to bring children under control

d. Possibility of recreational activity is limited

e. There is high level of moral decadence

f. Frequent threat of eviction / ejection

g. There is high level of Crimes and Social vices

h. Social hazards, Prostitution and anti-social activities are on the increase

i. Increased fear and tension due to violence

j. High level of apparty to government programmes

Table 3: Impacts of Bulbula Slum Environment on the Economic Lives of Residents

S/ N	Item	Bulbula	
		Mean	**Remark**
1	Poor feeding and inadequate housing maintenance as a result of low household income	2.10	Agree
2	High cost of environmental management due to high degree of deterioration of the environment	2.50	Agree
3	Poor environmental conditions leads to low economic productivity.	2.22	Agree
4	Lack of good health facilities gives rise to high infant and child mortality rates	2.24	Agree
5	Low influx of tourist industries which in turn impact negatively on the residents.	**3.08**	**Disagree**
6	Inadequate financial power as a result of high level of environmental degradation.	2.18	Agree
7	There is Economic stagnation	2.40	Agree
8	Inadequate housing maintenance	2.06	Agree
9	Increasing poverty due to unemployment	2.36	Agree
10	Low property values due to the nature of the slum environment	2.40	Agree

Source: Researcher's Field Survey, 2023

The negative impacts of the Bulbula slum environment on the economic lives of her residents are as follows:
the slum environment impacts her residents negatively through the following ways:

a. Poor feeding and inadequate housing maintenance as a result of low household income

b. High cost of environmental management due to high degree of deterioration of the environment

c. Poor environmental conditions leads to low economic productivity.

d. Lack of good health facilities gives rise to high infant and child mortality rates

e. Inadequate financial power as a result of high level of environmental degradation.

f. There is Economic stagnation

g. Inadequate housing maintenance

h. Increasing poverty due to unemployment

i. Low property values due to the nature of the slum environment

To determine the impacts of the slum environment on the attitude of the residents of the selected slum area to environmental issues the responses of the respondents was analyzed in table 4.

Table 4: Impacts of Bulbula slum environment on attitude of the residents to environmental issues

S/N	Item	Bulbula	
		Mean	**Remark**
1	Poor waste disposal attitude due to inadequate waste disposal facilities	2.20	Agree
2	Poor personal and general hygiene	2.20	Agree
3	There is high level of noncompliance to sanitation rules	2.20	Agree
4	Increased litigation because of avoidable errors	**3.88**	**Disagree**
5	Depression, low self-esteem, anxiety as a result inadequate infrastructural amenities.	2.48	Agree
6	Increased degradation of waste disposal facilities due to inadequacy	2.00	Agree
7	The environment is most times littered with wastes	2.06	Agree
8	There is unplanned deforestation and devegetation occasioned by uncontrolled exploitation of environmental resources	2.58	Agree
9	There is indiscriminate dumping of waste	1.76	Agree
10	Sewage facilities are readily filled up	**3.54**	**Disagree**
11	Drainage facilities are blocked with wastes	2.22	Agree

Source: Researcher's Field Survey, 2023

The respondents in Bulbula agreed with the following as the impacts according to the table:

a.   Poor waste disposal attitude due to inadequate waste disposal facilities

b.   Poor personal and general hygiene

c.   There is high level of non-compliance to sanitation rules

d.   Depression, low self-esteem, anxiety as a result inadequate infrastructural amenities.

e.   Increased degradation of waste disposal facilities due to inadequacy

f.   The environment is most times littered with wastes

g.   There is unplanned deforestation and de-vegetation occasioned by uncontrolled exploitation of environmental resources

h.   There is indiscriminate dumping of waste

i.   Drainage facilities are blocked with wastes

The tables 5 and 6 presents the mean scores for the responses of respondents on the general questions on WaSH and DPE and the Five-Point Scale of the general questions on WaSH and DPE respectively.

Table 5: General Questions on WaSh and DPE

S/N	Item	Bulbula	
		Mean	**Remark**
1	What is your main source of portable water supply?	7.34	
2	The main sanitation facilities available in your area is ___?	7.92	
3	What type of dwelling place is your household occupying?	1.90	
4	What is your main waste disposal method?	4.26	
5	What are the available hand washing measures you adopt?	1.34	

Source: Researcher's Field Survey, 2023

Table 6: Five–Point Scale General Questions on WaSH and DPE

S/N	Item	Bulbula	
		Mean	Remark
1	There is Unimproved sanitation facilities (public or shared latrine, open-pit latrine, bucket latrine, pourflush latrine without connection, surface water, and open space)	2.18	Inadequate
2	There is Improved sanitation facilities (connection to a public sewer, connection to a septic system, pourflush latrine, simple pit latrine, and ventilated improved pit latrine)	3.52	Inadequate
3	There is Unimproved facility for hygiene : inadequacy of place for hand-washing and Material for washing hand in households	2.28	Inadequate
4	There is Improved facility for hygiene : adequacy of place for hand-washing and Material for washing hand in households	3.82	Inadequate
5	There is Adequacy of availability of waste bin/disposal facilities in household	4.00	Inadequate
6	There is Availability of adequate housing for residents (number of persons per room per household)	4.08	Inadequate
7	There is Presence of stagnant or sewage water near dwelling or near water sources	2.56	Inadequate
8	There is Presence of good drainages facilities	3.66	Inadequate
9	There is Access to good water portable supply	3.74	Inadequate
10	There is Adequate Health facilities	3.96	Inadequate

Source: Researcher's Field Survey, 2023

Table 7: Rating the Level of Deprivation of various amenities in the slum area

S/N	Item	Bulbula	
		Mean	Remark
1	Power supply	2.94	Inadequate
2	Supply of portable water	2.82	Inadequate
3	Health facilities	2.96	Inadequate
4	Educational facilities	3.14	Inadequate
5	Waste disposal facilities	3.22	Inadequate
6	Drainage facilities	3.04	Inadequate
7	Recreational facilities	3.28	Inadequate
8	Open spaces	2.90	Inadequate

Source: Researcher's Field Survey, 2023

Computation of Slum Deprivation Index (SDI)

From the literature, The first step begins with the estimation of the absolute variation in performance (AVP) which indicates the difference between the highest and the lowest proportion of residents that lack a service variable on each of the DPE and WaSH components across a settlement, as indicated in Equation (1):AVP = max Xijk –Xijk (1).

Where AVP = Absolute Variation in Performance; Xijk = score on a variable (1, 2, 3…) in different locations; Max Xijk = maximum variable score in a location (Akoteyon *et al*, 2021).

The total variation in performance(TVP) is therefore represented by Equation (2):

TVP = max Xijk –min Xijk (2)

From the above equations 1 and 2, SDI can be computed using the expression;

$$SDI = \frac{\sum_{ijk=1}^{n} \bar{x}_{ijk} - \min(\bar{x}_{ijk})}{\left(Max\left(\sum_{ijk=1}^{n} \bar{x}_{ijk}\right) - \min(\bar{x}_{ijk})\right)} \quad (3)$$

and the aggregate of the SDI can be computed using the expression;

$$SDI_{Aggregate} = \frac{\sum_{ijk=1}^{n} SDI_{ijk}}{n} \quad (4)$$

where n is the number of SDIs computed.

Table 8: presents the rating of the Slum Deprivation Index for the three selected slums under study and the aggregate Slum Deprivation Index for all put together.

Table 8: Rating of SDI for Bulbula slum area

SDI	Bulbula
Power supply	0.59
Portable water supply	0.51
Health Facilities	0.52
Educational Facilities	0.675
Waste Disposal	0.62
Drainage Facilities	0.635
Recreational facilities	0.51
Open Space	0.58
Aggregate SDI	0.58

Pearson correlation of SDI rating of Bulbula and Mean rating of response from Bulbula = 0.892

P-Value = 0.003

Interpretation: The correlation value is 0.892. This correlation value is positive and greater than 0.5. Therefore, high deprivation is leading or has led to poor attitude of the people of Bulbula in terms of attitude to environment. The correlation is significant since its P-value is less than 0.05.
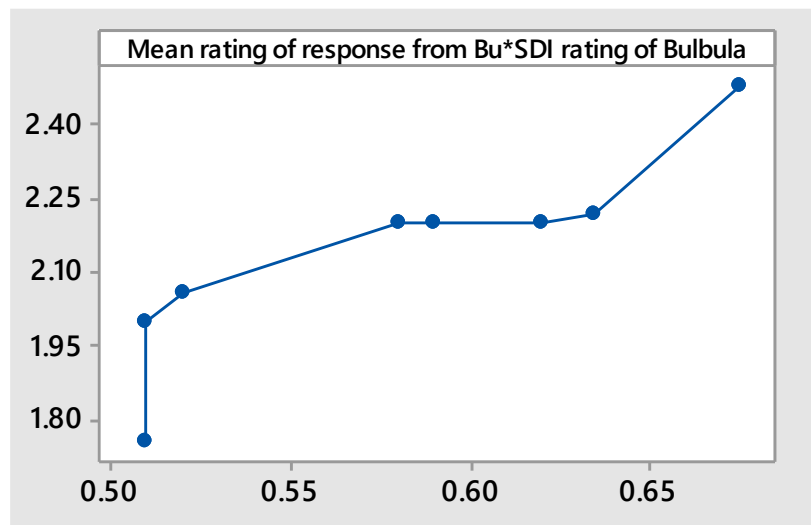

Fig. 3: Scatter Plot of the relationship between the variables

Interpretation: From the scatter plot, it can be deduced that the observations increase from left hand side to right hand side which is an indication of positive relationship between the variables.

Regression model of relationship between SDI and attitude of residents to environmental issues for the slum area

Table 9: Model for Bulbula

Regression Statistics	
Multiple R	0.891659
R Square	0.795057
Adjusted R Square	0.760899
Standard Error	0.101767
Observations	8

In the model summary, the coefficient of determination is 79.5 percent which is an indication that the independent variable can adequately explain the dependent variable.

Table 10: ANOVA for Bulbula

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.241061	0.241061	23.27637	0.002926
Residual	6	0.062139	0.010356		
Total	7	0.3032			

In the output, the P-value of the ANOVA is 0.002926 which is less than 0.05. This implies the model is adequate and can be used for decision making.

Table 11: Intercept Rating for Bulbula

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.41175	0.360022	1.14368	0.026326
SDI rating of Bulbula	2.979742	0.61762	4.824559	0.002926

The P-values of the t-test are less than 0.05 which implies the parameters in the model are significant. The model for Bulbula as slum location is

$y = 0.41175 + 2.979742x$

Where x is SDI and y is the attitude of the respondents to the environment. From the model, it can be observed that the relationship is positive as more deprivation will lead to bad attitude towards environment.

Summary of the Interview Report

In response to the inquiry regarding the primary toilet facilities accessible within the vicinity, it was found that among the respondents residing in Bulbula, 28.57% (four individuals) reported utilizing shared simple pit latrines as their main sanitation option. Additionally, 14.29% (two individuals) indicated that they relied on non-shared simple pit latrines. Furthermore, 7.14% (one individual) reported access to pour flush toilets. Conversely, approximately 50% (seven individuals) acknowledged resorting to open defecation and the use of buckets for their sanitary needs. This finding indicates that open defecation is the predominant form of toilet provision in the community of Bulbula.

Regarding the inquiry on the adequacy and improvement of sanitation facilities, the findings from interviews conducted in Bulbula indicate that 64.29% (9 out of 14 individuals) expressed dissatisfaction, stating that their sanitation facilities are unimproved and inadequate. On the other hand, 28.57% (4 individuals) reported that their sanitation facilities are moderately adequate and have shown improvement. A minority of 7.14% (1 individual) claimed to possess sanitation facilities that are both adequate and improved. This finding indicates that the sanitation facilities in Bulbula are lacking in improvement and are insufficient. Pertaining to the primary waste disposal infrastructure within one's household and its adequacy for proper waste management, the findings from the Bulbula region indicate that a significant proportion of respondents, specifically nine individuals constituting 64.29% of the sample, expressed dissatisfaction with the sufficiency of their waste disposal facility. Conversely, a larger number of participants, six individuals accounting for approximately 42.86%, reported the absence of a designated main household waste disposal facility.

Inquiring about the nature of the residential accommodations of your household, the prevailing style of dwelling observed in Bulbula was a one (1) or two (2) room batcher, which accounted for approximately 42.86% of the documented cases, accommodating around six (6) individuals.

The investigation on the primary way of home waste disposal was conducted, with a total of seven individuals providing responses. The findings indicate that a majority of approximately 50% favored the utilization of bush and burning as the main approach to waste disposal in the Bulbula area. In response to the inquiry on the hand washing measures employed, it was found that at Bulbula, a total of 9 individuals, accounting for approximately 64.29% of the sample, reported utilizing water exclusively. Additionally, 3 individuals, constituting 21.43% of the sample,

indicated employing both water and soap. Conversely, 2 individuals, amounting to roughly 14.29% of the sample, reported not adopting any hand washing measures.

On the inquiry regarding the adequacy and improvement of household hygiene facilities, a survey was conducted in the Bulbula community. Out of the total sample size of 14 individuals, it was found that 57.14% (8 individuals) expressed dissatisfaction, perceiving the facilities as unimproved and inadequate. On the other hand, 14.29% (2 individuals) reported a moderate level of satisfaction, considering the facilities to be fairly adequate and improved. Lastly, 28.57% (4 individuals) expressed contentment, stating that the facilities were both adequate and improved.

With regards to the responses on the question on the sufficiency of housing availability for residents in the Bulbula area, a sample of 14 individuals was interviewed. Among the respondents, 8 individuals, constituting 54.14% of the sample, expressed the view that the housing availability is inadequate. Additionally, 2 individuals, or approximately 14.29% of the sample, opined that the housing availability is fairly adequate. Similarly, 2 individuals, also accounting for 14.29% of the sample, indicated that the housing availability is adequate.

Considering the average number of individuals residing in a room within one's household, findings from interviews conducted at Bulbula indicate that out of a total of 14 participants, 6 individuals, accounting for 42.86% of the sample, reported an occupancy range of five to six persons per room. Additionally, 2 respondents, constituting approximately 14.29% of the sample, indicated that two individuals typically inhabit a single room.

About the investigation on the existence of stagnant or sewage water in proximity to residential areas or water sources, a survey conducted in Bulbula involved interviews with 14 individuals. Among the respondents, 8 individuals, accounting for approximately 57.14% of the sample, affirmed the presence of such water. Additionally, 4 individuals, constituting 28.57% of the participants, reported encountering stagnant or sewage water periodically. Conversely, 2 individuals, equivalent to approximately 14.29% of the respondents, stated that they did not observe the presence of stagnant or sewage water.

With respect to inquest on the availability and affordability of water supply, a survey was conducted in the Bulbula region. The survey involved interviewing a total of 14 individuals. Out of the respondents, 11 individuals, accounting for approximately 78.57% of the sample, affirmed that they have access to a good water supply. Conversely, 12 individuals, constituting around 85.71% of the sample, reported that their water supply is not deemed adequate. Additionally, 2 individuals, representing approximately 14.29% of the sample, expressed satisfaction with the adequacy of their water supply. Lastly, 3 individuals, accounting for approximately 21.43% of the sample, indicated that they do not have access to a good water supply.

On the inquest concerning the primary source of portable water supply, data collected from interviews conducted in Bulbula revealed that out of the total sample size of 14 individuals, 4 respondents, constituting approximately 28.57% of the participants, reported relying on public piped taps. Additionally, 3 individuals, accounting for 21.43% of the sample, indicated that they obtain their portable water from open dug wells. Another 3 participants, representing approximately 31.43% of the respondents, reported relying on harvested rainwater as their main source of portable water. Lastly, 4 individuals, constituting about 38.57% of the sample, stated that they obtain their portable water from water vendors.

Regarding the inquiry pertaining to the availability of a minimum of 20 liters of enhanced water on a daily basis, could you please confirm whether such access is at your disposal? In the Bulbula study, a total of 14 individuals were interviewed. Among the respondents, 5 individuals, accounting for 35.71% of the sample, expressed agreement, while the remaining 9 individuals, or around 64.29% of the sample, indicated disagreement.

Considering the investigation on the adequacy of electricity supply situation in your locality. In the Bulbula study, a total of 14 individuals were questioned. Among these participants, 13 individuals, accounting for approximately 92.86% of the sample, expressed their dissatisfaction with the level of adequacy and consistency. Conversely, one participant, representing 7.14% of the sample, reported no issues in this regard.

On the question "do the existing health facilities meet the required standards?",At Bulbula, a total of four individuals, accounting for approximately 28.57% of the participants, responded affirmatively. Conversely, ten individuals, including approximately 71.43% of the respondents, expressed a negative response.

On the issue of rating of the adequacy of the educational facilities within your vicinity. In the Bulbula study, a total of 14 individuals were interviewed. Among these participants, 8 individuals, accounting for about 57.14% of the sample, expressed their perception as inadequate. Additionally, 2 individuals, representing 14.23% of the sample, reported their perception as fair. Similarly, 2 individuals, comprising approximately 14.29% of the sample, indicated that the situation was adequate.

Pertaining to the availability of sufficient waste disposal facilities, a total of 14 individuals were interviewed at Bulbula. Among these respondents, 12 individuals, constituting around 85.71% of the sample, expressed their dissatisfaction with the current waste disposal facilities, deeming them inadequate. Conversely, 2 individuals, accounting for 14.29% of the participants, said that the waste disposal facilities were fair.

Considering the adequacy of the existing drainage systems in your locality, all 14 individuals who were interviewed, constituting 100% of the sample, reported experiencing inadequacy at Bulbula. On the issue of rating the adequacy of recreational facilities, at Bulbula a total of 14 individuals were interviewed, all of them, representing 100% of the sample, expressed their perception of inadequacy. While about the investigation on the adequacy of open spaces, a total of 14 individuals were interviewed at Bulbula. Among these participants, 2 individuals, accounting for approximately 14.29% of the sample, responded affirmatively. Conversely, 9 individuals, representing 64.29% of the sample, indicated a negative response. Additionally, 3 individuals, comprising approximately 21.43% of the sample, expressed uncertainty by stating that they did not know.

DISCUSSION OF FINDINGS

Overcrowding is a common issue in slums worldwide, leading to poor living conditions, increased health risks, and limited access to basic services (Owoeye and Adedeji, 2013). Chandramouli (2003) in his study of the demographic characteristics of Chennai slum supported large family sizes in slums, this was affirmed by the data of the slum residents in Bulbula. It also agrees with the findings by some earlier researchers with related interest of study like Prasad & Singh (2009). The negative impacts of slum environment on the health of residents of all the three selected slum areas are significantly the same and include: Outbreak of diseases due to filth; Increase in Health hazards (illnesses and diseases); Increase in Heat stress, air pollution or carbon emission; Rise in Eviction / demolition causing depression and health issues; Water contamination causes dysentery, diarrhea, malaria, typhoid; High mortality rate as a result of inadequate health facilities; Overall poor living conditions; High degree of breeding and spread of pathogens; and Frequent illness due to exposure to filth and poor environment. This affirms the findings Nwaka (2005) and Unger & Riley (2006) who indicated that inadequate provision of safe water and improper management of wastes are major factors leading to the widespread of diseases. Also Ola (2011) found that poverty result in the very poor health conditions of the residents of slum areas due to exposure to pollution of different forms.

From the analyses of the SDI for water supply, health facilities, educational facilities, waste disposal facilities, drainage facilities, recreational facilities and open spaces it was found that all the three slum areas being studied are deprived of all these facilities, though at various degrees. Authors like Gurmit (2012); Funmilayo (2012); Owoeye and Adedeji (2013) and Yussuf *et al*, (2014) who studied slums earlier supported this finding.

The slum environment has various negative health impacts, including disease outbreaks, health hazards, and water contamination. These health risks are prevalent in slums globally due to inadequate sanitation and healthcare facilities. Akinwale (2018), opined that the health effects of

slum environments on the slum dwellers are numerous and increasing with increased neglect of the slum areas. According to him, they usually lack basic infrastructural facilities and are characterized by very poor environmental conditions.

Ezenwa *et al* (2013), affirmed that a significant relationship exists between slum characteristics and crime rates this was also supported by Izobo *et al*, (2014). Slum environments contribute to social challenges such as insecurity, moral decay, and high crime rates. These social issues are often observed in slums worldwide, where lack of proper infrastructure and services can lead to social instability (Akinyinka, 2020). Slum living environment results in economic challenges like poor income, unemployment, and inadequate housing maintenance. Economic hardships in slums are a global concern, as residents often lack access to formal employment and face barriers to economic mobility (Madhusoodhanan, 2008; Sen, 2007). Economic impacts of the slum environment vary among residents of the selected slum areas. This variation mirrors the diverse economic challenges faced by slum dwellers worldwide.

CONCLUSION AND RECOMMENDATION
Conclusion

From the findings of this study, the following conclusions were made:

1. Negative impacts of slum environment on the health of residents include but are not limited to: outbreak of diseases due to filth; increase in health hazards (illnesses and diseases); increase in heat stress, air pollution; water borne diseases like dysentery, diarrhea, malaria, typhoid as a result of water contamination; high mortality rate as a result of inadequate health facilities; general poor living conditions; high degree of breeding and spread of pathogens; and Frequent illness due to exposure to filth and poor environmental sanitation.

2. The identified impacts of slum environment on the social lives of the residents are: high degree of restlessness; high level of insecurity; it is hard to bring children under control; limited possibility of recreational activities; high level of moral decadence; frequent threat of eviction / ejection; high level of crimes and social vices; social hazards, prostitution and anti-social activities are on the increase; increased fear and tension due to violence; and high level of apathy to government programmes.

3. The negative impacts of that slum environment on the economic lives of residents of the slum area includes: poor feeding and inadequate housing maintenance as a result of low household income; high cost of environmental management due to high degree of deterioration of the environment; poor environmental conditions leading to low economic productivity; lack of good health facilities which gave rise to high infant and child

mortality rates; inadequate financial power as a result of high level of environmental degradation; economic stagnation; inadequate housing maintenance; increasing poverty due to unemployment; and low property values due to the nature of the slum environment

4. The slum environment was found to affect the attitude of the residents of the slum area to environmental issues in the following ways: poor waste disposal attitude due to inadequate waste disposal facilities; poor personal and general hygiene; high level of noncompliance to sanitation rules; depression, low self-esteem, anxiety as a result inadequate infrastructural amenities; increased degradation of waste disposal facilities due to inadequacy; littering of the environment with wastes; unplanned deforestation and devegetation occasioned by uncontrolled exploitation of environmental resources; indiscriminate dumping of waste; and blocking of drainage facilities with wastes.

5. The general computation of the SDIs considering all the facilities being investigated is 0.6481 this confirms that the slum area is deprived of the various facilities.

6. The Slum Deprivation Index (SDI), is directly proportional to poor attitude of residents to environmental issues. The increase in deprivation is leading or has significantly led to poor attitude of the inhabitants of the slum area to environmental issues like: environmental sanitation, waste disposal.

Recommendations

From the result of the analyses of the generated data, the observation and literature studies, the following recommendations have been put forward:

a. Academic development of the slum dwellers should be intensified as this will improve their understanding of the dangers of a filthy environment to their health and general well-being, hence they will become proactive and not always wait on the government to spoon feed them in the area of environmental sanitation.
b. There is need for increased awareness campaign in these slum areas and collaboration with nongovernmental bodies in project execution in these areas to give them a better live.
c. The government and non-governmental agencies including international donors should be involved in improving the environmental condition of these slum areas by providing the necessary amenities as this will go a long way in changing their orientation about the environment and also improve their attitude towards environmental sanitation.
d. Environmental Sanitation should be intensified in these slum areas to mitigate the negative impacts of the dirty environments on the health of the residents.
e. Family planning programmes should be encouraged to educate the inhabitants on the importance of having a manageable family size and through this population growth will be

controlled, social vices will be limited and overuse/over stretching of available facilities in the future will be taken care of.

f.   Programmes and or project to alleviate poverty and improve the socio-economic status of the residents of the area should be adopted to enhance the economic and social life of these slum dwellers.

g.   As was observed during the interview, where some respondents opined that sometimes government initiate projects that are not in any way of pressing importance to them without their consent, it is recommended that the government and other agencies who may wish to invest in the development of these slum areas should try to get the inhabitants involved as their opinion should be critically absorbed.

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