ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

Assessing Vulnerability and Suitability of Schools Shelters for Flood Displaced Victims in Port Harcourt Metropolis, Nigeria

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DOI: https://doi.org/10.51584/IJRIAS.2025.10030033

Received: 25 February 2025; Accepted: 04 March 2025; Published: 07 April 2025

ABSTRACT

This study assessed the vulnerability and suitability levels of schools as a determinant of their choice as temporary shelters for flood-displaced victims in Port Harcourt Metropolis. The study adopted a quantitative survey approach and used a total of nine hundred and three (903) schools in the study area, made up of private and public schools, which were classified into low, moderate and high vulnerability ans suitability levels using the open space suitability index. The research used descriptive statistics and Nearest neighbour analysis to analyze the data classified into low vulnerability level to determine the site suitability level of the schools in the survey. The result revealed that the distribution pattern of schools was significantly dispersed, while the determinant factors of schools selected as suitable for Internally Displaced Persons (IDPs) camps showed that 86.75% of the classrooms were large; with 66% having between 1 and 5 classrooms. 75% of the schools were safe from being attacked by kidnappers, gunmen, and other vices, with 70% being close to police stations/military bases and 60% close to health centres; 51.8% were accessible by road, with 60% of the schools having potable waters. Whereas this result signified that the majority of the schools (89.16%) could serve as IDP camps for flood disaster victims, it fails to provide measures that could mitigate the effects of disruption to the education of these children that would be displaced by flood victims-in-shelter while occupying there schools, hence the need for continuous education system strategy. It is thus recommended among others that, apart from the provision of more buildings in schools to enable many people to be accommodated during flood disasters, investing in mechanisms that will keep the students from loosing steam in their education at this period is equally important.

Keywords: Flood Disaster, Sustainability, Internally Displaced Persons (IDPs), Shelter, Schools System.

INTRODUCTION

Floods have been identified as one of the most destructive climate change-induced natural disasters in recent times across the globe, usually resulting in a painful and devastating loss of lives and properties, destruction of public utilities, as well as a huge loss to the economy of a nation and the livelihood of the affected people or community (Akukwe, 2014; Akukwe & Ogbodo, 2015; Aguiyi, 2022 & Denchak, 2023). Flood, often described as the inundation or accumulation of water over a normally dry land, is possibly caused by the overflow of coastal or inland waters (like rivers and streams) or by an unusual accumulation of water from heavy or prolonged rains, storm surges, or sudden snowmelt (Denchak, 2023). The impacts of flood especially in Nigeria, be it the fluvial, pluvial, flash, coastal, or urban flood as it's generally classified have continued in frequency and severity over the past decades. Several studies have linked the flood frequency and severity to climate change, which they claim may even increase due to global warming and changing climates (Kesikoğlu,

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

et al., 2013; IPCC, 2022, Lai, 2023). Unfortunately, the school system has always been at the receiving end of flood inundations, most especially in our cities where there are more concentrations of both public and private schools established to cater for the education of the increasing urban population.

In Nigeria, devastating flood events date back to 1963 in Ibadan city when the Ogunpa River was over-flown causing loss of lives and property. These hazardous events reoccurred in 1978, 1980, and 2011, with estimated damages of over 30 billion naira and deaths of over 100 people, thus making Ogunpa River nationally and internationally famous (Adegbola & Jolayemi, 2012; Agbola, et al., 2012). Since the floods of 2012, in which over 603 people were killed, more than 2,400 people were injured, and more than 1.4 million people had to be relocated (NEMA, 2013), the negative stories about flood-affected communities persist. In 2020, flood incidence in Nigeria affected about 40% of the local government areas, and 97% of the states, displacing over 120,000 persons and killing 68 persons aside from the properties and farmlands destroyed (Ogwo, 2022). The 2022 flooding adjudged as the worst ever experienced in Nigeria was reported to have severely affected 31 of Nigeria's 36 states, with over two million persons displaced (Aguiyi, 2022), resulting in the damage of 332,327 hectares of land, along with about 82,035 homes (Maclean, 2022; Oguntola, 2022 & THISDAY, 2023).

The flood situations in the Niger Delta of Nigeria, especially in Rivers and Bayelsa states revealed that most schools were closed down, especially in Bayelsa State because many schools have been submerged by floods (Ogwo, 2022). The report also noted that many school proprietors were out of business during that flood event, and even after the waters had gone down, adequate repairs and/or rebuilding of the essential damaged buildings could not be restored immediately. For this reason, academic activities were often put on hold during flood events, which could be very disturbing considering the well-being of the children and the learning disruptions they face.

Olumide, et al, (2022) noted that the over 200 communities in four local government areas of Rivers State including Ogba/Egbema/Ndoni, and Ahoada West LGAs, who were displaced by Nigeria's ravaging flood of 2020, were yet to fully bounce back when the 2022 flood disaster struck. Several communities and critical infrastructures such as buildings, roads, schools, and healthcare facilities were submerged in flood water. In the Ahoada East Local government area, for instance, the 2022 floods did not only disrupt normal daily activities, about 22 public and private schools were submerged by flood in more than 15 villages. All across Rivers State as in other critically impacted states by the perennial Nigeria urban floods, this situation affected educational activities, putting access to education in the state and other parts of the country in a mess by grounding education and jeopardizing the future of many youths who could not continue to have access to education in the affected states across the federation. (Nwiyii, et al, 2022; Olumide, et al, 2022; Bell-Gam, 2023, UNICEF, 2024).

For the 2024 floods, the Work Bank on 15 October 2024 reported that about 10 million children across four countries in West and Central Africa - Nigeria, Mali, Niger, and the Democratic Republic of the Congo (DRC) - were currently out of school due to massive regional flooding, which has damaged and destroyed infrastructure and displaced nearly one million people from their homes (Save the Children, 2024; UN-OCHA, 2024 & World Bank, 2024). The report further showed that the unprecedented heavy rains across these countries have created a worsening education crisis with the damage or destruction of schools, the occupation of school buildings by displaced families, and the displacement of families away from schools.

The report by Save the Children (2024) further disclosed that over 10 million children were stuck at home or displaced due to floods in addition to about 36 million children estimated already to be out of school in the four countries due to conflict and poverty, out of which over 20 million are in Nigeria. This implied that while the back-to-school season was expected to start at the end of September in the sub-region, all four countries had masses of their children missing out on the start of the school year (UNESCO, 2024). Similar reports by Save the Children (2024) and UNHCR (2024) showed that in Nigeria, at least 3 million children are reported to be out of school in Borno state, with 2.2 million children newly out of school due to statewide closures from flooding. This was coming in the heals of the heavy rains that have affected about 31 of Nigeria's 36 states

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

over the past month, killing 269 people and forcing 640,000 people from their homes (Save the Children (2024); UNICEF, 2024, & World Bank, 2024).

Port Harcourt Metropolis in particular, known for its peculiar low terrain, with local environmental characteristics like soil, geology, vegetation, climate, drainage, and land use, coupled with its rising urbanization, making it susceptible to massive flooding across the city especially during the rainy season. Schools, both public and private ones, which are located in different areas of the metropolis, often have their school premises submerged by floods, and in most of the cases, the schools may not be accessible depending on the intensity of the flood at that location and as a result, the school are shut down temporarily (Rivers State Ministry of Education, 2022). Reports on the areas that are often mostly affected by floods in the metropolis indicate places like parts of Rukpokwu, Olu Obasanjo, Rivers State University roundabout, NTA Road, Nkpolu, Rumuogba, and Woji areas. At such time, many roads became impassable, leaving numerous vehicles stranded and cutting off access to essential services including schools. (Nwosu, 2023). Unfortunately, as the flooding intensifies, the available schools not submerged by the flood are often designated as temporary shelters and camps for displaced flood victims, thus leading to a complete suspension of all academic activities for that period.

Despite the perennial and annual occurrence of flooding and the enormous risks associated with each round of flooding, not many studies have been devoted to the location or site vulnerability and suitability level as one of the key determinants of the exposure of both the public and private schools to flooding and its associated effects on their sustained functioning in the study area. This present study sought to fill the gap by assessing the suitability level as a determinant of the choice of schools as temporary shelters for flood-displaced victims in the Port Harcourt metropolis. The key objectives among other things were to identify and examine the location characteristics of the schools in the study area; examine the factors that make schools suitable; classify schools into different suitability levels to shelter flood-displaced victims, while evaluating to what extent this aligns with the checklist for best practices in planning a shelter for displaced disaster victims using schools in Nigeria.

Concepts of Flood Vulnerability, Suitability Level, and Emergency Shelter (e.g. Schools, Camps) for Displaced Victims of a Disaster

Suitability refers to the state or quality of being satisfactory or in accord with what is desired or appropriate. Suitability Analysis is therefore used to rank and score sites based on multiple weighted criteria, and uses ranking based on data variables from a given or installed dataset with site attributes (Tsioulou et al, 2021). The outcome of this analysis is the Suitability levels or classes, which are divisions of suitability orders that show the degree of suitability and are usually classified into highly suitable (HS), suitable (S), moderately suitable (MS), not suitable (NS). Vulnerability on the other hand, which comes from the Latin word for "vulnus" or "wound", refers to the state of being open or exposed to attack, injury, damage, or loss. In the context of different hazards or disasters therefore, some groups are more susceptible (i.e. vulnerable) to damage, loss, and suffering than others, and likewise (within these groups) some people could experience higher levels of vulnerability than others (Wisner et al., 2004). According to UNDRR (2017) and Iorhen (2021), a vulnerability could be in the form of physical, economic, social, and attitudinal vulnerability, which are used to describe how communities are at-risk of disaster (Eludoyin & Weli 2011 & Komolafe, et al, 2020).

The rationale and importance of including vulnerability in our understanding of disaster risk, as well as in the determination of the suitability level of a place or facility to shelter displaced disaster victims harp on the acknowledgment that disaster risk not only depends on the severity of hazard or the number of people or assets exposed but that it is also a reflection of the susceptibility of people and economic assets to suffer loss and damage (UNDRR, 2017). In this study, while exposure simply refers to the predisposition of a system (e.g. the school system) to be disrupted by a flooding event due to its location and other socio-dynamic factors in the area, Disaster risk is conceived as the consequence of the interaction between a hazard and the characteristics that make people and places vulnerable and exposed, in which case, vulnerability is thrown up as the fourth components of disaster risk (UNDRR, 2017).

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

It is to be noted also that, with the way that vulnerability changes over time, because many of the processes that influence vulnerability are dynamic, including rapid urbanisation, environmental degradation, and demographic change, etc, assessing the vulnerability of the built environment (schools in this case) to hazards, is extremely important in assessing the potential consequences of an event and for mainstreaming disaster risk reduction into the local development planning process (UNDRR, 2017; Echendu, 2021, & Dan-Jumbo, et al. 2018). This is also against the background that, any effort that is geared towards reducing exposure to vulnerability could ultimately result in disaster risk reduction, and as such the effects of flooding on the school system could be mitigated. This implies that if we reduce vulnerability and leverage on site suitability, risk exposure and impacts on most of the schools especially in our cities will reduce in the event of say, a flood disaster.

In an emergency, the urgency to provide and evacuate to a temporary shelter for the people affected by a disaster is very important. From the perspective of disaster management and humanitarian operations, 'a shelter is meant to provide safety and protection from different types of weather conditions, such as rain, wind, heat, cold and dangerous animals' (Anhorn & Khazai, 2014). Apart from this, it could be a temporary place to keep belongings, while also serving as a place to rest and carry out day-to-day activities in the meantime. Such emergency shelters could be a hasty, semi-permanent, and permanent, or a temporary shelter, temporary housing, and permanent housing. With the focus of this study on the use of schools as temporary shelter, the concept of a temporary shelter is hereby described as short-term housing solutions provided to internally displaced persons, to meet immediate needs in emergencies (Félix et al., 2013; FEMA, 2013 & UNHCR, 2020).

Whichever form of shelter is considered ideal in the event of an emergency, the provision of emergency centers according to Anhorn & Khazai (2014); WHO (2019) & Anthony et al, (2019) therefore critical to response and victims management after a disaster, and equally serves as an important measure to improve the disaster prevention and mitigation capabilities of a country, region, state or community (Geng, et al 2021). However, Emergency planners and humanitarian professionals involved in disaster management and disaster victims management can greatly benefit from a sound methodology deploying a scientific approach that identifies suitable shelter areas and sites where shelter services need to be cited or improved. One of these scientific approaches and methodologies according to Anhorn & Khazai (2014) is to rank the suitability of identified or proposed spaces for contingency planning and placement of shelter during and in the immediate aftermath of a disaster.

For instance, the analysis of the Open Space Suitability Index (OSSI) involves the use of a qualitative and quantitative evaluation criterion usually based on network analysis along with other elements to determine possible shelter sites (Franchin, et al 2006). For this purpose, (Eludoyin & Weli, 2011; Ndimele, et al 2024 & Adekiya, et al 2024), the Geographic Information System (GIS) is used to showcase the spatial patterns of shelter demand. For this particular study on the determinant of the suitability levels of schools designated as shelters for flood disaster displaced victims in Port Harcourt Metropolis, a lucid combination of both qualitative evaluation and quantitative criterion was used.

MATERIALS AND METHODS

The Study Area

Port Harcourt, the administrative, industrial, and economic hub of Rivers State Nigeria, served as the location for this study. It was selected because of its susceptibility to flood hazards because the Metropolis has rapidly expanded with the establishment of several schools in its various neighbourhoods to serve the growing and geographically spread-out population. The area is geographically located between latitude 4º 42'and 4º 49' North of the equator and between 6º 55' and 7º 08' East of the prime meridian **(**Figure 1). The yearly temperature in Port Harcourt is 26.55 °C (79.79 °F) and it is -2.91% lower than Nigeria's averages. Rivers typically receive about 330.36 millimeters (13.01 inches) of precipitation and has 304.91 rainy days (83.54% of the time) annually. This increased/prolonged rainfall is the foremost and direct cause of flash floods in Port Harcourt city, while other influences such as surface modifications which reduce the infiltration rate also heighten all the flood forms (Ologunorisa, 2009; Akpokodje, 2010 & Akukwe, 2014).

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

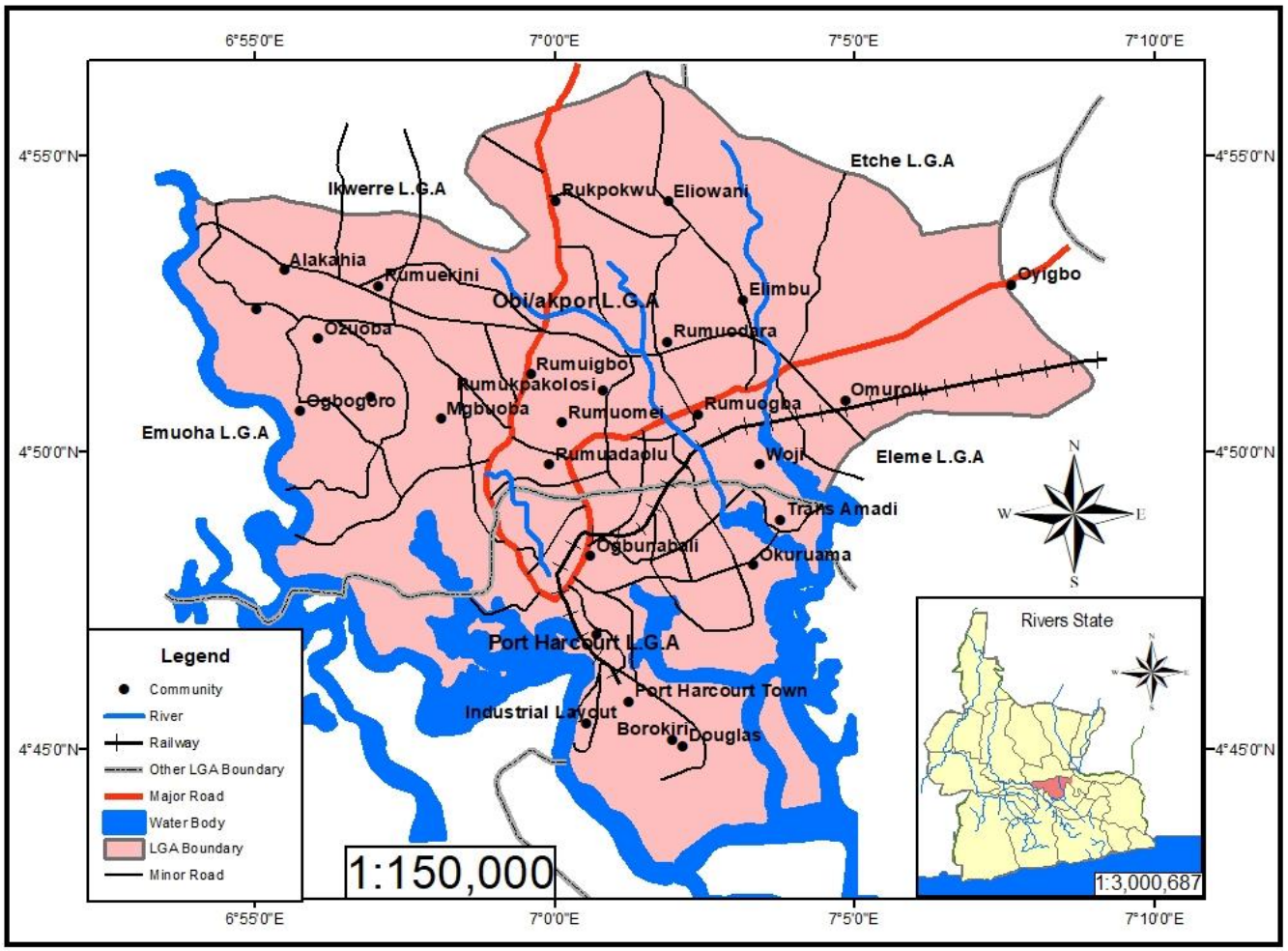

Fig. 1 Port Harcourt Metropolis.

Source: Adopted from Olerum et al. (2021).

Nature and Source of Data

The nature and source of data used in this research consisted of both primary and secondary data. While the primary data were mainly results of the questionnaire survey and computed suitability level used to classify schools into low, medium, and high suitability levels. 83 copies of the questionnaire were served on the head of schools in the survey with all returned completed and used for the analysis. The secondary source of data included the administrative map of the study area, reports on the situation of each private and public schools from Anhorn & Khazai (2014) and Rivers State Ministry of Education, (2022), the internet, LGA Documents, journals, newspaper, textbooks etc. The data obtained from the Rivers State Ministry of Education provide the list of approved schools and there location in the metropolis, which were useful for determining the suitability levels of the schools.

Method of Data Analyses

Hypothesis 1 which states that the pattern of distribution of public schools is random was analyzed using the Nearest Neighbour (Rn) statistics (Equation 1).

$$Rn = \frac{\bar{D}(Obs)}{0{\cdot}5\sqrt{\frac{a}{n}}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Equ. 1}$$

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

Where:

Rn = nearest neighbour value

A = Area under study

N = Total Number of Points

$\bar{D}(Obs)$ = Mean Observed nearest neighbour Distance

The nearest neighbour (Rn) provides for clustering result when Rn = 0 - 0.8,

For random result, when Rn = 0.8 - 1 and for regular result when Rn = 1 - 2.15

The results showed whether the pattern of public schools is random, dispersed/regular, or clustered. A random pattern suggests that the schools can be found anywhere while a clustered pattern indicates the presence of local factors precipitating the distribution.

Suitability Analysis of School as Shelter for Internally Displaced People (IDP)

The schools that were categorized into low flood vulnerability levels were those selected for the possible role of providing suitable shelter for flood-displaced people in the study area. The criteria and weights for these techniques are obtained using the practitioner's knowledge and geospatial datasets (Yang, et al 2023 & Adekiya,et al 2024). For this study, criteria employed were classroom size, availability of sanitary facilities, conditions for habitation in terms of shelter before and after flood disaster, immediate environmental safety, accessibility by road, satisfaction of living environment, sources of drinking/potable water, building types in the school compound, number of classroom, regular supply of electricity, sources of power/energy, types of road (tarred or untarred), proximity to health facility, and proximity to police station/military base. These criteria or factors were weighted and used to generate the suitability classes of low, moderate, and high to classify the schools in the study location.

For the determination of the suitability levels in this study, the rationale was to ensure that schools chosen for shelter would guarantee low vulnerability. Hence, all the schools sampled in the study area which comprise both public and private schools were categorized into low, moderate, and high flood vulnerability levels. Out of the total number of schools in the study area, the 83 schools that fall within the low flood vulnerability levels category were those purposively selected for the possible role of providing suitable shelter for flood-displaced people in the study area.

RESULTS

The analysis of the result provided in this session was based on the survey of the 83 schools that fell within the category of low suitability from among all the schools located in the study area and listed for this study. These schools are of two major types namely public and private schools. Based on the official list of the 903 approved schools in the study area by the government (Rivers State Ministry of Education, 2022), 86.6% of the schools were private schools, while the remaining 13.4% were public schools, which indicates that private schools were far more than public schools in the study area. (Table 1). The spatial distribution of these schools is displayed in Figure 2.

Table 1: Distribution of Schools as Public and Private Schools

School Category	Frequency	Percentage (%)
Public Schools	782	86.6
Private Schools	121	13.4
Total	903	100.00

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

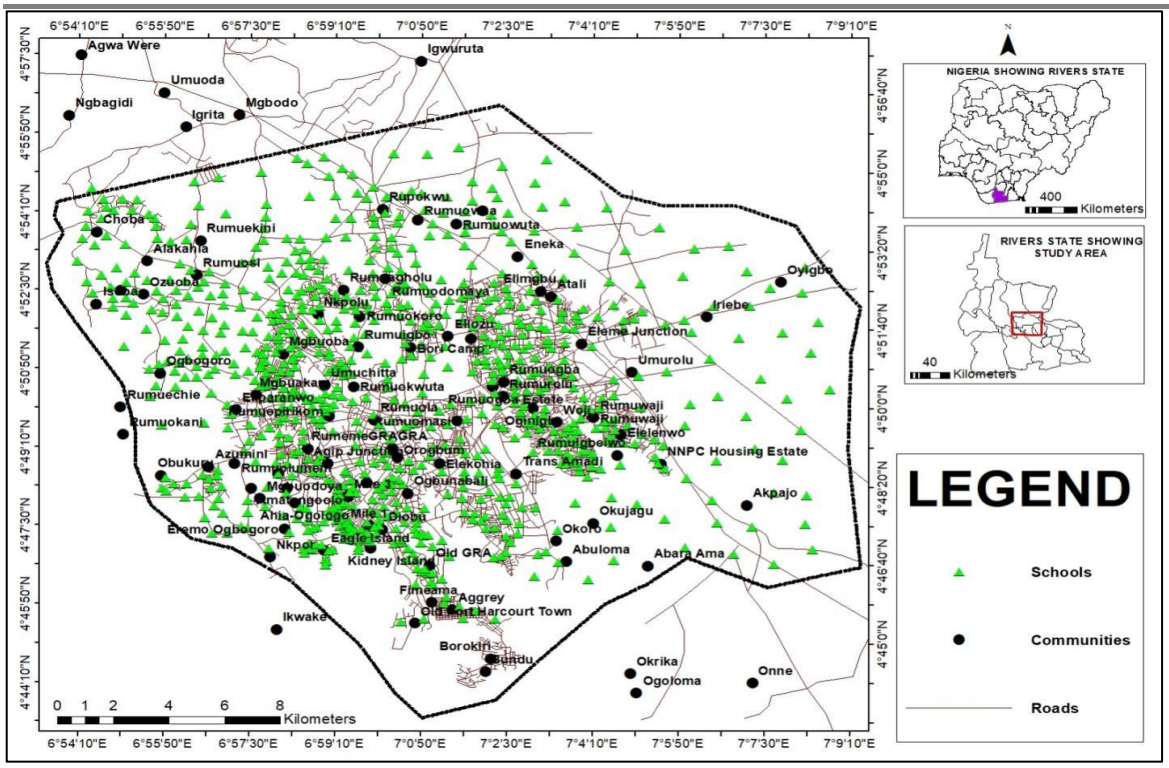

Fig. 2: The spatial distribution of Schools in the study area

Figure 3 shows the level of the distribution pattern of the schools in which the nearest neighbor analysis reveals that the pattern of distribution was dispersed (Z=3.83; p=0.000). This suggests that schools were significantly present everywhere in the study area (Table 2).

Table 2: Average Nearest Neighbor Summary

Items	Values
Observed Mean Distance:	407.6311 Meters
Expected Mean Distance:	381.3517 Meters
Nearest Neighbour Ratio:	1.068911
z-score:	3.825398
p-value:	0.000131

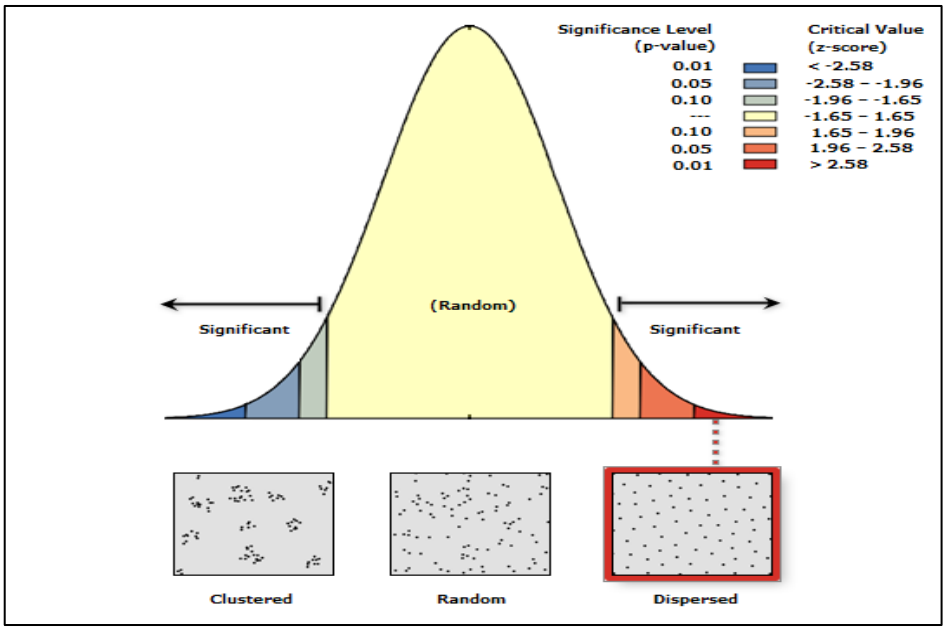

Fig 3 Level of distribution of schools in the study area

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

Against the background of the checklist for determining the suitability of schools as temporary shelters or camps for flood internally displaced victims in the study area (Table 3), the results showed that 13.25% of the low flood-vulnerable schools had classroom sizes less than or equal to $300m^2$, those between $301m^2$ and $600m^2$ were 33.73% of the classrooms. Furthermore, 32.53% of the classrooms had sizes between $601m^2$ and $900m^2$ while 20.48% had sizes greater than $900m^2$. It is a fact that the larger the size of the classroom, the higher the number of persons that it can accommodate. So, the situation in the study area showed that the majority (86.75%) of the classrooms were large, hence the probability or tendency for them to accommodate many displaced persons.

The sanitation facilities analyzed showed that 6.02% did not have a toilets; 36.14% had pit toilets; 2.41% had flush toilets; and 14.46% had composting toilets. Water closet toilet recorded 30.12% and each of urinals, lavatories, and pressure-assisted toilets had 1.20%. This shows that pit toilets and water closets were dominating sanitary facilities in the school. Concerning the conditions for habitation in terms of shelter before and after the flood disaster, it is shown in the analysis that the conditions of 20.48% were good, 24.0% were fair, 46.99% were poor and 8.43% showed no change in condition. The immediate safety of the classroom against kidnapping and other vices was analyzed and it was discovered that 19.28% were not adequate, 34.94% were adequate, 25.30% were fairly adequate and 20.48% were highly adequate. This showed that more than 75% of the schools were safe against being attacked by kidnappers, gunmen, and other vices.

The analysis of the road accessibility level of schools revealed that 13.25% were not accessible by road, 34.94% were lowly accessible, 36.14% were moderately accessible and 15.66% were highly accessible. Since the quality or state of road accessibility to the schools was also considered as a factor for suitability, findings revealed that 83.13% of the schools had access to the tarred roads while 16.87% did not. The implication is that most of the schools would be accessible during a flooding disaster. The analysis of the living environment reveals that 59.04% of the schools had a satisfactory living environment while 40.96% had an unsatisfactory level of living environment. The common sources of drinking water reveal that 32.53% had access to boreholes, 28.92% were accessible to protected wells, 16.87% made use of rivers/streams and unprotected wells were made use by 21.69%. Thus, more than 60% of the schools in the study area had potable water that can prevent the distribution of contagious diseases. The building types analyzed showed that 21.69% of the schools had bungalows, 18.07% had storey buildings, 7.23% had semi-detached, 12.05% had halls while 32.53% had classrooms and 8.43% had laboratories.

The number of classrooms in the schools revealed that 65.06% of the schools had between 1 and 5 classrooms, 18.07% had between 6 and 10 classrooms, 8.43% had between 11 and 15; 6.02% had between 16 and 20; while 2.41% had over 20 number of classrooms. It can be seen that very few schools had enough classrooms that could serve as accommodation for the displaced people. The analysis of the presence of a regular supply of electricity also revealed that 21.69% agreed to have electricity regularly while 78.31% had no regular supply of electricity. Concerning the sources of power in the study location, it is shown that 9.64% made use of Solar, 7.23% made use of battery, 60.24% relied on generating set, none used coal while 3.61% used kerosene and 19.28% relied on hydroelectricity which supposed to be the most reliable source of electricity in the study area.

The analysis of the proximity of schools to health facilities showed that none of the schools had health facilities on site. 6.02% of schools were between 1km and 5km distance to the nearest hospitals, 31.33% were between 6km and 10km away, and 12.05% were between 11km and 15km away; while 42.17% were between 16 – 20km away, while 8.43% of the schools were more than 20km away from the nearest health care center. The implication of this is that the majority (>60%) of schools had a minimum distance of 6 km from the nearest health centre. The proximity to a police station/military base is another factor that was considered for the suitability of schools for internally displaced people during and after flood disasters. The analysis revealed that no military base was found within the schools, whereas 7.23% of the total schools were between 1km and 5km from the nearest military base. It was also observed that 16.87% of schools were found between 6km and 10m, 46.99% were found between 11km and 15km; 22.89% were found between 16km and 20km while 6.02% of the total schools were at a distance of more than 20km to the nearest military base/police station.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

Table 3: Factors or determinants that make schools suitable for Flood Internally Displaced Victims Camps in the study area

Suitability Factors and Determinants	**Frequency**	**Percentage (%)**
Classroom Size (sq m)		
≤ 300	11	13.25
301-600	28	33.73
601-900	27	32.53
≥ 900	17	20.48
Total	83	100.00
Sanitary Facilities		
No Toilet	5	6.02
Pit Toilet	30	36.14
Flush toilet	2	2.41
Composting toilet.	12	14.46
Septic Tank	5	6.02
Water Closet	25	30.12
Urinals	1	1.20
Lavatories	1	1.20
Pressure Assisted Toilets	1	1.20
Waterless Dry Sanitation Toilet	1	1.20
Total	83	100.00
Conditions for habitation in terms of shelter before and after flood disaster		
Good	17	20.48
Fair	20	24.10
Poor	39	46.99
No Change in Condition	7	8.43
Total	83	100.00
Immediate safety		
Not adequate	16	19.28
Adequate	29	34.94
Fairly adequate	21	25.30
Highly adequate	17	20.48
Total	83	100.00
Accessibility by Road		
Not Accessible	11	13.25
Lowly Accessible	29	34.94
Moderately Accessible	30	36.14
Highly Accessible	13	15.66
Total	83	100.00
Access Road Characteristics		
Types of road		
Tarred	69	83.13
Untarred	14	16.87
Total	83	100.00
Living environment		
Satisfactory	49	59.04
Unsatisfactory	34	40.96
Total	83	100.00
Common Sources of Drinking Water		
Borehole	27	32.53
Protected Well	24	28.92

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

River/Stream	14	16.87
Unprotected Well	18	21.69
Total	83	100.00
Building Characteristics		
Building Types		
Bungalows	18	21.69
Storey building	15	18.07
Semi-Detached	6	7.23
Halls	10	12.05
Classrooms	27	32.53
Laboratories	7	8.43
Total	83	100.00
Number of Classrooms		
1-5	54	65.06
6-10	15	18.07
11-15	7	8.43
16-20	5	6.02
Over 20	2	2.41
Total	83	100.00
Presence of Regular Supply of Electricity		
Yes	18	21.69
No	65	78.31
Total	83	100.00
Sources of Power		
Solar	8	9.64
Battery	6	7.23
Generators	50	60.24
Coal	0	0.00
Kerosene	3	3.61
Gas	0	0.00
Hydroelectricity	16	19.28
Total	83	100.00
Proximity to health facility (km)		
On-site	0	0.00
1-5	5	6.02
6-10	26	31.33
11-15	10	12.05
16-20	35	42.17
Greater than 20	7	8.43
Total	83	100.00
Proximity to Police Station/Military Base (km)		
On-site	0	0.00
1-5	6	7.23
6-10	14	16.87
11-15	39	46.99
16-20	19	22.89
Greater 20	5	6.02
Total	83	100.00

Furthermore, the suitability levels of schools in the study area are shown in Table 4. From the analysis, 10.84% of the total schools were of low suitability, 51.81% had moderate suitability and 37.35% were highly suitable for internally displaced persons by flood in the study area. It is thus discovered that the majority of public and private schools sampled in Port Harcourt could serve as places of abode during flood crisis or disaster.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

Table 4: Suitability Levels of Schools in Port Harcourt

Port Harcourt Metropolis	Frequency	Percentage (%)
Low	9	10.84
Moderate	43	51.81
High	31	37.35
Total	83	100.00

On the perception that there ought to be prior notification, preparedness and planning measures to be put in place in Schools chosen as temporary shelters for flood victims (Table 5), the survey reveals that while 48.2% rooted for a long time notification to the school management, 42.6% went for a short time notification, and only 9.2% saying that there is no need for prior notification before the displaced persons by flood in the study area are sheltered in the schools during, and after flood crisis or disaster.

Table 5: Prior notification, preparedness and planning of Schools as IDPs of flood victims

Period of Notification	Frequency	Percentage (%)
Long time notice	40	48.2
Short time notice	35	42.6
No prior notice	8	9.2
Total	83	100.00

On the implication of the above notification on the impact on the school system, in terms of affecting the school calendar, thereby bridging the teaching and learning in these schools due to lack of time of notification, preparedness, and planning of Schools as IDPs ahead bringing in the flood victims, 41.4% Strongly Agreed, 52.1% Agreed; 5.2% disagreed, and none for Strongly disagreed, while the rest 1.3% said that they don't know whether the time of notification should be long, short or no notice at all.

DISCUSSION

The distribution pattern of schools was dispersed. This means that they are relatively distributed all over the entire study area. This could be attributed to the fact that Port Harcourt Metropolis has rapidly expanded and schools have been established in various neighborhoods to serve the growing and geographically spread-out population. Schools are often built where land is available (which may not always be in central locations) and in response to local community demands (ensuring that education is accessible to students in different neighborhoods) leading to a dispersed distribution. Also, the location of schools is influenced by infrastructure development like roads and utilities.

Private schools were observed to be more in number than the public schools in the study area. The reason could be attributed to the better performance of most of the private schools when compared to public schools. This presence of more private schools was affirmed in the Nigeria Education Data Survey (2015) where two-thirds of parents with children in a government school identified school proximity as the main reason, while parents with a child in a private primary school said the decision was based on quality, suggesting dissatisfaction with government schools (NEDS,2015). This finding corroborates the earlier work of Anderson, et. al (2017), where most parents chose private schools to public schools. Furthermore, it has been found that parents perceived private schools to be working harder even as in (Walford, 2017) though they are a lot more expensive than free public education, with adequate facilities and delivering more teaching (of whatever quality) than government schools.

The classrooms, sanitary facilities, drinking water, and roads linking the schools were not adequate. This aligns with the work of Asiyai (2011) who asserts that the maintenance carried out on school facilities were inadequate for majority of the facilities. The factors encouraging school facilities deprecation included excess pressure on available facilities and delayed maintenance amongst others. It was observed that the existing

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

infrastructure in most of the public schools was in deplorable condition along with the lack of functional public sanitary facilities; hence the reason some result to the bush to defecate around such schools. In terms of the availability of sanitary facilities in schools, pit toilets and water closets were the dominating sanitary facilities in the classrooms. Also, the classrooms were not enough as many of the existing ones were in bad condition.

Findings on the adequacy of maintenance activities carried out on school facilities indicated that the maintenance carried out on school buildings such as repairing cracks on broken walls, broken ceiling roofs, and electric fixtures was inadequate. Damaged louvers, doors, and windows were not replaced immediately. The furniture was also not repaired and buildings were not regularly renovated. This finding does not reflect what was earlier suggested that School facilities need adequate and efficient management. Proper and efficient management of school facilities rests solely on school administrators and educational stakeholders (Asiyai, 2011; FEMA, 2013). For effective management and maintenance of school facilities, breakdown maintenance, corrective maintenance and preventive maintenance as the three types of maintenance that school administrators should adopt to ensure that school facilities are kept near their original state.

The inadequate funds allocated and disbursed to schools appear to have not allowed for proper maintenance of available facilities. In addition, over-usage of the facilities tends to make the facilities highly susceptible to constant wear and tear and hence their depreciation. This finding supports the earlier studies that the longer a school facility stays, the more the utility depreciates, hence the need for regular maintenance (FEMA, 2013; Alsubaie, 2017; Duru, et al, 2022). The bad condition of most of the schools has in turn made the condition of habitation of these schools generally unfit in terms of shelter used as temporary camps before, during, and after flood disasters (UNICEF 2006, 2011 & UNCHR, 2013).

Accessibility is a key measure of the vulnerability of road networks to disruptions such as floods. Road accessibility is not so good as flood will not allow much access to the school. This is always observed especially during the flood period. Unfortunately, most of the schools in the study location were affected by this occurrence. The indirect effect of the flood on the transportation network caused decreasing local network capacity (He et al., 2021), and transportation elements are impacted in both temporally and spatial contexts. As mentioned earlier, the vital infrastructure can be the transportation and power grid, which are related (Rebally et al., 2021). Therefore, it has led to an increase in travel time and route length as the indirect impact of flooding. In this situation, failure in one network node can also affect the other nodes (Rebally et al., 2021). Direct and indirect damages lead to cascading effects common when critical infrastructure is damaged, leading to an inundated area and affecting parts of the society far from the primary hazard. Thus, floods can cause disruptions to roads that leave transportation networks partially operational to be completely cut off, which could result in notable service delays (Pregnolato et al., 2017).

There is no health center or police station/military base inside the schools but the nearest is at a minimum of 6km from the schools. The distance of the health care facility is dangerous because it could be dangerous for the survival of the would-be residents in the camp. This shows that the level of insecurity of the internally displaced persons may be jeopardized and attacks which may be launched on them by hoodlums or kidnappers would not be easily resisted or avoided. This is not in tandem with the view of UNGA (2010); Dela Cruz (2017) and UNHCR (2020) on what the safety of the school environment designated as shelter for displaced disaster victims should look like. In Port Harcourt Metropolis, even though the majority (89.16%) of schools can serve as places of abode or shelter during flood crises or disasters as they fall within moderate and high suitability ranks, there are yet safety and security concerns.

It is to be noted that against best practices, where there should have been appropriate preparedness and planning of shelters for disaster victims when it occurs, just as it was not considered very important to give sufficient notification for school management to adjust their activities before the schools are suddenly disrupted for sheltering disaster displaced victims. This contradicts best practices as earlier observed in the case of Australia, Florida, Texas, and Japan (Kruger, et al, 2018; Sugawara, et al, 2018; Cabinet Office, Government of Japan, 2019; UNHCR, 2019). This study reveals a lack of necessary preparedness planning before engaging these schools for temporary shelter for flood-displaced victims, unlike the case in Japan where for instance, it is now an official policy of the government of Japan to integrate the use of schools as shelters in the event of a disaster.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

CONCLUSION

The frequency and impact of flood disasters across the world have often resulted in the need to activate an emergency response that may require the evacuation of victims to temporary shelters. Hence, this study assessed the suitability of schools as temporary shelters for flood-displaced victims in the Port Harcourt Metropolis. The total number of nine hundred and three (903) schools existed in the study area. Private schools were more than public schools and showed a dispersed pattern of distribution. The schools classified under the category of low vulnerability level used for the analysis showed that they substantially met the criterion factors that made the schools suitable for IDP camps and thus, indicated as suitable schools in the study area that could be used as temporary shelters for flood-displaced victims. Furthermore, a great percentage of the schools can serve as places of abode or shelter during flood crises or disasters as they fall into moderate and high suitability ranks. The study therefore concludes that, based on the criterion factors for determining the suitability of schools as places of temporary shelter for the flood displaced people, the majority of schools in the study area that were found not usually inundated by floods across the seasons could serve as shelter during flood crisis or disaster as they fall into moderate and high suitability ranks.

On the perception that there ought to be prior notification, preparedness, and planning measures to be put in place in Schools chosen as temporary shelters for flood victims, this study revealed the absence of such standard practice. The implication of the insufficient time of notification given to the school administrators to prepare the school to provide shelter for displaced victims was its obvious effects on the school calendar, thus compromising the stable environment required for teaching and learning as well as sustained children's education. This negates the ideal and spirit of one of the seventeen (17) United Nations Sustainable Development Goals (SDGs) number 4, which advocates for ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all (United Nations, 2015).

RECOMMENDATIONS

It is in the light of the foregoing that the following recommendations were made, which are that:

1. Sanitary facilities in the schools selected for temporary shelters should be improved from the dominant pit latrine observed to a water closet or other modern sanitary facilities
2. There should be an improvement in the sources of power especially the supply of hydroelectricity instead of the self-dependent use of generating sets which is dangerous because of its high risk of fire incidents.
3. Flood hazard and risk mapping should be encouraged and adequately produced periodically as planning inputs to reduce flood damages in the highly vulnerable areas within the study area using appropriate tools such as the Geographic Information System (GIS). This should be integrated into broader urban planning and development strategies.
4. Updating and production of Suitability and Vulnerability level information, characteristics, and maps of schools be regularly provided for all schools in the region. This will aid risk-informed decision-making on the choice and implication of the use of schools to shelter IDPs in flood disasters.
5. Training and capacity building for school administrators and community leaders is advocated to enhance their preparedness and response capabilities to the menace of incessant flooding in the area.

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