RIK International Journal of Social Sciences and Humanities (RIK-IJSSH) *Vol. 6 No. 2, November 2022*
ISSN: 2350-5342 (Print)
ISSN: 2350-143X (Online)

Effect of Flooding on Housing Infrastructure in Yenagoa Metropolis, Bayelsa State

Mbee, Daniel Mbee
Department of Geography and Environmental Management
Faculty of Social Sciences
University of Port Harcourt
Port Harcourt, Rivers State, Nigeria

&

Tamunoiminabo Lawson
Department of Geography and Environmental Management
Faculty of Social Sciences
University of Port Harcourt
Port Harcourt, Rivers State, Nigeria

ABSTRACT

Flooding is a geographic phenomenon that poses threat to humanity. In places where flooding has occurred, housing stock is usually depleted. This study, therefore, seeks to investigate the effect of flooding on housing infrastructure in the Yenagoa metropolis. The survey research approach was used in the study and the study population was household heads. A combination of primary and secondary data was used. Simple and stratified random sampling techniques were utilized while the Taro Yamane method was used in the determination of the sample size which came to 400Thereafterer the proportional allocation method was used in distributing the sampled population into the ten strata that the study covered. Copies of the questionnaire were administered to the sampled population but only 329 copies were successfully retrieved. Hence the analysis was based on the responses of respondents using both descriptive and inferential statistics. The study has shown that housing infrastructure such as tiles, skirtings and wall rendering with mean values of 2.42, 2.42 and 2.19 respectively are partially damaged due to flooding. The study also shows that the p-value (0.000) is less than the critical level of alpha (0.05) hence there is statistically significant variation in the effect of flooding on housing infrastructure in the different areas that make up the metropolis of Yenagoa. Based on this, the study recommends that water-resistant materials be used during construction to prevent water from penetrating courses in walls and damp-proof membranes in the substructure and water seepage that will weaken the bonding adhesives during flooding. Also, the study recommends that the drying process after a flood is essential as soon as physically possible to prevent additional deterioration of housing infrastructure due to long-term water exposure.
Keywords: Flood, Urban, City, House, Infrastructure.

Introduction

Urban centres are social centres which deliver quite several services and functions such as energy and water provision, transport links, housing, education and employment

that make city life very attractive and luxurious (Tibaijuka,2008). Around the world, cities are repositories of knowledge and agents of socio-political change and they play a key role towards liberating people from the shackle of poverty (UN-Habitat, 2003). Urban spaces are not just simply places made of bricks or mortar but places of dreams and fancy, of nostalgia and imagination, of emotions and desires but focal points that enhance the economic and social activities of the people and society at large. In describing a city, Watson (1993) argued that a city is a living system made up of different interacting parts and functioning through the interplay of different sectors. Nonetheless, the services offered by a city can be significantly disrupted by flooding. Flooding is a general temporal state of partial or fully submersed inundation from overflows of inland or tidal waters or from frequent and rapid accumulation of runoff water (Onuigbo *et a*l. 2017; Jeb & Aggarwal, 2008). Global warming is likely to increase the frequency and severity of floods due to the combined effects of increased precipitation, storminess, distorted regional weather patterns, and deforestation with the increasing capacity of surface runoff leading to soil erosion and rising sea levels (Gwilym & Chen, 2011). According to Olanrewaju & Fadairo (2003), flooding is often intensified by human activities such as the presence of riverside infrastructure (dams, piers, and lands). It is aggravated by poor development practices including riverside development, excessive cleaning, encroachment upon waterways, and dredging which may result in changes in the hydrological balance of the waterways involved (Nolan & Marron, 1995).

Flood is a leading cause of natural disaster that affects dwelling units and livelihoods (UN-Water, 2011). Floods are considered the most recurring, widespread, disastrous and frequent natural hazards of the world. It is indeed one of the most devastating hazards that are likely to increase in many regions of the world partially because of global climate change and poor governance United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA, 2018) & Askew,1999). Generally, urban flooding impacts negatively socioeconomic activities. It destroys the ecosystem and dislocates sociological functions. Human lives are also lost (World Disaster Report, 2009; Knight, 2011; Sato, 2006; Genovese, 2006). It causes major disruptions in cities; leading to significant impacts on people, the economy and on the environment. The United Statesof America (USA), in the 1990s, lost approximately 5.4billion USD annually due to flooding while more than 1.6 million people were displaced. The loss further jumped to USD 10 billion annually in the 2000s mostly affecting housing infrastructure (Association of State Flood Plain Managers (ASFPM, 2013. Nearly 525,000 houses were affected; 39,000 were destroyed and 485,000 were damaged. The estimated loss was over USD 401 million. In another development, more than 1.6 million people were displaced by flooding and landslides while nearly 525,000 houses were affected in Myammar (Government of the Union of Myanmar, 2015). Usually, the impact of flooding is not only varying in the amount of damage but also in the type of damage experienced.

In most cities in Nigeria, flooding is recognized as a significant environmental challenge or major hazard that is constantly affecting the effective functioning of the urban

environment, particularly in the areas of sustained infrastructure and services, which are critical to a sustainable livelihood. Tragedies associated with flood disasters in Nigeria have significant effects on the people, city infrastructure and urban governance. According to National Emergency Management Agency (NEMA, 2022), no fewer than 203,371 housing units have been damaged by flooding. In light of this level of damage, flooding in Nigeria has further depleted Nigeria's housing stock thereby widening the accommodation gap among Nigerians. Housing is a fundamental need critical to the welfare, survival and health of humans whether in the city or in the rural area (Soriwei 2013). It is worth noting that flooding damages housing infrastructure and other urban social infrastructure such as water supply, electricity, roads and railway lines (Doocy et al., 2013).

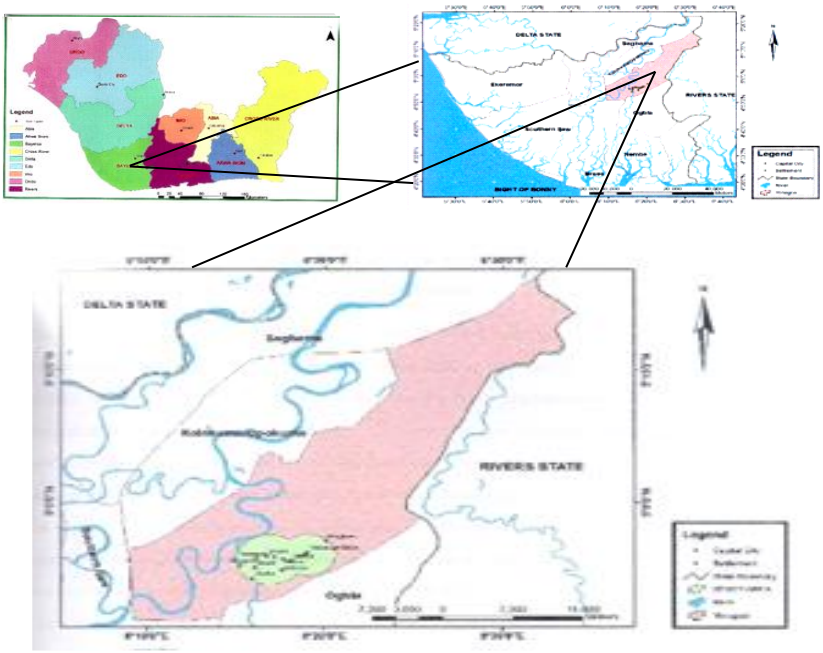
Housing is one of the three fundamental needs of mankind and it is the most crucial for the physical survival of man after the provision of food. Adequate housing contributes to the attainment of the physical and moral health of a nation and stimulates social stability, work efficiency and the development the individuals. It is also one of the best indicators of an individual standard of living and of his place in society. Housing, both in units or multiple forms is a significant component of the physical form and structure of a community, while the human and family contents of the house are parts of the very spirit of life and prosperity of the society. Housing can be defined as a building structure in which humans live in for meeting shelter and social needs. It is the social and spatial process in which building types are considered to be the convergence of social relations and spatial practice (Abdul & Mahmud 2012). Housing as a buddle of a commodity or as infrastructure changes depending on taste, location, cost, government regulations and housing needs (Law *et al*. 2008). However, housing infrastructure is the set of interconnected indoor and outdoor structural facilities that enhance the function and use of the entire structure. It includes energy, electronic gadgets, furniture, wood and roofing sheets (Sullivan & Sheffrin, 2013). Such damage poses major challenges for any urban housing system thus threatening the intent of the right to adequate housing as a human right recognized in Article 25 (1) of the Universal Declaration of Human Rights (Fadamiro, Taiwo & Ajayi, 2004). Against this background, this study intends to assess the impact of flooding on housing infrastructure in the Yenagoa metropolis, Bayelsa State.

Study Area

Yenagoa is the Bayelsa State administrative capital and lies within the Nun River, Ekole and Epie Creeks. It is located on latitude $4^0$55N and longitude $6^0$16E as shown in figure 1. It is located in the north eastern region of the state and is bounded at the north and east by Rivers State, at the South by Southern Ijaw and Ogbia Local Government Area and at the west by Kolokuma – Opokuma Local Government Area. Yenagoa is situated within the subequatorial south which extends from the coast to roughly 130 to 160km inland. The study area experiences heavy rainfall for eight to nine months of the year. The highest rainfall values are obtained in June (322.92mm), July (413.59m), August (438.34mm) and September (439.84mm), (Yenagoa Master Plan 2004).

Bayelsa State is predominantly under two ecological zones; the barrier island forest (mangrove forest) and the freshwater swamp forest. It has a large deposit of hydrocarbon. Yenagoa is situated in the freshwater swamp forest eco-zone. The people of people are predominately fishermen (NNDC, 2006).

Figure 1: Map of the Study Area



Source: Surveyor General Office Bayelsa State 2016

Methodology

The survey research design was employed in this study. Household heads constituted the study population. Out of the 29 areas that make up Yenagoa, 10 (34%) of them representing the areas were selected using the simple random sampling technique as shown in table 1. The sources of data for the study included primary and secondary data.

Table 1: Selected Communities and their population

S/No	Communities	Population
1	Amarata-Epie	23,519
2	Azikoro	16,819
3	Biogbolo	10,728
4	Ekeki	10,728
5	Kpansia	24,564
6	Okutukutu	11,045
7	Opolo	24,677
8	Swali	16,667
9	Yenagoa	57,694
10	Yenezue-Gene	13,767
	Total	**210,208**

Source: National Population Commission, 1991

In the sampled areas, Taro Yamane formular was used in determining the sample size because it reduced large sample size to a manageable population. See table 2. The formula is written as:

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

Where

N = Target Population (210,208)
e = Constant (0.05 at 95%)
n = Sample Size

After substitution, the derived sample size was 400. To avoid bias, the proportional allocation method was used to allocate samples to the different strata that the study covered. The instrument used for the study was the questionnaire. It should be noted that out of the 400 copies of the questionnaire administered, 329 of them were successfully completed and retrieved. Therefore, both descriptive and inferential statistics were used in the analysis of data.

Table 2: Derived Sample Size

S/No	Communities	Population	Sampling Size
1	Amarata-Epie	23,519	45
2	Azikoro	16,819	32
3	Biogbolo	10,728	20
4	Ekeki	10,728	20
5	Kpansia	24,564	47
6	Okutukutu	11,045	21
7	Opolo	24,677	47
8	Swali	16,667	32
9	Yenagoa	57,694	110
10	Yenezue-Gene	13,767	26
	Total	**210,208**	**400**

Source: Researchers' computation, 2022

Results and Discussion

Revealed in table 3 is the perceived effect of flooding on housing infrastructure. Housing infrastructure includes furniture, electronic gadgets, fittings, appliances and facilities, skirting, doorways and wall renderings were the major housing infrastructure affected by flood in the study area. The study showed that tiles, skirtings and wall rendering, and doorways are housing infrastructure affected during flooding. Out of 329 sampled respondents, it is revealed that 55.6% which is over half of the respondents perceived that wall tiles are affected by flooding. It has the highest criterion mean value is 2.42 thus it is rejected. The study also found that skirtings, wall renderings and doorway all have criterion mean values greater than 2. Apparently, tiles, skirtings and wall rendering are ranked first, second and third respectively. It can be inferred that these

infrastructures are damaged during flooding. This finding agrees with Nauman *et al*., (2009) who contended that wall renderings and paintings due to prolonged contact with flood waters are the major impacts of the flood on housing superstructures. Furthermore, Wai (2004) argued that water seepage into joints between tiles overtime accentuates tiling works failure and that the destruction of most timber-based building products from doors, and windows to roofing members depends on the level of inundation or flood depth and duration of flood waters in contact with the building.

On the other hand, the study established that roof wood works, roofing sheets and windows are the housing infrastructure that are partially damaged during flooding. Based on the result of the study as presented in table 3, they are ranked 4th, 5th and 6th respectively. This finding reinforces the observation of Chu (2006) that housing infrastructure that has contact with water is easily damaged. As observed by Amole (2017) roofing sheets, roof woodworks and windows are the superstructures of a house that are not directly affected by water. They are damaged when the substructure of a building is compromised.

Table 3: Effect of Flooding on Housing Infrastructure

Housing Superstructures	Complete Damage (3)	Partial Damage (2)	No Damage (1)	Mean	Rank	Remark
Doorway	126(38.3%)	139(42%)	64(19.4%)	2.19	3rd	Partial Damage
Roofing sheets	73(22.1%)	95(28.9%)	161(49.0%)	1.73	5th	No Damage
Roof Woodworks	74(22.4%)	107(32.5%)	148(45.0%)	1.78	4th	No Damage
Skirting	117(35.6%)	174(53.0%)	38(11.6%)	2.24	2nd	Partial Damage
Tiling Works	183(55.6%)	101(30.7%)	45(13.7%)	2.42	1st	Partial Damage
Wall Rendering	89(27.0%)	214(65.5%)	26(8.0%)	2.19	3rd	Partial Damage
Windows	18(5.5%)	125(38.0%)	186(56.5%)	1.49	6th	No Damage

Source: Researchers' Computation, 2022
*Reject if the mean score is greater than 2.0

The empirical test on the data set using ANOVA as depicted in table 4 shows that the p-value (0.000) is less than the critical level of alpha (0.05) hence there is statistically significant variation in the effect of flooding on housing infrastructure in the different areas that make up the metropolis of Yenagoa. This finding is in tandem with the report of (National Emergency Management Agency (NEMA, 2012). The report noted that the intensity and effect of flooding vary from community to community depending on location and recovery response time.

Table 4: ANOVA Table

ANOVA

Mean score	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.349	6	1.225	8.118	.000
Within Groups	9.506	63	.151		
Total	16.855	69			

Source: SPSS output, 2022

Conclusions and Recommendation

Flood is a very serious issue affecting housing stock in the urban and rural areas in the Deltaic region. Over time, housing infrastructure has been compromised arising from floods. and the situation may become severe as changes in climatic elements keep occurring. This study examined the effect of flooding on housing infrastructure in ten areas in the Yenagoa metropolis. It is revealed by the study that tiles are skirtings and wall rendering are partially damaged during flooding. These components of the building are parts of the building that make a house liveable. Therefore, any damage done to these infrastructures could reduce the housing quality. The study concludes by recommending that the drying process after a flood is essential as soon as physically possible to prevent additional deterioration of housing infrastructure due to long term water exposure. It is also suggested that water-resistant materials be used during construction to prevent water from penetrating courses in walls and damp-proof membranes in the substructure and water seepage that will weaken the bonding adhesives during flooding.

References

Adebayo. H. O. (2017). GIS analysis of flood vulnerable area in Benin–Owena and environmental degradation in Awka, Anambra State, Nigeria. *International Journal of Innovative Research and Development*. 8. 10.

Askew, A. J. (1999). Water in the International Decade for Natural Disaster Reduction. In Leavesley et al. (Eds.), Destructive Water: Water-caused Natural Disaster, their Abatement and Control. IAHS Publication No. 239.

Association of State Floodplain Managers [ASFPM] (2013). Region IV Report 2012 Annual Conference / Board Meeting Hartford, CT May 2013 Terri L Turner, AICP, CFM, Region IV Director.

Doocy, S., Daniels, A., Murray, S. & Kirsch, T., (2013). The human impacts of floods: A historical review of events 1980–2009 and systematic literature review, PLoS Currents Disasters. 1, 1–29.

Genovese, E., (2006). A methodological approach to land use based flood damage assessment in urban areas: Prague case study. Technical EUR Reports, EUR, 22497. Jawaharlal Nehru National Urban Renewal Mission, 2007. City Development Plan Dehradun,

Jeb, D. N. & Aggarwal, S.P. (2008). Flood Inundation Hazard Modelling of the River Kaduna Using Remote Sensing and Geographic Information Systems. *Journal of Applied Science*. 4, 1822–1833.

Knight, L., (2011). World Disasters Report 2009.

National Emergency Management Agency (2013). NEMA Annual Report.

Naumann, L. & Vazire, S. & Rentfrow, P. & Gosling, S. (2009). Personality judgments based on Physical Apperance.

Okafor, Ikenna & Keke, Onyinye & Efobi, Dumebi. (2019). Assessment of housing quality on physical appearance. *Personality & Social Psychology Bulletin*. 35. 1661-71.

Olanrewaju, D., & Fadairo, G. (2003). Flooding as an induced environmental problem: A case study of Ala River in Akure, Nigeria. *Journal of Nigerian Institute of Town Planners*. XVI, 85-96.

Onuigbo, I. C. Ibrahim, P. O. Agada, D. U. Nwose, I. A. & Abimbola, I. I. (2017). Flood Vulnerability Mapping of Lokoja Metropolis Using Geographical Information System Techniques. Journal of Geoscience and Geomatics, 5, 229–242.

Pryce, G., Chen, Y., & Galster, G. (2011). The impact of floods on house prices: an imperfect information approach with myopia and amnesia. *Housing Studies*, *26*(02), 259-279. River Basin Nigeria. *Indonesian Journal of Geography*. 49, 1, 27 – 33. DOI: http://dx.doi.org/10.22146/ijg.12777.

Sato, Teruko. (2006). Fundamental Characteristics of Flood Risk in Japan's Urban Areas. Society to Emerging Disaster Risks in Mega-Cities. 23–40.

Soriwei, F. (2012). Flood Disaster Cost – NEMA, 2013 retrieved from http//www.punching.cm/2012flood-disaster-nigeria.

Tibaijuka, A. (2008). The challenge of urbanization and the role of UN-Habitat. A lecture delivered at Warsaw School of Economics, April 18th, 2008.

UN-Habitat (2003). The challenge of slums - global report on human settlements.

UNOCHA. Nigeria: Humanitarian Response Plan; United Nations Office for the Coordination of Humanitarian Affairs: Abuja, Nigeria, (2018).

UN-Water. (2011). Cities coping with water uncertainties. Media Brief, UN-Water Decade Programme on Advocacy and Communication.

Watson, S. (1993). Cities of dreams and fantasy: Social planning in a postmodern era. In Freestone, R. (Ed.), sprited cities: Urban planning, traffic and environmental management in the nineties. 140-149.Sydney: Federation Press.

World Disasters Report (2009). Focus on Early Warning, Early Action.