World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Evaluation of the severity of flood impact on building structures and fabrics in Anambra West Local Government Area, Anambra State, Nigeria

Chukwudi Miracle Ndife [1], Peter Uchenna Okoye [1], Daniel Fadumo Oluwatayomi [1] and Joseph Oluchukwu Duluora [2,*]

[1] *Department of Building, Faculty of Environmental Sciences, Nnamdi Azikiwe University, Awka.*
[2] *Department of Environmental Management, Faculty of Environmental Sciences, Nnamdi Azikiwe University, Awka.*

World Journal of Advanced Research and Reviews, 2026, 30(03), 428-435

Publication history: Received on 23 April 2026; revised on 29 May 2026; accepted on 01 June 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.30.3.1540

Abstract

Flooding remains the most common environmental hazard with devastating effects on buildings worldwide. This study investigated the severity of flood impact on building structures and fabrics in Anambra West Local Government Area, Anambra State, Nigeria. A descriptive survey research design was adopted, with a sample size of 393 respondents and 100 buildings selected through simple random sampling. Questionnaires and physical observations were used for data collection. Findings revealed that aesthetic discolouring ranked as the most severe impact (mean = 4.66), followed by submerging of buildings (mean = 4.63), deterioration/degradation of building components (mean = 4.59), contamination of buildings (mean = 4.56), structural damage/cracks (mean = 4.50), disruption of serviceability (mean = 4.48), and inflow into sewage (mean = 4.06). Building collapse recorded a lower mean score of 2.58, indicating it rarely occurs. One-sample t-test analysis confirmed that flooding has a statistically significant impact on all building components ($p < 0.05$). The study concludes that flooding severely affects building aesthetics, structural integrity, and functionality in Anambra West. Recommendations include the use of durable building materials, structure elevation, enforcement of building codes in flood-prone areas, use of oversite concrete floors to minimize rising damp, and encouragement of concrete and sand-crete block homes and any durable building typologies and practices in the area

Keywords: Flood Impact; Building Structures; Building Fabrics; Severity; Anambra West

1. Introduction

Flooding is the most common of all environmental hazards, accounting for 44% of all disaster events from 2000 to 2019 and affecting 1.6 billion people worldwide (United Nations Office for Disaster Risk Reduction, 2019). In Nigeria, floods have become an annual occurrence, particularly in states located along major rivers Niger and Benue (Okey-Ejiowhor, Edwin, Anthony & Lawson, 2025). Anambra West Local Government Area, situated in the floodplain of Anambra State, experiences recurring flooding that causes destruction, damage, degradation, and contamination of buildings (Anyanechi& Okolie, 2020). The impact of flooding on buildings can cause direct damage, degradation of building materials, and contamination due to flood-borne substances (Mirajkar, 2021). Construction Industry Research and Information Association (2007) stated that flood damage to buildings includes instability and settlement of foundation, corrosion in metal components, moisture absorption in timber causing warping, cracking of ground floor due to uplift pressures, accumulation of contaminated silt, and structural weaknesses. Despite the severity of these impacts in Anambra West, limited studies have specifically examined the severity of flood impact on building structures and fabrics in this area. This study therefore aimed to determine the severity of impact of flooding on building structures and fabrics in Anambra West Local Government Area.

*Corresponding author: J. O. Duluora

2. Literature

2.1. Overview of flooding

Flood is the excessive flow of rain water after a heavy downpour and simply defined as the excessive quantity of water submerging a usually dry area of land (Otaka and Nwafor 2023). Uche (2013) also defines flood as an overflow of water that submerges or drowns land. Adetunji and Oyeleye (2018) further define it as unusually high rates of discharging; often leading to inundation of land adjacent to streams, and it is usually caused by intense or prolonged rainfall. Overflow or retention of water in an area that is normally dry is referred to as flood (Oluseye, Yetunde, Babatunde and Oladokun, 2018). According to Danhassan, Abubakar, Zangina Mohammad, Hazaea, Ishak and Jiahua (2022) flooding is regarded as one of the most dangerous natural disasters confronting the world today. In many countries around the world, particularly developing nations, flooding has become a major issue because of its social, economic, and environmental consequences. It is one of the most common natural environmental hazards in the developing world. Flooding is a general temporal state of partial or full submerged inundation from overflows of inland or tidal waters or from frequent and rapid accumulation of runoff. It is one of the most widespread and destructive natural perils, affecting approximately 250 million people worldwide and causing US$ 40 billion in losses on an annual basis (Cirella and Iyalomhe, 2018).

Flooding in Nigeria is caused by a variety of factors. Majorly, flooding occurs when river channels are no longer able to further contain surging discharge (Babatunde, Owolabi, Taiwo and Wahab, 2012). According to Oyebamiji and Oyedeji (2022), flooding is caused by storm surges, heavy or consistent rain falls, failure or excessive release from dams, blocked river channels and drainage greatly exacerbate flooding incidents, worsening its impact and effect.

Flooding results from climate change, excessive precipitation, building on water ways, sea-level rise, soil moisture regime, dam operations, rapid population growth, inadequate preparedness, and lack of political will (Umar and Gray, 2022). Floods are natural events; however, due to various human related activities coupled with climate change which is influenced by human activities, flooding tends to be both human-induced and natural events (Afolabi, Emelu, Wali, Orji, Bosco- Abiahu, Yemi, Wali and Asomaku, 2022). Okoye (2019) identified factors impacting flooding in Nigeria as poor waste disposal, sewages block drainage, preventing free flow of rain water. Poor land use policy, improper citing of structures and buildings. Okoye, Ezeokoli and Ezeokonkwo (2015) in their study revealed that the siting of buildings on waterways, flood channels/plains, inadequate/lack of drains in the compounds, lack of planning restriction/developmental control, size of the building/area occupied by the building among others contribute greatly to the incessant flood menace.

2.2. Impacts of flooding on buildings

According to Duluora (2017), the impacts of flooding include destruction, damage, degradation and contamination of buildings, destruction of properties, environmental pollution, forced migration, psychological effects and trauma experienced by the inhabitants and they include issues such as forced migration, attempted suicide or committing suicide, traumatic effects as a result of the aftermath of the flood incidence. Nwajuaku and Ekenta (2018) state that the impacts of flooding include physical damages to structures, social dislocation, contamination of clean drinking water, spread of water-borne diseases, shortage of crops and food supplies, death of non tolerant tree species, disruption in transportation system, serious economic loss and psychological trauma. Mirajkar (2021) explains that due to impacts of flood, buildings damaged directly. During or after the flood, degradation of building material takes place. Flood borne substances cause the contamination of the building. According to Mclean and Watson (2009) the porous, plaster, timber, decorative materials and services located within the living accommodation suffer greatest degradation when saturated. Another high value cost of flooding events is that of structural damage caused when the flow of flood waters is checked and contained within the structure. The forces this releases can cause structural damage to both substructure and superstructure elements.

According to Ezeokoli, Okolie and Onyia (2019), when flood water finds its way into the building, it causes severe damages to the building structures and fabrics. These damages according to Lamba, Gautam and Gapta, (2015) arises from the following:

Corrosion: Salt-laden, moist air can corrode exposed metal surfaces and penetrate any opening in the building. Also, corrosion attack metal connectors, fasteners for siding and connectors for attaching exterior-mounted heating, ventilation, and air-conditioning units, electrical boxes, lighting fixtures, and any other item mounted on the exterior of the building;

Moisture: Trapped moisture increases the moisture content of the material and potentially leads to decay. The potential for wood frames in low-lying coastal areas to decay is high. Therefore, connectors should be designed to shed water to prevent water from accumulating between the connector and the material the connector is attached to.

Weathering: The combined effects of sun and water on many building materials causes weathering damages in form of: fading of finishes; accelerated checking and splitting of wood; gradual loss of thickness of wood; and degradation of physical properties. The effects of weathering reduce the life of building materials unless they are naturally resistant to weathering or are protected from it, either naturally or by maintenance.

Termites: The likelihood of termite infestation in coastal buildings can be reduced by maintenance that makes the building site drier and otherwise less hospitable to termites, others are: keeping water pipes, water fixtures, and drainpipes in good repair; avoiding dampness in crawlspaces by providing adequate ventilation or installing impervious ground cover membranes; and avoiding frequent plant watering adjacent to the house and trimming plants away from the walls.

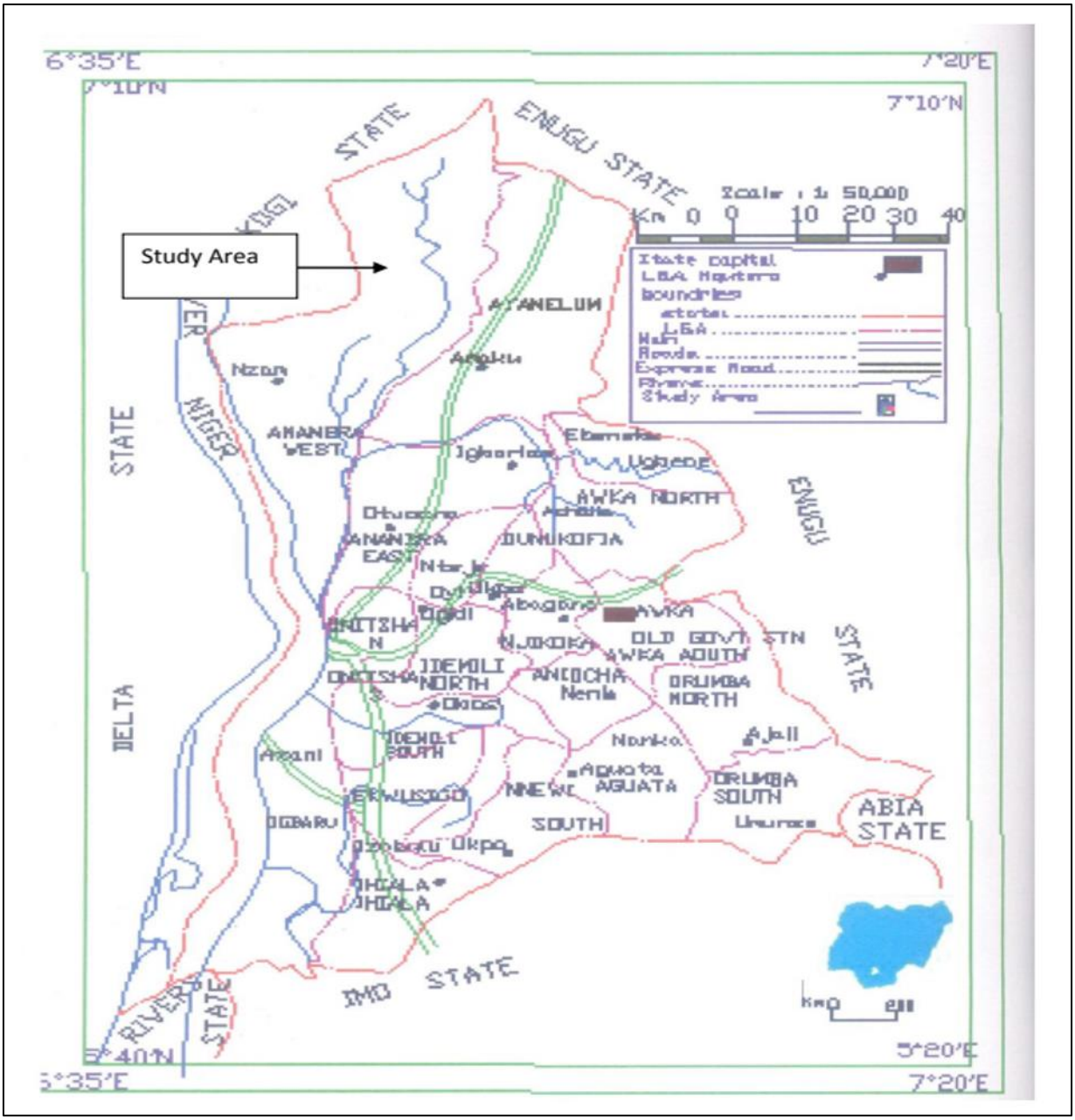
3. Methodology

3.1. Research Design

The study adopted a descriptive survey research design.

3.2. Study Area

Anambra West Local Government Area is located in the northwestern part of Anambra State, Nigeria, within latitudes 6°15'N to 6°45'N and longitudes 6°40'E to 7°00'E. The area is riverine with seventeen towns, including Mmiata Anam, Umueze Anam, Nzam, Odekpe, and Ukwalla, Oroma-Etiti, OnonoUmuikwu Anam, Nzam, Igbedor, Igbokenyi, Odekpe, Onugwa, Iyiora Anam, Owelle and Olumbanasa. The area of the local government is riverine, most of the inhabitants are farmers and fishermen. They produce yam, cassava, maize, and rice in abundance yearly. Anambra West is bounded in the north east by Ayamelum L.G.A., in the south east by Anambra East L.G.A., while in the north east it has a boundary with Kogi State (Duluora, 2017).



Source: Duluora, (2017)

Figure 1 Map of Anambra State showing Anambra West

3.3. Population and Sample

The population comprised residents and housing units in Anambra West (projected population of 254,358 in 2025; 52,398 housing units). Using Taro Yamane's formula, a sample size of 393 respondents and 100 buildings was selected through simple random sampling.

3.4. Instrumentation and Data Collection

A structured questionnaire with a five-point Likert scale (Strongly Agree=5 to Strongly Disagree=1) was administered to household heads. Physical observations were conducted on 100 randomly selected buildings, examining foundations, floors, walls, fittings, and finishes.

3.5. Data Analysis

Data were analyzed using descriptive statistics (mean, standard deviation, frequency, percentage) and inferential statistics (one-sample t-test) at a significance level of 0.05.

4. Results

Table 1 Severity of Impact of Flooding on Building Structures and Fabrics

S/N	Items	N	Mean	SD	Rank
1	Destruction (Building collapse)	393	2.58	1.18	9
2	Structural damage (cracks)	393	4.50	0.95	5
3	Damage to building fabrics and finishes	393	3.69	1.40	8
4	Deterioration/degradation of building components	393	4.59	0.80	3
5	Contamination of buildings	393	4.56	0.82	4
6	Submerging of buildings	393	4.63	0.71	2
7	Disruption of serviceability and operation	393	4.48	0.90	6
8	Inflow to sewage	393	4.06	1.15	7
9	Aesthetic discolouring	393	4.66	0.66	1

Table 2 One-Sample T-Test Results (Test Value = 3.0)

Impact item	Mean	T- Test	P- value	Significance
Building collapse	2.58	-7.0	0.00	Significance
Structural damage	4.50	31.3	0.00	Significance
Damage to building fabrics and finishes	3.69	9.77	0.00	Significance
Deterioration	4.59	39.4	0.00	Significance
Contamination	4.56	37.71	0.00	Significance
Submerging	4.63	45.51	0.00	Significance
Serviceability disruption	4.48	32.6	0.00	Significance
Inflow to sewage	4.06	18.27	0.00	Significance
Aesthetic discolouring	4.66	49.96	0.00	Significance

Overall Impact Mean: 4.26 | Overall T-statistic: 18.69 | Overall P-value: 0.0000

5. Discussion

The findings revealed that aesthetic discolouring (mean = 4.66) was the most severe impact of flooding on buildings in Anambra West, indicating that floodwaters leave significant staining on tiles, paints, and wall finishes (see Figure 3). Submerging of buildings (mean = 4.63) ranked second, confirming that floodwaters routinely inundate buildings in the study area (see Figure 4). Deterioration and degradation of building components (mean = 4.59) and contamination of buildings (mean = 4.56) followed closely, demonstrating that flood borne substances compromise building materials and introduce contaminants. Structural damage/cracks recorded a mean of 4.50, consistent with Edoka, Idris and Anozie (2024), which found that flooding causes foundation, floor, and wall cracks (see Figure 2). Disruption of serviceability and operation (mean = 4.48) aligns with Adetunji and Oyeleye (2018), who noted that flood hazards disrupt building serviceability when water depth impedes access. Inflow to sewage (mean = 4.06) confirms Efobi and Anierobi's (2013) observation that flooding causes sewage system contamination. Notably, building collapse recorded the lowest mean (2.58), suggesting that while flooding severely damages buildings, complete collapse is rare in Anambra West. This finding diverges from Okunbiri and Puyate (2023), who reported building collapse in other flood-prone areas, possibly due to the predominance of elevated storey buildings with reinforced concrete construction in the study area. The one-sample t-test confirmed that all eight flood impact items were statistically significant ($p < 0.05$), leading to rejection of the null hypothesis that flooding does not have significant impact on building components. The overall

mean score of 4.26 (above the neutral value of 3.0) conclusively establishes that flooding has severe and significant impacts on building structures and fabrics in Anambra West.

Source: Ezeokoli et al, 2019

Figure 2 Damage to building fabrics and finishes

Source: Duluora, 2017

Figure 3 Aesthetic discolouring

Source: Researcher, 2026

Figure 4 Submergence, disruption of the operation and serviceability of the building

6. Conclusion

This study conclusively determined that flooding has severe impacts on building structures and fabrics in Anambra West Local Government Area. The most severe impacts are aesthetic discolouring, submergence of buildings, deterioration of building components, contamination, structural damage, disruption of serviceability, and inflow to sewage. While building collapse is rare, the cumulative effect of annual flooding progressively degrades building quality

and functionality. The statistical analysis confirmed that all identified impacts are significant, necessitating urgent intervention.

Recommendations

- **Building materials:** Use water-resistant building components and finishes that withstand prolonged water exposure
- **Structure elevation**: Raise ground floor levels to at least 1.5 meter above natural ground level
- **Oversite concrete:** Use oversite concrete floors to minimize rising damp
- **Building codes:** Enforce strict building and developmental laws to prevent construction on flood channels.
- **Retrofitting:** Retrofit existing vulnerable buildings with flood-resilient feature.
- **Building typologies and practice:** Concrete and sand-crete block homes and any durable building typologies and practices should be encouraged in the area. Other building typologies and practice such as mud or timber home should be discouraged.
- **Drainage and reservoir:** Government should create drainages reservoir dam in Anambra West Local Government Area.

Areas for Further Study

- Comparative analysis of flood impact severity between different building typologies in Anambra West.
- Long-term monitoring of building material degradation due to recurrent flooding.

Compliance with ethical standards

Disclosure of conflict of interest. The authors declare no conflict of interest.

No conflict of interest to be disclosed.

References

[1] Adetunji, M. A. and Oyeleye, O. I. (2018). Assessment and control measures of flood risk in Ajibode Area of Ibadan, Oyo State, Nigeria. *Journal of Physical and Human Geography*, 6(1), 1-16.

[2] Afolabi, O., Emelu, V., Wali, E., Orji, M., Bosco- Abiahu, L., Yemi, O.Wali,O and Asomaku, S. (2022) Geospatial Analysis Of Flood Vulnerability Levels Based On Physical Characteristics and Resilience Capacity of Peri-Urban Settlements in Nigeria. *Journal of Geoscience and Environment Protection,* 10(8) DOI: 10.4236/gep.2022.108017

[3] Anyanechi, C. N. and Okolie, K. C. (2020). Evaluation of the factors responsible for flood in Anambra West Local Government Area, Anambra State, Nigeria. *International Journal of Innovative Research and Development,* 9(2).

[4] Babatunde, S. A., Owolabi, A., Taiwo, O. J., and Wahab, B. W. (2012). The August 2011 Flood in Ibadan, Nigeria: Anthropogenic Causes and Consequences, *International Journal of Disaster Risk Science 2012*, 3 (4): 207–217 doi:10.1007/s13753-012-0021-3

[5] Cirella, G. T., Felix O. and Iyalomhe, F. O (2018*)* Flooding Conceptual Review: Sustainability-Focalized Best Practices in Nigeria*. Article of Applied Sciences.*

[6] Construction Industry Research and Information Association (2007). Improving the flood performance of new buildings - Flood Resilient Construction. London: RIBA Publishing.

[7] Danhassan, Abubakar, Zangina, Mohammad, Hazaea, Ishak and Jiahua (2022). Flood Policy and Governance: A Pathway for Policy Coherence in Nigeria. Article doi:10.20944/preprints202211.0525.v1

[8] Duluora, J. O. (2017). Flood vulnerability and its effect in Nmiata-Anam, Anambra West Local Government Area of Anambra State, Nigeria (Doctoral dissertation). Nnamdi Azikiwe University, Awka, Nigeria.

[9] Edoka, A. J., Idris, O. D. & Anozie, A. C. (2024). Geographic Information System assessment of the impact of flooding on residential buildings in Akure, Nigeria. British Journal of Environmental Sciences, 12(2), 12-30.

[10] Efobi, K. and Anierobi, C. (2013). Impact of flooding on riverine communities: The experience of the Omambala and other areas in Anambra State, Nigeria. Journal of Economics and Sustainable Development, 4(18

[11] Ezeokoli,F.O., K.C. Okolie, K. C. and C.I.Onyia (2019) The Fundamentals of Building Construction in the Flood-Plains of Ogbaru Local Government Area, Anambra State,Nigeria. *Journal of Engineering Research and Application*, 9(7) (Series -II), 26-35July 2019w.ijera.com ISSN: 2248-9622

[12] Lamba S., Gautam C.P. and GaptaA. K. (2015). Flood Physical Vulnerability on Buildings, *Journal of Civil Engineering and Environmental Technology*,2(8); 2015.

[13] Mclean, S and Watson, P (2009) A practical approach to development of housing on floodplain land in the UK. *Journal of Building Appraisal (2009) 4, 311 – 320. doi: 10.1057/jba.2009.10* .

[14]). Mirajkar, D. (2021). Building design strategies to mitigate flooding disasters. Conference paper presented at 4th WCDM, MIT ADT University

[15] Nwajuaku I. I. and Ekenta O. E, (2018) Analysis and design of a Residential Building against flood Force in Floodplain Araa: A Case Study of Ogbaru L.G.A of Anambra State, Nigeria*. International Journal of Academic Engineering Research (IJAER).*

[16] Okoye, C. (2019). Perennial Flooding and Integrated Flood Risk Management Strategy in Nigeria*. Journal of Economics, Commerce and Management; United Kingdom,* 7(9) ISSN 2348 0386

[17] Okey-Ejiowhor, C. H., Edwin, A. D., Anthony, and Lawson, T. (2025). The impact of perennial pluvial flooding on the architectural quality and performance of residential buildings. *World Journal of Innovation and Modern Technology,* 9(2).

[18] Okoye, P. U, Ezeokoli, F. U and Ezeokonkwo, J. U (2015) Building Development Practice in Flood Prone Area: Case of Ogbaru Council Area of Anambra State Nigeria *Int. Journal of Engineering Research and Applications,* 5(8), 30-40 www.ijera.com ISSN: 2248-9622, August 2015

[19] Okunbiri, O. P. and Puyate, S. T. (2023). Perceived impact of annual flooding on residential buildings in Bayelsa. Journal of Contemporary Science and Engineering Technology, 2(3), 68-80

[20] Oluseye, A. A, Yetunde, O.M. O, Babatunde O. O and Oladokun, V. O (2018) Developing Flood Resilient Buildings in Nigeria: A Guide. *Journal of Environment and Earth Science, 8(*3), *www.iiste.org ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)*

[21] Otaka E. P and Nwafor M. (2023). Appraisal of The Legal And Policy Framework For Flood Control in Nigeria." *International Journal of Innovative Legal & Political Studies* 11(1), 104-111, www.seahipaj.org ISSN: 2467-8503

[22] Oyebamiji, T. O and Oyedeji, O. V. (2022). Towards a Sustainable City Environment: Resolving the Challenge of Flooding in a Growing Tropical City in Osun State, Nigeria- A Review Aswan University Journal of Environmental Studies (AUJES), 3(4), 346-356, (December2022) DOI: 10.21608/aujes.2022.145259.1074

[23] Uche D. O. V. (2013) The environmental effects of flood disaster in Anambra state. Advances in Applied Science Research, 4(1), 499-505. Pelagia Research Library.

[24] Umar, N. and Gray, A (2022) Flooding In Nigeria; A Review Of Occurrence And Impacts And Approaches ToModeling Flood. Journal environmental studies DOI. 10.1080/00207233.2022.2081471

[25] United Nations Office for Disaster Risk Reduction (UNDRR). (2020). The Human Cost of Disasters 2000-2019. UNDRR Report. [Online]. Available: https://unhabitat.org/topic/resilience-andrisk-reduction