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FLOOD MANAGEMENT STRATEGIES AND INSTITUTIONAL ARRANGEMENTS IN UYO CAPITAL CITY, AKWA IBOM STATE, NIGERIA

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Abstract

This study evaluated the efficacy and sustainability of flood management strategies within Uyo Capital City, Akwa Ibom State, Nigeria, driven by the pressing need to mitigate recurrent flooding impacts. The study was structured around four objectives, namely, examining causative factors of flooding, assessing the environmental impacts, evaluating the existing institutional arrangements for flood control, and proposing a sustainable flood management approach. Adopting a mixed-methods research design incorporating both qualitative and quantitative approaches, the study collected information from the residents of Uyo Capital City. To ensure spatial and demographic representation, 400 structured questionnaires were distributed across both flood-prone and flood-free settlements, and the Chi-square technique was utilised in testing the hypotheses. Empirical results confirmed a significant detrimental impact of flooding on the local environment, including damage to properties and disruption of livelihoods. Findings identified excessive rainfall as the predominant causative factor, compounded by inadequate and often blocked drainage infrastructure. The analysis also revealed that flood risk reduction efforts are currently government agency-led, with underground drainage systems being the most prevalent, though often insufficient, management approach. In conclusion, flooding in Uyo Capital City is fundamentally a product of hydrometeorological extremes interacting with infrastructural deficits. The study recommended that the government prioritise significant investment in the construction, maintenance and regular desilting of underground drainage systems and implement comprehensive public sensitisation programmes focused on sustainable waste disposal to prevent future blockages and foster community resilience against flood hazards.

Keywords: *Flood management, Institutional arrangement, Management strategies*

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1 Introduction

Flooding has emerged as a critical global phenomenon, characterised by increasing complexity and dynamism with far-reaching implications that cannot be overstated. From biblical accounts to the present day, floods have repeatedly inundated schools, residential areas, farmland, and protected zones. While natural causative factors exist, many are exacerbated by anthropogenic activities that extend beyond immediate human comprehension. Over the years, the world has witnessed numerous notable disasters resulting in large fatalities, devastating economic losses, and unbelievable environmental damage, with the most significant impacts felt at the community level. Statistically, approximately 100 million people are affected by flooding annually across the globe (NEWMAP, 2018; Adamson, 2018). Developing countries, particularly in Africa, remain especially vulnerable to flood disasters due to weak state infrastructure and the absence or inadequate implementation of policies for disaster reduction and prevention. Nigeria ranks among the most disaster-prone countries in Africa, with floods representing the most common and recurring natural disaster, and the frequency, severity, and spatial extent of these floods continue to escalate (Federal Government of Nigeria, 2020). The most devastating floods in the nation's history occurred between July and October 2012, affecting 25 of 36 states and resulting in 363 deaths, 5,851 injuries, 3,891,304 persons affected, and 387,153 displaced. Flooding is a frequent phenomenon in major urban centres such as Lagos, Port Harcourt, Kano, Kaduna, and others (FGN, 2020). Floods may be caused by anthropogenic activities representing human intervention in natural processes, including increased settlement areas, population growth in low-lying flood-prone plains leading to alterations in natural drainage and river basin systems, deforestation, climate change, and urbanisation.

Attempts by man to harness water resources through dam construction and other water control structures have resulted in failures that affect the social, psychological, and economic fabrics of society (United Nations Environmental Programs, 2021; United Nations Office for Disaster Risk Reduction, 2015). Hu *et al.* (2019) investigated flooding's impact on the Chinese economy from the manufacturing sector perspective, finding that large flood events reduce firm outputs, measured by labour productivity, by approximately 28.3 per cent annually. Using input-output analysis, the study estimated a potential macroeconomic impact at 12.3 per cent annual loss in total output, amounting to 15,416 RMB billion, indicating that the scale of economic impacts from flooding is substantially larger than micro-analyses of direct damage would suggest. The frequency and severity of disasters have increased significantly due to climate change (WMO, 2021a, 2008). During 2021, several regions around the world experienced extreme flood events, which caused massive destruction and even human death (WMO 2021b). In Sweden, heavy rainfall caused severe flooding across the country during the summer of 2021 (SMHI 2021a), and recent flooding has received much attention in Swedish news media, with monitoring of climate-related issues increasing (SvD 2018; Friborg 2021). The Intergovernmental Panel on Climate Change (IPCC, 2022) reported that the risk of flooding due to heavy rainfall and rising sea levels is likely to increase and intensify as the planet warms, highlighting the urgency to combat climate change in the long term while also

dealing with current impacts to achieve sustainable, safe, and resilient societies, as reflected in Sustainable Development Goals 11 and 13 of the 2030 Agenda.

Aderoju, Egbemiro, Liyu, Nwadike, Ajanye, and Salman (2021) stated that flooding in 2010 affected 178 million people. Urban settlement, as defined by Kesiena (2020), represents the major economic and social hubs of any national population. Several factors have been identified as principal drivers for the enhanced pervasiveness and effects of flooding around the world, including the more widespread occurrence of heavy and long-lasting rain, the increased intensity of precipitation in the form of brief but torrential rainfall, and a greater frequency of tropical cyclones and monsoon rains. With respect to impacts, flooding produces greater human casualties and economic losses due to the rising share of the global population that has settled in flood-prone areas. In the specific instance of the Caribbean sub-region, flooding events often result in significant disruptions of economic and social life. For example, the island of Hispaniola has suffered several flooding events over the past two decades, with one of the most significant causing loss of life of more than 900 persons in Haiti and the Dominican Republic in 2004 and several repeated occurrences up to 2017. Still in 2017 and 2018, several regions in Jamaica have also experienced repeated flooding events, with the most recent occurring in 2012, 2017, and 2018.

Similar events have also been noted for several islands of the Eastern Caribbean, including Antigua and Barbuda (2010); Barbados (2010); the British Virgin Islands (2010 and 2017), Dominica (2013, 2017), Saint Lucia (2013, 2016), Saint Vincent and the Grenadines (2013), and Trinidad and Tobago (2016, 2017 and 2018). Mainland Caribbean territories have also had their challenges with flooding, as was the experience of Guyana in 2005, Suriname in 2008, and Belize in 2015 (WMO, 2020). Caribbean countries such as Jamaica and Trinidad and Tobago face a potentially great reversal in economic and social improvements at the local level due to weather-related disasters such as flooding; for instance, their portfolio of investments and existing debt could be affected by spending shifts that force the diversion of resources destined for productive sectors and social spending into reconstruction efforts. The flood scenario in Nigeria is unprecedented, with a terrible record of yearly floods, particularly in the low-lying terrain of the Niger Delta region, where Akwa Ibom State is heavily affected. Urban flooding has emerged as a significant environmental and developmental challenge in many rapidly growing cities across Nigeria, and Uyo, the capital city of Akwa Ibom State, has experienced recurrent urban flooding in recent years, resulting in the destruction of property, disruption of socio-economic activities, loss of lives, and severe environmental degradation. Despite the implementation of various urban planning and flood management interventions by government agencies, flooding persists with growing intensity and frequency, raising critical concerns about the adequacy and effectiveness of existing flood management strategies in the city. The problem of urban flooding management in Uyo is rooted in the interplay of rapid urbanisation, poor land-use planning, inadequate drainage infrastructure, and weak institutional enforcement of environmental regulations. Urban flooding is not only a result of natural hydrological phenomena such as heavy rainfall and

topography but also a function of human-induced activities, including indiscriminate dumping of refuse in drainage channels, unregulated construction on floodplains, and the sealing of soil surfaces with impervious materials such as concrete and asphalt. Uyo's increasing population growth and expansion of residential, commercial, and industrial zones have outpaced the capacity of the city's flood management infrastructure and planning framework. Udo and Effiong (2021) documented that flood events in Uyo are seasonal but often devastating.

Numerous studies have highlighted specific flood-prone areas such as Nsikak Eduok Avenue, Oron Road, Aka Road, IBB Way, Atiku Abubakar Way, and Nwaniba Road, where heavy rainfall events frequently overwhelm the existing drainage systems. The level of flash floods in Uyo exceeds the capacity of available drains, and poor connectivity leads to overflow. Furthermore, the Akwa Ibom State Government, through the Ministry of Environment and Works, has embarked on several flood control projects; however, despite these measures, flooding incidents persist, suggesting possible weaknesses in implementation, policy coherence, and stakeholder engagement. Various flood risk assessments have acknowledged the role of climate change in exacerbating rainfall intensity and variability, leading to more frequent flash floods in urban centres such as Uyo. Developmental agencies, including the World Bank and Nigeria's Ecological Fund Office, have also intervened through various infrastructural projects (Adekola *et al*., 2020). Moreover, the Nigerian Meteorological Agency (NiMet) and the Nigeria Hydrological Services Agency (NIHSA) have been providing seasonal rainfall predictions and flood alerts. These resources, however, often fail to translate into localised flood prevention or mitigation action in Uyo due to poor integration into local planning and limited accessibility to vulnerable urban populations. What is unknown, and what constitutes a critical gap in the existing body of knowledge, is the extent to which current urban flooding management strategies in Uyo are effective, sustainable, inclusive, and adaptive to the city's socio-spatial dynamics. It remains unclear how well local urban planning frameworks incorporate flood risk management into land use policies. The absence of comprehensive data on the performance of existing drainage systems, the level of community awareness and participation in flood mitigation, and the institutional coordination between state and local authorities pose serious challenges to informed decision-making.

Furthermore, there is limited empirical understanding of the cost-effectiveness and environmental impacts of the interventions implemented so far. Despite frequent reports of flood incidents and complaints from residents and business owners, no robust longitudinal study has yet evaluated the long-term impact of government-led flood management strategies on reducing urban vulnerability in Uyo. It is also largely unknown to what extent informal settlements, many of which lack basic urban services, are factored into the city's flood management policies. There is a need to investigate whether a community-based approach has been adopted or whether most flood control efforts remain top-down, engineered solutions that may not address the root causes of flooding or the socio-economic realities of the city's diverse populations. This study aims at providing an evidence-based evaluation of urban flooding management strategies in Uyo Capital City,

including a systematic analysis of the strengths, weaknesses, opportunities, and threats (SWOT) of existing interventions; the spatial dimensions of flooding through geospatial analysis to map flood-prone areas; the roles of stakeholders and community participation; and the extent to which urban development policies align with principles of integrated flood risk management, sustainability, and resilience. The paper shall evaluate flood management strategies in Uyo Capital City, Akwa Ibom State, by examining the causative factors of flooding; assess the environmental impact of flooding; evaluate institutional arrangements for flood control and management; and proffer an effective flood management approach for sustainability.

2 Materials and Methods

i. Study Area

Uyo capital city (the study area) lies within latitude 40°56'02'' N – 5°08'00'' N and longitude 7°49'00'' – 8°00'10'' E. It is bounded in the north by Ikono, Ibiono Ibom and Itu Local Government Areas; in the south by Ibesikpo Asutan, Nsit Ibom and Etinan Local Government Areas; in the east by Uruan Local Government Area; and in the west by Abak Local Government Area (Figure 1). It covers a total landmass of 155.856 square kilometres. The limit of the capital city, however, exceeds some of the boundaries of Uyo Local Government Area and covers approximately 314.65 square kilometres and is made up of four clans, namely Oku (15 villages), Etoi (22 villages), Offot (22 villages) and Ikono Ibom clan.

Uyo Capital City is situated within the equatorial rainforest belt, which is often evergreen in nature and is characterised by tall trees and tree shrubs with thick ground cover. But on the contrary, population pressure and unsustainable environmental practices have resulted in the disappearance of this ideal vegetation type in Uyo Capital City. The area is now in the modified rainforest locally known as the oil palm bush and is presently built up.

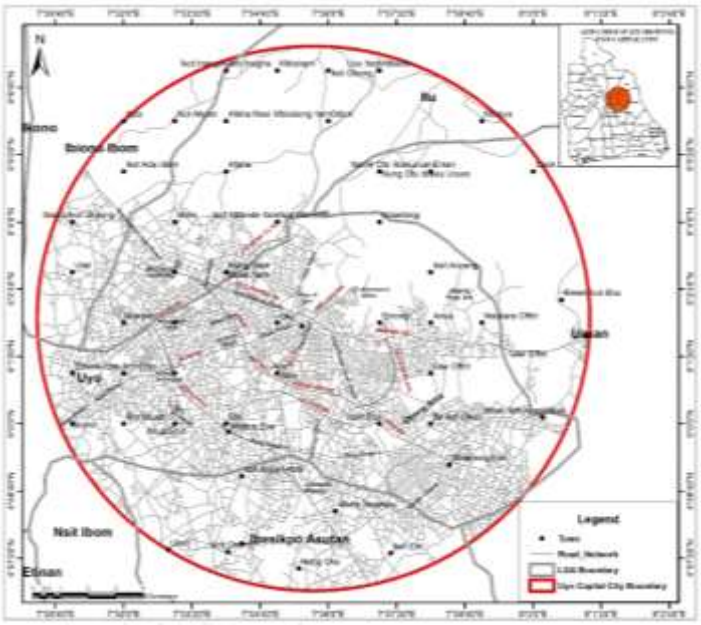

Figure 1: Uyo Capital City (the Study Area)

The original rainforest, which used to occupy over 75% of the land surface, has largely been removed through decades of intensive human activities such as farming, firewood

exploitation, road expansion and urbanisation, among others (Ituen and Udoh, 2004). As observed in other parts of Akwa Ibom State, climatic characteristics of the study area are contingent both on the position/location of the inter-tropical discontinuity (ITD) and the influence of the Atlantic Ocean (which is several kilometres away). The two prevalent air masses that blow over the area are: The warm, humid tropical maritime [mT] which is associated with South-Westerly Trade Winds (i.e., monsoon), blows from the Atlantic Ocean. These winds usher in the wet/rainy season between April and October. The second are the light, dry dusty tropical continental [cT] air masses with the associated harmattan winds which blow from the Sahara (North-East Trade Winds), usually experienced between December and February. This study relied heavily on archival data from the Nigeria Agro-Meteorological station, Uyo synoptic station at Owot Uta for macroclimatic conditions of the study area.

ii. Data set and Techniques

This study employed a mixed-methods research design, integrating qualitative and quantitative approaches to examine the relationship between flood management strategies and flood control effectiveness. The descriptive approach enabled a nuanced understanding of the complex dynamics of flood management from both broad and specific perspectives. Qualitative data captured the social and psychological impacts of flooding, while quantitative data measured economic effects on revenue generation, employment, and infrastructure through structured questionnaires. Triangulation of both data types ensured a robust understanding of flood impacts; for example, quantitative data indicated the rate of flood damage, whereas qualitative interviews provided deeper context on how damage affects community life. Variables on flood causes, environmental effects, damage magnitude, and coping strategies were sourced from questionnaires and analysed using frequency and percentage distributions. Using a random sampling technique, 400 respondents aged 18–65 years were selected from flood-prone and flood-free areas of Uyo Capital City, irrespective of gender. A systematic random sampling method was applied, and only individuals who had resided in the target areas for at least five years were included to ensure accurate, reliable information.

The research used both qualitative and quantitative methods. This research design allowed an in-depth examination of the relationship between flood management strategies and flood control effectiveness. This approach combines the strengths of both qualitative and quantitative research, allowing for a more nuanced understanding of the research problem. A descriptive approach is suitable for understanding the complex dynamics of flood management strategies, as it enabled the researcher to capture detailed insights from both a broad and specific perspective. Qualitative data provided insights into the social and psychological impacts of flood. The quantitative component involves gathering statistical data to measure the economic impacts of flood, including revenue generation, employment, and infrastructure development using questionnaires. Using both qualitative and quantitative data allowed investigator to triangulate findings, ensuring a more robust understanding of the social impacts. For example, quantitative data showed the rate of flood damage, but qualitative interviews provided deeper insights into how this perceived damage affects local community life. The major forms of data collection are primary and secondary sources of data. The data sets included the causes of flood, effect of flooding on the environment, magnitude of flood damage and coping strategies, including its variables were sourced from questionnaire and measured in frequency and percentage. A random sampling technique was used in selecting respondent from Uyo Capital City. The respondents were selected from age 18 to 65 years irrespective of gender, those

businesses, shops, offices are around the targeted zones. A total of 400 questionnaires form were distributed among the settlements along the flood prone and flood free areas using systematic random sampling technique to those expected to have lived for at least five (5) years in the targeted areas to be sure they are not visitors so as to obtain an accurate information that will guard the research.

3. Results and Discussion

Based on respondents' opinions, it was revealed that rainfall has been the major cause of flooding across all the sampling areas, as 29% of the respondents attest to it. This is the reality; as excessive rainfall leads to massive flooding across the capital city. Lack of drainage (22%) in some of the streets visited was the second major cause of flooding. Other causes include blockage of the drainage channel (18.9%), poor drainage system (8.7%), illegal building along the flood path (5.6%), among others. On the Impact of Flooding on the Environment, Uyo Capital City was categorised into soil erosion and land degradation, water pollution, biodiversity loss, and other impacts. For Stakeholders Involved in Flood Management Government agencies are the major stakeholders involved in flood management within Uyo capital city. For instance, the IBB flood control project was facilitated by the World Bank through the Nigeria Erosion and Watershed Management Project (NEWMAP) with counterpart funding from Akwa Ibom State government. Others include the recent Atiku Abubakar underground flood control project facilitated by the Akwa Ibom State government. In some areas, the communities and the youth play a key role in flood management through desilting of drainages, digging of new gutters, and expansion of old ones, among others. Private individuals are also engaged in flood management by adopting measures such as raising house foundations and bagging to prevent floodwater from entering their compound, as mostly experienced along Abak Road, Nkemba, and Esuene, among other streets. The result shows that the insensitivity of residents towards flood management is the major constraint to effective flood management. This is followed by lack of information on flood management and lack of flood management facilities. Others include inadequate fund to social groups to combat flooding, unavailability of social groups for extension training and varying topography of buildings.

The study reveals that while intense, seasonal tropical rainfall is the primary natural trigger of flooding in Uyo Capital City, the severity and frequency of these events are heavily driven by human activity and systemic planning failures. Rapid urban expansion has replaced natural vegetation with impervious concrete and asphalt surfaces, which drastically reduces soil infiltration and spikes surface runoff. This increased runoff quickly overwhelms the city's limited drainage network. The problem is further compounded by severe infrastructural deficiencies: many neighbourhoods completely lack drainage systems, while existing channels are often narrow, shallow, and clogged with silt and plastic waste. Furthermore, a lack of strict urban planning enforcement has allowed residents to construct illegal buildings directly on natural floodplains and water channels, blocking natural runoff pathways and redirecting floodwaters into residential zones.

The Chi-Square analysis confirms a highly significant relationship between flooding and environmental degradation in the study area, yielding a Pearson value of 1098.081 (df=20, p=0.000). The practical consequences of this relationship are devastating and multi-dimensional. Flooding frequently inundates residential areas, causing severe structural damage to homes and destroying household assets. Beyond residential areas, commercial markets and shops suffer frequent closures and merchandise loss, while agricultural sectors face crop destruction that threatens local food security. The impact also touches the cultural fabric of

Uyo, as floods degrade ancestral homes, graves, and sacred shrines, eroding community heritage. Most critically, the study highlights the human cost of these disasters, noting tragic losses of life from drowning and flood-related accidents.

Stakeholder engagement in flood risk reduction across Uyo is characterised by a mix of formal, top-down government projects and informal, reactive community efforts. Major structural interventions are led by public institutions, highlighted by the World Bank-supported IBB flood control project through NEWMAP and the state-funded Atiku Abubakar underground drainage initiative. In areas where government intervention is delayed, local youth and community groups proactively step in to desilt clogged drains and dig makeshift channels. Individually, residents in high-risk areas like Abak Road, Nkemba, and Esuene Street resort to self-preservation tactics, such as raising building foundations and using sandbags. While these efforts align with established literature highlighting the power of self-organised community action, the study notes that traditional institutions and local elders remain an underutilised resource in building unified, culturally inclusive flood management frameworks.

To achieve long-term sustainability, the study evaluates various flood mitigation approaches and the barriers preventing their success. Large-scale underground drainage systems are widely recognised as the most effective structural solution, supplemented at the community level by sandbagging, regular drainage desilting, and planting soil-stabilising vegetation. However, several critical barriers hinder the long-term success of these strategies. Chief among these is public apathy, characterised by improper waste disposal and a general lack of civic responsibility toward maintaining local drains. This behaviour is fuelled by a lack of public information, environmental training, and community engagement. When combined with uneven topography and limited funding for local community groups, these factors create a significant implementation gap, emphasising the urgent need for an integrated model that harmonises government-led infrastructure with grassroots community participation.

4. Conclusion

This study establishes that while heavy rainfall is the primary natural catalyst for flooding in Uyo, the crisis is significantly intensified by anthropogenic factors. The city's vulnerability is deeply rooted in severe infrastructural deficits, characterised by an outright absence of drainage systems in numerous neighbourhoods, alongside existing channels that are structurally deficient and heavily obstructed by silt and domestic waste. This systemic failure to accommodate storm water is further compounded by weak regulatory enforcement, which has allowed illegal property developments on natural floodplains and vital water channels, effectively trapping runoff within built-up urban spaces. The environmental and socio-economic consequences of these flooding events are profound and multi-dimensional. Most visibly, flooding inflicts severe damage on residential properties, particularly within low-lying areas. Prolonged water inundation routinely ruins household assets, compromises structural integrity, and, in extreme cases, triggers catastrophic building collapses that threaten human lives and livelihoods.

In response to these challenges, the study highlights a critical synergy between public and private efforts, demonstrating that formal government initiatives are vitalised by the active, grassroots participation of local communities and youth groups. These local actors routinely organise proactive mitigation exercises, including desilting blocked drains, digging new gutters, and expanding localised channels. Additionally, low-cost, decentralised interventions, such as constructing makeshift runoff diversions and planting soil-stabilising vegetation, have proven highly effective at providing

immediate relief while fostering long-term ecological resilience. However, the long-term sustainability of these flood management efforts remains constrained. Without addressing critical bottlenecks such as community apathy, poor public waste disposal habits, a lack of structured environmental education, and uneven resource distribution, Uyo's path to climate resilience will remain incomplete. Addressing these barriers requires a unified, well-coordinated framework that seamlessly integrates top-down municipal infrastructure with bottom-up, community-led adaptation strategies.

5. Recommendations

To address the persistent challenges of flooding in Uyo Capital City and foster long-term environmental resilience, a coordinated, multi-pronged approach is required from both governmental and community stakeholders. First and foremost, the government must prioritise infrastructural development by investing in the construction of robust underground drainage systems, while simultaneously implementing a rigorous maintenance schedule to routinely desilt existing gutters and improve overall water flow capacity. Alongside these structural improvements, the state should deploy regular public sensitisation programmes aimed at educating residents on proper waste disposal habits and flood prevention strategies, thereby tackling the behavioural root causes of drainage blockages.

Furthermore, sustaining these efforts requires a stronger framework for community engagement. The government and relevant development partners should actively empower local communities and youth groups by providing them with formal training and dedicated funding to support grassroots initiatives, such as self-organised gutter digging and community-led desilting exercises. Finally, these structural and behavioural interventions must be backed by strict policy enforcement. Urban planning authorities must rigorously enforce zoning regulations and halt illegal construction projects along natural floodplains and water paths, ensuring that vital drainage corridors remain unobstructed. Through this integration of structural development, civic education, community empowerment, and regulatory discipline, Uyo can achieve a sustainable and flood-resilient urban future.

References

Adamson, M. (2018). Flood risk management in Europe: the EU "Floods" directive and Analysis for Flood Risk Assessment at the Regional Scale. International Symposium on a Robust and Resilient Society against Natural Hazards and Environmental Disasters, and the 3rd AUN/SEED-NET Regional Conference on Geo-Disaster Mitigation, Kyoto, August 24-26 2010, 11 p.

Adekola, O. A., Ogundele, F. O. and Adeyemo, O. (2020). Urban flooding in Nigeria: Causes, impacts and sustainable mitigation measures. *Environment and Urbanization ASIA*, 11(1), 41–57. https://doi.org/10.1177/0975425320904527

Adelekan, I. O., Johnson, C., Manda, M. A. Z., Matyas, D., Mberu, B. U., Parnell, S. and Satterthwaite, D. (2015). Disaster risk and its reduction: An agenda for urban Africa. *International Development Planning Review*, 37 (1), 33-43.

Aderoju, O. M., Egbemro, K. C., Liyu, A. B., Nwandike, O. C., Ajanye, S. O., & Salman, M. A. (2020). Geospatial analysis of flood vulnerability in a changing climate: A case study of Lagos, Nigeria. *International Journal of Environmental Science and Technology,* 14(3), 47–64.

Adeyemi, M. and Olorunfemi, M. (2022). Urban development, land use policies and flooding in Nigerian cities. *Urban Studies Review*, 15 (2), 89–103. https://doi.org/10.1234/usr.2022.089.

Berdtsson, R., Becker, P., Persson, A.,

Aspegren, H., Haghighatafshar, S., Jönsson, K., Larsson, R., Mobini, S., Mottaghi, M., Nilsson, J., Nordström, J., Pilesjö, P., Scholz, M., Sternudd, C., & Sörensen, J. (2019). Drivers of changing urban flood risk: A framework for action. Lund University.

Cook, B., Forrester, J., Bracken, L., Spray, C., and Oughton, E. (2016). Competing paradigms of flood management in the Scottish/English borderlands. *Disaster Prevention and Management, 25*(3), 314–328.

Criss, R. E. (2019). Statistics of evolving populations and their relevance to flood risk. *Journal of Earth Science,* 30(1), 97–104.

Federal Government of Nigeria [FGN]. (2020). National flood emergency preparedness and response plan. Federal Ministry of Humanitarian Affairs, Disaster Management and Social Development.

Galadima, D. H., Samaila, I. K. and Joshua, M. I. (2019). Evaluation of flood management in Nigeria: A case study of Yauri Local Government Area, Kebbi State. *International Journal of Environment and Climate Change,* 9(11), 652–659.

Hegger, D. L. T. and Dieperink, C. (2014). Institutional adaptability in flood risk governance: The case of the Dutch Room for the River programme. *Journal of Flood Risk Management,* 7 (2), 151-163.

Holling, C. S. (1973). Resilience and stability of ecological systems. Annual Review of Ecology and Systematics, 4(1), 1–23.

IPCC. (2021). Summary for Policymakers. In Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S.L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M.I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J.B.R., Maycock, T.K., Waterfield, T., Yelekci, O., Yu, R. & Zhou, B. (eds.), *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 11-41). Cambridge University Press.

IPCC. (2021b). *Definition of Terms*. IPCC Data Distribution Centre (DRAFT). https://www.ipcc-data.org/guidelines/pages/definitions.html.

Kesiena, O. (2020). Assessment of institutional frameworks for flood disaster management in the Niger Delta region of Nigeria [Master's thesis, University of Port Harcourt].

Mojtahedi, S. M. H. and Oo, B. L. (2014) Stakeholders' Approaches to Disaster Risk Reduction in Built Environment 23. *Disaster Prevention and Management*, 356–369.

National Emergency Management Agency [NEMA]. (2020). Annual report on flood disasters in Nigeria. NEMA Publications.

Nigeria Erosion and Watershed Management Project [NEWMAP]. (2018). Integrated watershed management plan: Final report. World Bank.

Swedish Meteorological and Hydrological Institute [SMHI]. (2021). Future climate and hydrology in Sweden: A scenario-based assessment. SMHI Report RO 100

Thaler, T. and Levin-Keitel, M. (2016). Multi-level governance and flood risk management: A comparative analysis of Germany and the Netherlands. *Journal of Flood Risk Management*, 9 (2), 147-159.

Thaler, T., and S. Priest (2014) Partnership Funding in Flood Risk Management: New Localism Debate and Policy in England. *Area* 46 (4): 418-425

Udo, A. K., and Effiong, J. B. (2021). GIS-based flood hazard mapping and drainage recommendations for Uyo urban area. *Nigerian Journal of Environmental Sciences*, 12(3), 45–60.

United Nation Office for Disaster Risk Reduction (UNISDR) (2015). The Human

Cost of Weather-Related Disasters 1995–2015. The Centre for Research on the Epidemiology of Disasters (CRED). United Nation Office for Disaster Risk Reduction (UNISDR). University Press. https://www.ipcc.ch/report/ar6/wg1/downloads/report/

United Nations Environment Programme [UNEP]. (2021). Adaptation gap report 2021: The gathering storm. https://www.unep.org/resources/adaptation-gap-report-2021

Van den Berg, M. and Gupta, J. (2018). The role of social norms and trust in flood risk management: A case study of the Netherlands. *Journal of Flood Risk Management*, 11(2), 151-163.

Van Meerkerk, I.F., Boonstra, B. and Edelenbos, J. (2013). Self-Organisation in Urban Regeneration: A Two-Case Comparative Research. *European Planning Studies* 21 (10): 1630-1652

World Meteorological Organization [WMO]. (2008). Guide to hydrological practices: Volume I and II (6th ed.). WMO-No. 168.

World Meteorological Organization [WMO]. (2020). 2020 State of Climate Services: Risk information and early warning systems. WMO-No. 1252.

World Meteorological Organization [WMO]. (2021). Atlas of mortality and economic losses from weather, climate and water extremes (1970–2019). WMO-No. 1267.