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Editorial Note

This is a brief introduction to a timely and intellectually relevant conversation in this AYIKA publication. It centres on ten articles that cover unique aspects of development challenges in Africa, with particular attention to South Africa and Nigeria. These contributions, taken together, not only identify persistent challenges in environmental protection and economic growth but also advance policy recommendations in response to Africa's changing circumstances across various fronts. To be clear, the needs of Africa are multifaceted and interconnected in several ways; the challenges are similar across the board, although the manifestations may differ geographically. These articles address the connections in the needs and choices of Africa while projecting a better future. Motswaledi's article illuminates this in this volume, concluding that equitable and inclusive energy provision should be prioritised as a fundamental social justice intervention to redress historical inequalities, promote human dignity, and advance socio-economic transformation in post-apartheid South Africa. Such insight applies to all of Africa.

Collectively, these contributions demonstrate that Africa's development challenges cannot be understood in isolated compartments. Governance affects environmental management; energy affects social justice; infrastructure affects economic growth, etc. The major strength of this collection is therefore its interdisciplinary character. It brings together governance, economics, environmental studies, development studies, public policy, agriculture and social justice. More importantly, the articles consistently return to a central question: how can African societies build institutions and development pathways that improve human welfare without undermining the environmental and social foundations of the future? This collection does not claim to offer simple answers. Instead, it provides evidence, cases and critical perspectives that can help scholars, policymakers and practitioners ask better questions. New and better research questions are a right way in the right direction.

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CLIMATE CHANGE ADAPTATION AND NATIONAL WATER POLICIES ON FLOODING RISK MANAGEMENT: ANALYTICAL EXPERIENCE FROM OSUN STATE, NIGERIA

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Abstract

Empirically, studies have shown that persistent climate change has increased the frequency and severity of flooding in Nigeria, threatening lives, infrastructure, agricultural productivity, and sustainable development across the country, from the North to the South and from the East to the West. Thus, this paper proposes a synthesised analytical framework that examines the role of, and adaptation measures for, climate change adaptation and national water policies, as well as flood resilience, in Osun State. The study adopts a qualitative systematic literature review, drawing on secondary data from peer-reviewed journal articles, government policy documents, and reports from national and international organisations. Data were analysed using thematic content analysis based on the paper's themes. Findings reveal that ineffective policy implementation, inadequate funding, weak institutional coordination, poor regulatory enforcement, rapid urbanization, and limited community participation continue to undermine flood risk management efforts. The review also highlights that integrated water resources management, ecosystem-based adaptation, strengthened early warning systems, and collaborative governance significantly enhance resilience to flooding in Osun State. The study concludes that flood risk management requires

stronger policy and institutional coordination on implementation of national water policies and climate adaptation strategies to reduce vulnerability and promote sustainable environmental governance in Osun State.

Keywords: *Climate Change, Climate Adaptation, National Water Policies, Flooding Risk Management, Nigeria*

1. Introduction

The contributions of diaspora remittances and social capital networks to households' adaptation to climate change have been comparatively understudied in West Africa. The findings of a qualitative study on remittance-receiving households in similar household settings as studied in Singh (2025) indicate that the informal financial flows represent an under-recognised aspect of adaptive capacity, as evidenced by their greater capacity to invest in protective building materials, move further away from flood-prone areas, and recover from losses of income after floods. This type of adaptive capacity is also highly unequal and largely enjoyed by households with access to international migration networks, thereby reinforcing patterns of socioeconomic differentiation in adaptation outcomes within communities, Singh (2025) argues. This view is supported by the IPCC AR6 (2022), which highlights that adaptive capacity extends beyond formal policy instruments to encompass social capital, household assets, and relational networks, thereby calling for adaptation research

and policy to be inclusive of non-technical aspects of resilience in Nigeria.

Climate change adaptation and public health are emerging topics in the academic literature, especially in tropical developing-country settings like Southwest Nigeria. The current IPCC AR6 (2022) report confirms a strong link between waterborne and water-dependent vector-borne diseases, such as cholera, typhoid, and malaria, and flooding events, and that the burden of these diseases will be significantly increased in tropical regions with poor water and sanitation infrastructure as a result of climate change. Singh (2025) emphasizes that there remains a lack of attention to public health aspects in climate-sensitive flood adaptation planning and suggests that community-level implementation of climate adaptation should be based on long-term interdisciplinary cooperation among environmental agencies, water governance bodies, and the public health sector. The IPCC AR6 (2022) also shows that adaptation investments will fail to mitigate flood hazards without considering the cascading health impacts that are particularly harmful to communities in Osun State

and the Southwest of Nigeria, even when this integration is done.

The Southwest region of Nigeria is highly urbanized, and climate change adaptation and the urban heat island are two new and problematic intersections of climate stressors in the region. The results by Oyeniyi *et al.* (2025) show that the built-up areas of Akure and Osogbo increased from 41.8 km² to 58.3 km² between 2014 and 2023, and that the surface urban heat island effects grew significantly during the period, a trend directly related to the increase in impervious built-surface area. The IPCC AR6 2022 confirms that these increases in impervious surfaces will exacerbate surface runoff and flood exposure, while also causing additional urban heat stressors that will compound flood hazards, producing multi-dimensional climate burdens for urban populations. As noted by Corgo *et al.* (2024), the use of IUCAS (combining the three climate aspects of flood risk mitigation, heat stress reduction, and biodiversity conservation) in formal planning practice is still in its infancy. It is not widely used, especially in Nigeria where, as noted, the institutional and financial barriers to implementing IUCAS are significant.

There is still a considerable gap in the global climate adaptation architecture with regard to monitoring and evaluation of adaptation interventions, especially at the local level in Nigeria. Evidence for

evaluating the efficacy of adaptation is systematically weaker than evidence for adaptation planning and adaptation policy design. This is evident across geographic contexts and governance levels and is a fundamental barrier to learning and course correction in adaptation programmes, as revealed in IPCC AR6 (2022). This is echoed by Chapagain *et al.* (2025), who have found that evaluation shortcomings are structural barriers to adaptive learning, and that if outcomes are not systematically tracked, the same high-expense and inequitable errors can be perpetuated through successive policy cycles. As per the recommendations of the IPCC AR6 (2022) and Chapagain *et al.* (2025), there is an urgent need to build capacity for locally adapted monitoring and evaluation systems for flood preparedness programmes, drainage infrastructure investments and land use enforcement, especially for sub-national governance actors under such environment as that of Osun State, where already vulnerable populations most feel the effects of continued failure to evaluate.

The drivers of flood risk in medium-sized cities in sub-Saharan Africa have provided valuable, highly applicable insights for Southwest Nigeria. Rapid unplanned urban development, encroachment on wetlands and water bodies, and insufficient urban drainage system expansion are the most significant and common factors that influence urban flood vulnerability, with the authors in

this paper concluding that these drivers compound to expose urban populations to levels of vulnerability that are much larger than those that can be illustrated on a single map of exposure to physical risks. In the specific context of the city of Osogbo in Southwest Nigeria, Alimi *et al.* (2022) supports this analysis, showing using geospatial analysis that the loss of wetlands and the increase of impervious surfaces and the decrease of natural water-holding capacity are especially important to urban flood risk in Southwest Nigerian cities, but are also largely ignored in the implementation of urban flood management policies that continue to focus on channel engineering, rather than landscape-scale interventions. Moulds *et al.* (2021) also argue that planning approaches that neglect these underlying causes are misaligned and set the stage for disproportionate effects on the informal and low-income urban population that is most exposed to floods.

2. Climate Change Adaptation

Although much has been researched on the physical dimensions of adaptation, Singh (2025) contends that the behavioural and psychological dimensions of adaptation are comparatively under-researched and are significant for the design of effective adaptation strategies. Empirical research shows that cognitive biases, cultural norms, social networks, and the experiences of individuals and communities influence

how they respond to climate change, and that these factors are not represented in traditional technical models (Singh, 2025). This is confirmed by the IPCC AR6 (2022), which found that risk perception, trust in institutions, and access to information are key mediators of adaptation behaviour, and that socially sensitive approaches that consider these factors have a significantly greater chance of success than information-based approaches.

Adaptation and Disaster Risk Reduction (DRR) is a conceptually integrating space that is emerging as an important area of research and policy. The IPCC AR6 (2022) and the Sendai Framework for Disaster Risk Reduction (2015–2030) both state that the divide between the management of climate variability and climate change adaptation is becoming blurred and that integrated approaches are needed that can face up to both short-term weather conditions and long-term structural climate change for effective governance. This integration is of particular importance for flood management in Nigeria, as the IPCC AR6 (2022) also reports that extreme rainfall events are expected to become more intense and frequent, making it impossible to manage flooding without considering the climate drivers that intensify the hazard. Singh (2025) states that one of the immediate knowledge and institutional frontiers for disaster risk governance and long-term climate adaptation planning lies

in highly vulnerable areas such as Osun State.

One of the major challenges and the most poorly structured aspects of the global climate response is funding for adaptation. The Sixth Assessment Report (AR6) (2022) by the IPCC states that the level of adaptation finance flowing is not commensurate with adaptation needs, especially in the most vulnerable countries and communities, and that governance systems for directing adaptation finance are slow, cumbersome, and poorly aligned with local adaptation priorities. The IPCC AR6 (2022) also indicates that increased investments in both public and private funds, with a focus on implementation rather than planning and design, are crucial for transformative adaptation in Africa. This funding shortfall has implications for Nigeria, as illustrated by the Climate Policy Initiative (2025) Nigeria Landscape Assessment of Climate Finance, which highlights the persistent and growing gap between adaptation funding and investment to address increasing flood and climate risks at the national and sub-national levels.

The COP27 agreement in 2022 to establish a specific fund for loss and damage has served as a turning point in global climate policy, but the governance structure, eligibility requirements, and funding of the fund are still subject to debate (IUCN, 2022). This paradigm shift has obvious

implications for the floodplain communities of Southwest Nigeria. According to the Climate Policy Initiative (2025), the 2022 Nigeria floods resulted in loss and damage estimated at USD 6.7 billion, and recurrent floods in Nigeria are now more about irreplaceable assets and livelihood loss, and less about recovery, which is typically associated with adaptation (Shiyanbade & Alako, 2023).

Urban climate adaptation has received particular attention from scholars worldwide, since most of the world's population lives in cities, and many of these cities are located in low-elevation coastal and riparian zones that are particularly vulnerable to flooding. The IPCC AR6 (2022) reports that in cities such as Ibadan, Osogbo, and Ile-Ife in Southwest Nigeria, the natural drainage system is increasingly threatened by rapid and unchecked urban expansion, especially informal settlements, which lack access to early warning systems, emergency services, and post-disaster recovery mechanisms. For urban adaptation strategies to yield lasting medium- to long-term results, they must include NbS within formal urban governance frameworks; the integration of NbS into formal urban governance frameworks is not optional but imperative, and NbS is vital to urban planning to ensure climate resilience (as per Corgo *et al.*, 2024). This position is further confirmed by Oyeniyi *et al.* (2025), who used

spatiotemporal analysis of Osogbo and Akure to show that the built-up area has quickly expanded between 2014 and 2023, worsening surface runoff, the frequency of flood events, and the intensity of the urban heat island effect, which are among the climate stressors that urban adaptation strategies must tackle.

3. Flood Risk Management

Flood early warning systems (FEWS) have attracted considerable academic interest as part of integrated flood risk management, especially in developing countries, where structural protection is often lacking or inadequate. As mentioned by Nkwunonwo *et al.* (2020), the implementation of FEWS has improved greatly in developing nations, thanks to international technical and financial aid; however, obstacles such as access to data, data quality, and data management still limit the use of FEWS in practice. Nkwunonwo *et al.* (2020) additionally suggest that successful FEWS need to be based on communities; involve the incorporation of knowledge about risks into the FEWS system, as well as risk monitoring, warning dissemination, and response capacity; and that communities' understanding of flood risk is an essential, but often underemphasized determinant of FEWS effectiveness. This is corroborated by Echendu (2020), who posited that one of the main causes of

the failure in flood governance in Nigeria is the use of flood warning information in isolation; that, for most technical agencies, FEWS data is not transmitted to the community level for prompt and timely response and action, thus limiting the benefits of investment in monitoring infrastructure.

It is now known that social vulnerability is a key factor in flood risk that is not adequately captured in traditional approaches. This is an interesting report by Dulawan *et al.* (2024) from Metro Manila that found that when social vulnerability indices are added to hazard data, an actionable flood risk picture can be obtained that is significantly different from the hazard-only picture, in that communities previously identified as moderate risk are further identified as high risk when social vulnerabilities are added. According to Dulawan *et al.* (2024), this reclassification is not only a technical change but also a governance need, noting that flood risk management frameworks that rely solely on physical hazard mapping will always underinvest in the most vulnerable communities.

The projections for the flood risk level in the sub-Saharan region show a definite and increasing rise in flood risk, closely linked to urbanisation, land-use transformation, and climate change. Research using the combination of machine learning and geospatial analysis of flood pattern changes in Nigeria has found

that flood extents have increased dramatically in the high-risk downstream areas from 2018 to 2024, driven by a combination of land-use change, upstream operations, and hydrology, indicating that existing flood management systems are not adequately keeping up with a rapidly evolving risk landscape. Nkwunonwo *et al.* (2020) warn that the quality of hydrological input data is critical to the reliability of such modelling outputs, and that even sophisticated models are not reliable enough for confident decision-making in many Nigerian states with few ground-based monitoring networks. The IPCC AR6 (2022) also supports this worry, emphasizing that the investment required for advancing the evidence base needed to inform data-driven and adaptive flood governance in countries such as Nigeria, where there is a significant mismatch between the reality of flood hazards and the institutional capacity to respond, is essential (Shiyanbade & Alako, 2023).

There are still many methodological challenges regarding the collection of flood damage data and loss accounting, which limit the evidence base for flood risk management policy in Nigeria and sub-Saharan Africa more broadly. The findings by Nkwunonwo *et al.* (2020) indicate that flood damage in Nigeria is under-documented, with losses in the informal urban settlements and rural areas often not captured in official databases, and suggest that this

information gap is a significant challenge in the development of the political and financial argument for continued investment in flood risk reduction. The EM-DAT International Disaster Database is recognised as underestimating overall losses from floods, as it relies on data reported by countries, which are also subject to institutional constraints, as are domestic data sources.

The EU Floods Directive (2007) is a key indirect influence on the global thinking around flood risk governance frameworks, which provides a model of systematic, evidence-based, and legally binding flood risk governance that includes three elements: flood risk assessment, flood risk mapping, and flood risk management planning in the most vulnerable areas. A key lesson from this framework, according to Dulawan *et al.* (2024), is the incorporation of physical hazard data with social vulnerability analysis and the focus on participatory planning, which can be transferred to developing country contexts like Nigeria, where there are no equivalent statutory governance bodies, that lead to fragmented and inconsistent flood risk management. Evidence-based multi-level governance arrangements are a prerequisite for effective adaptation to increasing flood hazard. In the absence of these arrangements, there will be increasing challenges in managing climate-driven increases in flood

frequency and intensity, as has been argued by the IPCC AR6 (2022).

A key and persistent finding in the existing literature on flood risk is the intimate relationship among poverty, informality, and low levels of flood risk management capacity. The poorest people and communities are consistently the most vulnerable to flood hazards, the least likely to have formal flood management infrastructure, and the least likely to recover from flood damage; this is not accidental; it is a consequence of the same inequalities that influence access to land, housing, and public services. (Moulds *et al.*, 2021) Additionally, if technically sound flood management interventions do not explicitly reference social equity, they will systematically favour better-resourced communities and exacerbate the structural inequities that underpin differential flood risk in the first place, as argued by Moulds *et al.* (2021). This study is supported by Echendu (2020) who shows that, in the Nigerian context, the lack of addressing flood risk as a cross-cutting development issue instead of tackling the subject as an emergency management problem has left the country's most economically marginalised urban and peri-urban communities exposed to the floods on a chronic basis, impacting on multiple SDG targets at the same time.

4. National Water Policies

The water and flood policy discourse process has been influenced

by international policies on disaster risk reduction and climate change adaptation in recent years in Nigeria. Nigeria has signed the Sendai Framework for Disaster Risk Reduction (2015-2030), Paris Agreement and 2030 Sustainable Development Agenda, all of which have flood risk management and water governance provisions. In the case of Nigeria, Abseno (2013) found that the interface between international and national water law is fundamental in determining compliance and progress towards meeting international obligations. In October 2024, the EPIC Response Framework workshop was co-organised with the World Bank and Government of Japan in Abuja to discuss the opportunity for scaling-up the use of internationally-developed frameworks for flood and drought risk management into the Nigerian national planning processes. The major impediments that were identified in good governance of flood were domestic/institutional in nature and will require a political buy-in in the domestic political arena to address and make international frameworks and technical assistance work (Shiyanbade & Alako, 2023).

Anticipatory action is one of the most important new policy innovations in the field of flood risk management and Nigeria has been one of the first countries to seek to mainstream it. Olawuyi (2025) examines and suggests that anticipatory action approaches are

largely underused in Nigeria at the community level, but are a promising approach in Disaster Risk Reduction (DRR) as identified in an empirical study published in Journal of Flood Risk Management. There are no linkages between national disaster management systems and the use of Vulnerability and Capacity Assessments and no proactive strategies in most flood affected communities. The key findings in the study show that fatalistic risk perceptions, institutional fragmentation and community's lack of preparedness infrastructure are the major barriers. Based on the findings of the study, the major barriers identified are fatalistic risk perceptions, institutional fragmentation and community's lack of preparedness infrastructure and lack of confidence in early warning systems.

Civil society/community organisation's role in the process of catalysing water and flood policy reform in Nigeria is under documented. Worugji (2023) observed that the right to water and water governance in general in Nigeria is an area in which Civil Society Organizations (CSOs) are less active and have less accountability, compared to other jurisdictions. More informal mechanisms of flood mitigation, such as neighbourhood-level drainage maintenance groups, community flood early warning networks and informal networks that facilitate the provision

of assistance for displacement, have been successfully documented in cities in Southwest. If fragile and under-resourced, these processes of grassroots governance illustrate the adaptive capacity of communities affected by droughts, and the need for a national water policy process that is founded on and respects, rather than takes for granted, communities as recipients of bottom-up governance.

5. Methodology

The study adopts a qualitative systematic literature review, drawing on secondary data from peer-review journal articles, government policy documents, reports from national and international organisation. The paper chooses to engage selectively and critically with the important literature on the national water policies, flooding risk management, and climate change adaptation as well as other relevant governance empirical studies. Relevant sources were identified through purposive engagement with water policies, flooding risk management and climate change studies. They consist of works on national water policies, flooding risk management, and climate change adaptation discourse as well as peer-reviewed research on the subject matter within the country. Thus, the choice of these sources depended on their conceptual and thematic relevant which is based on experience of climate change governance and water

risk management in Osun State. Data were analysed using thematic content analysis based on the themes of the paper.

6. Empirical Evidences of Flooding Events in Osun State

A GIS-based and Analytical Hierarchy Process (AHP) approach was used to conduct a flood vulnerability assessment in the study area, resulting in a spatial representation of flood vulnerability (Ogundolie *et al.*, 2024). Finally, using local government areas, the study illustrates flood vulnerability classes within the flood basin by determining proximity to river channels, soil permeability, and land cover type, which are considered the three most important factors contributing to flood vulnerability, along with elevation and population density. The classification has revealed that the proportion of the basin's area classified as vulnerable (and moderate and high) is large with increasing urbanisation and population growth leading to a growing number of people being exposed to high vulnerability.

The most detailed mapping of flooding history available recently is the spatial analysis of Eludoyin (2024) who mapped 14 discrete flooding events, between 2017 and 2023, using cross-validated Sentinel 1 and 2 satellite imagery with in situ reports, in the State of Osun. The study found that the local government areas of central and western were the most flooded

local government areas with the cases of Osogbo, Ede North, Ede South, Ife Central, Iwo, Isokan and Aiyedire being the most affected. The major concern is that the magnitude of flood events has increased with relatively shallow flood water depths in some areas during 2018-19, while flood water depths were recorded as extreme (>8 to 16 metres) during flood in 2019 at Boluwaduro and Oriade and the widest flood extents were recorded in 2022 and 2023 across the state.

The effect of land use change on the risk of flooding had been reported in a number of studies in Osun State. The land use and land cover change (LULCC) research in Osogbo and its surroundings revealed that there was a significant growth in the built-up and exposed surfaces of about 129 sq.km in the 20-year period from 1982 to 2002, followed by an expansion which coincided with the elevation of Osogbo as State Capital since the inception of Osun State. The natural buffering effect of the landscape from flooding was greatly reduced, as were natural buffers like forests and riparian vegetation. It is important to note that the location of flood-prone area is Osogbo as the state capital has a strong correlation with drainage inadequacy, urban morphology and low-income informal settlements which have the highest level of exposure as reported by Alimi *et al.* (2022) in the Egyptian Journal of Remote Sensing and Space Science.

This relationship between flooding in Osun State and the hydrology of Southwest region in Nigeria needs to be further explored. The Osun, Ogun and Owena as well as River systems are interwoven, with a regional hydrological network with dynamics that are influenced by land use change, climate variability and decisions related to infrastructure development at multiple scales that extend beyond state boundaries. The simultaneous flooding of several states in the Southeast in the course of the 2022 flood season is an indication of the interdependence of flood hazard in the region and the need for interstate, river basin-wide coordination of flood control efforts between states (Shiyanbade et al., 2026).

The implications of this evidence are enormous in the area of flood risk governance in Osun state. They have built up a much stronger evidence base for flood risk governance than they would have had before, having recorded flood events over the last 5 years, analysed land use change, modelled hydrology and mapped flood vulnerabilities. However, there are still other aspects which have not yet been studied. Flood exposure and flood impact distribution in the state at the socioeconomic classification level are poorly documented and also the spatial information of flood hazard to water and environmental management agency's action of water governance is not well documented. The trend in the

scholarship points is all in one direction: to the development of an evidence-based, inter-agency coordinated, drainage infrastructure investment, land use control, and community pre-disaster planning strategy to implement at the state level.

Some of the grey literature that documents the event history of the flood in Osun State and the Southwest region includes the situation reports of the state government, field assessment report by the Nigerian Emergency Management Agency (NEMA) and the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) Nigeria flash update. These resources provide non-peer reviewed but valuable ground truth information on the extent of displacement, impacted communities and losses from agriculture, which can be leveraged in conjunction with flood mapping based on satellite data. There could however be a need to combine these administrative data with more systematic analysis using remote sensing and community level qualitative research in order to enhance the localised flood knowledge base for Osun State. The need for this integration is noted by Echendu (2020) which has been a challenge in the use of evidence for flood governance in Nigeria; where technical agencies, EMOs and development planners have adopted a largely disjointed approach to the use of evidence, without any sign of forming an integrated evidence ecosystem.

The livelihood differential consequence of recurrent flood events to the study area (Osun State) is another aspect that need special scholarly attention which has not been met in literature. The major economic activity is Agriculture, a significant proportion of rural population is involved in this agriculture and the flood prone areas in Osun River, Oba River and Erinle River have intensive small-scale farming of maize, cassava, yam and vegetables. These flood-prone farm lands are destroyed by flooding and are slowly being washed away and their planting season delayed for several seasons, thereby deepening the food shortage. Farm assets and farm animals lost during flood events are also drivers to rural to urban migration, adding to the pressure that urban drainage places on urban communities; and informal settlement phenomenon grows, further increasing urban flood exposure and creating a feedback loop between rural flood exposure and urban flood vulnerability.

The effects of dams on flood conditions downstream have been a recognized effect of transboundary dam operations in the past, as discussed in the various studies of flooding in the Southwest. Jebba dam and Kainji dams, both on the Niger river and the Oyan dam in Ogun state have a positive impact on the hydrology downstream that can either exacerbate or in some instances, mitigate flood peaks. The flood in the

lower catchment of the Osun river system which includes Osogbo will be influenced directly by the Opa and Asejire reservoirs in the upper catchment. However, there is a dearth of academic evidence on the nature of the interaction between dam operations and downstream flood management agencies and also a lack of research that might provide an understanding of the interaction between dam operation practices and flood dynamics driven by rainfall in the Osun Basin. This distance is not just an area in which research needs to be carried out and is a practical governance challenge.

The development of the concept of flood memory and place-based knowledge is also pertinent and important to the Osun State scenario. There is also evidence from similar research that socio-cultural factors such as intergenerational experience and knowledge of flood seasonality, flood extent markers, early warning signs and traditional coping strategies can also be found in communities with a long history of dwelling in flood-prone areas that may not have been documented or integrated to the formal flood risk management. Traditional knowledge of the Osun River and its tributaries on their rainy season behavior, traditional zoning practices and the use of sacred groves can be captured from these oral histories and passed from generation to generation. Knowledge has to be unveiled through ethnographic or participatory research

methodology that can inform current planning of flood management, and that is cognizant of the cultural or spiritual aspects of the human-environment relationships in Osun's peculiar environment and heritage.

The academic reportage on the impacts of flood events on cultural heritage and sacred landscapes of Osun State is unique in the larger body of literature on flooding and development. The Osun-Osogbo Sacred Grove, along the banks of Osun River in Osogbo, is a UNESCO World Heritage Site since 2005, and has had documented flood damage: The UNESCO World Heritage Committee (2023) documented the collapse of Busanyin Shrine due to flooding and recommended the urgent development of Disaster Risk Management Plan and flood protection measures at the site. In addition to the economic damage from the loss of the sacred groves, shrines, artwork and the place for ritual, it is also a cultural and spiritual loss; the loss of sacred groves and shrines are important for cultural tourism; for the traditional practitioners and artisans, it is an important place for rituals. The flood challenge in Oshogbo, Osun state exemplifies the multi-faceted nature of the impacts of flooding at flood site and the need to have flood management strategies that consider the entire spectrum of values exposed to flood risk and not just the economic dimension of the flood damage assessment.

This study is an addition to the existing literatures on flood displacement and long-term effects on the social lives of the displaced people in Osun state and in the Southwest in general. The relief impacts of large-scale flooding are only partially documented in NEMA situation reports and the long-term displacement impacts including return and permanent migration, staying in temporary shelters etc. are not well known. Analysis of similar experiences in sub-Saharan countries indicate that often the problems caused by displacement are more permanent and long-lasting, including school absenteeism, social network disintegration, livelihood difficulties, and for those unable to make repairs or rebuild their destroyed flood-affected homes. A broader context of displacement is relevant to the design of immediate flood response programmes to move towards longer term recovery and sustainable livelihoods, and to the identification of those households most likely to be pushed into deeper poverty through repeated experiences of flooding.

7. Analysis and Results based on Existing Literature

Based on the systematic reviewed of existing studies, the study revealed that the financing of water or flood management in Nigeria has been cited in the literature as many of the reported implementation failures. River basin development authorities are an important component of

reservoir management, and have direct impacts on downstream flood risk, but are constrained by budgetary considerations in their ability to monitor, maintain and coordinate. Sanjo *et al.* (2024) confirmed that financial and institutional constraints are key challenges to SDG 6 implementation in Nigeria, noting that financial resources need to be sustained to implement water governance reforms, which can't be done with the current fiscal framework. In Nigeria, anticipatory action frameworks illustrate the costs and technical capacity to take pre-disaster actions with the aim of prepositioning resources and developing clear trigger mechanisms. This challenge is however to scale these approaches at the national level and it will require institutional commitment, financial predictability, which the water governance system in Nigeria has not previously been able to provide.

In another research, it was discovered that water and flood governance is critical in Nigeria, there is little research on the water governance systems and the Nigeria's climate change commitments under the Paris Agreement and Nationally Determined Contributions (NDCs). Researchers have found that while there are several instances of coherence between Nigeria's climate commitment and sectoral water and flood management processes, there is significant disconnection between the

processes of adaptation and water sector governance, with adaptation processes happening concurrently to water sector governance processes. Martin Velasco *et al.* (2023) show how the application of the OECD water governance indicator framework at local levels highlights the disconnect between institutions in climate and water governance and the implementation of evidence-based policy integration. A crucial institutional barrier that needs to be overcome to make this integration happen is to ensure that nationally-led adaptation planning is not an end in itself, but is a driver towards changing water governance, flood risk management and land use policy (Shiyanbade et al., 2026).

In general, despite the growing scholarship on the water policy in Nigeria, the country is confronted with a dilemma of technical and institutional complexity of good water use and institutional constraints of the Nigerian state. Nigeria has the technical capacity, in principle the financial resources and the law to manage its water resources and flood hazard in a better way than it is now. As academic work has demonstrated, it is less institutionally coherent, politically determined and accountable in terms of making legal plans and policy plans meaningful and tangible on the ground. In Nigeria, customary water laws and practices are found in an uneasy balance with formal water laws, and "synchronising" the two

systems is an essential condition for an integrated water governance system, as Kuruk (2004) discovered. All these groups can play a role in this institutional strengthening effort, but Nigeria's governance actors at local, state and federal levels need to make water and flood governance reform a top priority as the evidence overwhelmingly demonstrates.

Future research and policy attention to water governance and flood risk management in Nigeria are bringing the needed actions to light to enhance water governance and flood risk management. Increased institutional coherence and coordination of the various actors in the water and flood sector; ongoing and regular funding for technical agencies and infrastructure for water and flood monitoring as the backbone of good water and flood management; and enhanced enforcement of land use policies and practices that limit development in water and flood prone areas and can ensure the protection of the natural function of drainage and water retention. The greatest challenge to water policy reform in Nigeria is the need to reorient the approach towards water governance in accordance with principles of good governance based on OECD principles, especially the coherence, engagement and data pillars of water governance, according to Ukpai (2022). It essentially requires a mind shift, from the realm of emergency response to that of risk reduction anticipatory action and

community-centred approach to building resilience at the national level.

An emerging scholarship explored the ways indigenous knowledge and community-based practice can be engaged in a manner that is relevant to formal flood risk management frameworks. Singh (2025) shows that communities in West Africa have knowledge of flooding patterns, flood inundation zones, early signs of flooding, and strategies for reducing flood risk that have largely been ignored by formal technical systems, which are used to manage flooding. This demonstrates the existence of detailed knowledge on flood patterns, flood inundation zones, early signs of flooding and strategies for reducing flood risk among communities in West Africa that are largely ignored by formal technical systems used to manage flooding, which are an important but underutilized resource for adaptive flood governance. Singh (2025) also proposes that the issue of how to engage and include indigenes and local communities' knowledge in the formal governance structure without distortion or appropriation is methodological and ethical, and is only just starting to be addressed seriously in the field of flood risk management scholarship. This view is shared by Echendu (2020) who argues that the fractured manner in which evidence is utilised in the Nigerian Flood governance framework, one

which sees each of the three groups of agencies (technical, emergency management and development planners) operating largely independently of one another, has resulted in an ecosystem of evidence that remains systematically weak, and that overcoming this fragmentation requires deliberate engagement with community-based knowledge as a legitimate and valued input to flood planning.

A key issue in the flood governance literature is the distribution of responsibility for flood risk management between government, the private sector and affected communities. Echendu (2020) asserts that in most developing country contexts, including Nigeria, it has become a widely accepted view that the public sector is solely accountable for flood management, including the maintenance of drainage systems, operating flood forecasting and coordinating emergency response, an overview that is often not realised in practice because of the institutional fragmentation and constraints to resources of flood governance in Nigeria. This governance vacuum has directly affected Nigeria's failure to mainstream flood risk as a cross-cutting issue in urban development planning, land use policy and infrastructure investments, and has led to unnecessary and frequent impacts on SDG targets, says Echendu (2020). More coherent flood governance calls for explicit institutional mechanisms

for engaging non-governmental organizations and local communities in early warning dissemination, drainage maintenance, and post-flood response, and for systems that are limited to the public sector to continue to generate inequitable and inadequate flood management outcomes, as suggested by Moulds *et al.* (2021).

The discussion on the role of the river basin development authorities (RBDAs) in the water governance system in Nigeria needs to be expanded in the national water policy literature. Eleven (11) Federal RBDAs exist, one of which is the Ogun-Osun River Basin Development Authority (OORBDA) over the major hydrological systems of the Southwest of Nigeria. These authorities have grown to a more general mandate for water management, not only in irrigation development but also in the maintenance of the drainage infrastructure and, in principle, flood regulation, as they were set up mainly for irrigation development and rural water supply. However, a number of evaluations of the effectiveness of RBDA have found significant weaknesses in its operational abilities, which stem primarily from suboptimal funding, the need to replace aging facilities, staff turnover, and the absence of technical staff, and the poor linkage with state and local government planners. Okeola and Balogun (2017) asserted that the paradoxes within water resources policy development in Nigeria are

quite detrimental to the effectiveness of policy institutions such as RBDAs, because policy requirements are increasing without a corresponding rise in technical and financial abilities. Increasing RBDAs' operating capacity and institutional powers is cited in the literature as a necessary step to more successful catchment-level flood management, but the reform agenda has been slow to take off in the context of other political and fiscal priorities.

One of the most complicated parts of the national campaign on flood management in Nigeria is water related issues and land governance. The land use act of 1978, which empowers the state to own "all lands," creates a land ownership system in which, in principle, land use in floodplains and drainage corridors is under state control. But in reality, the enforcement of land use restrictions is feeble in flood prone areas, with continued encroachment of residents and entrepreneurs on floodplain areas in Osun state and Southwest region. Kuruk (2004) found that in Nigeria, the interface between customary water and land rights leaves governance gaps which pose a challenge to the formal restriction of land use in hydrologically vulnerable zones. Flood risk information is not widely incorporated into formal land use planning instruments (e.g., municipal physical development plans, state spatial development plans) and, where it does appear, is not well implemented as a result of the political nature of

urban land development and the limited capacity for planning. The gap between water policy and land governance will have to be bridged not only through technical and/or regulatory change, but also a long-term political commitment to focus on the objectives of flood risk management above short-term land development objectives.

Nigeria's membership in the climate change finance mechanisms, like the Green Climate Fund (GCF), and Adaptation Fund, affect the direction of the national water and flood policy. In order to benefit from such resources, a National Adaptation Plan (NAP) is needed, which will integrate the priorities of adaptation of individual sectors into a coordinated investment plan, including the water management and flood risk reduction sectors. In December 2021, Nigeria started a project to build capacity within the National Adaptation Plan process in Nigeria with support from UNEP (GAN/UNEP, 2021) and UNDP (2025) shows that Nigeria has not yet presented its final NAP to the UNFCCC. Technical support has been provided to the NAP process from development partners, such as the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP), but the real limitation has been the lack of domestic institutional capacity to integrate the cross-sectoral evidence and then to position this into

bankable investment proposals for climate finance institutions.

The lessons drawn from the comparative experience of other West African States, which has similar context of hydrology and institutions to Nigeria, and water policy reform, are useful. The Water Resources Commission (WRC) established by the Water Resources Commission Act of 1996 in Ghana has sometimes been called in the literature of regional governance as a more coherent institutional structure for a more integrated approach to water resources management, though a few difficulties have been cited in several aspects related to data systems, capacity, and inter-agency coordination. The case of Senegal River Basin Development Authority (OMVS), a transboundary water basin organisation of Senegal, Mali and Mauritania, provides a good example of potential and institutional needs for the water governance at the river basin level. It may be possible to build a more grounded water policy reform agenda for Nigeria in the context of regional experiences and the unique federal constitutional framework and political economy of Nigeria, which can contribute to a more realistic water policy reform agenda, beyond just of the Northern and global policy models.

With the federal constitutional framework of water governance decentralised, the quality and effectiveness of water and flood governance at the state level also vary

significantly. There are significant variations among the Southwest states on the degree to which they have enacted enabling legislation for integrated water resources management, have functional state water regulatory bodies, and have budgetary resources dedicated to maintaining drainage infrastructure and preparing for flooding. As in many Nigerian states, the challenge for Osun State is the implementation of its constitutional responsibilities for intrastate water management in the absence of adequate IRR and the absence of a systematic incentive system to invest in flood risk reduction in a federal transfer system. Sanjo *et al.* (2024) noted that the uneven progress in implementing SDG 6 across Nigerian states reflects deep-seated disparities in sub-national water governance capacity. The literature suggests that three components of strengthening the water governance capacity at the subnational level are necessary for bringing the national water policy's commitments to fruition: Fiscal reform, water technical capacity building, and intergovernmental water coordination.

8 Conclusion

The study concludes that flood risk management requires stronger policy and institutional coordination on implementation of national water policies and climate adaptation strategies to reduce vulnerability and promote sustainable environmental governance in Osun State. This further

confirms this, highlighting social and economic inequality as one of the primary drivers of the severity of flood impact as well as the need to include considerations of social vulnerability in flood risk governance to ensure the delivery of equitable and effective outcomes in Southwestern Nigeria.

The challenges highlighted in the discussion of analysis reveals that in the year 2022, flood in Nigeria which caused an estimated USD 6.7 billion in loss and damage, as reported by Climate Policy Initiative (2025), which represents only the measurable aspect of the socioeconomic impact of floods; it is clear that more robust, disaggregated and independently verified flood loss accounting systems are needed at the national and state levels. Finally, the structures must be adapted to the local institutional context and data limitations in Africa, otherwise they will be formally correct, but not effectively implemented.

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Ethical Considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

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Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

Authors' Contributions

All authors contributed equally to the conception and design of this study. All authors have read and agreed to the published version of the manuscript.

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