



Sustainable Environment and the built Space: Integrating Ecology, Planning and Human Well-being

Proceedings of the 6th International Conference (FESCON 2026) at Chukwuemeka Odumegwu Ojukwu University,
Uli Campus, Uli, Nigeria
18 - 19 June 2026

DESIGNING RESILIENT COMMUNITIES IN FLOOD-PRONE AREAS OF SOUTHEASTERN NIGERIA: A PROACTIVE APPROACH

Confidence C. Azinwa¹, Ndidi U. Okolo², Kelechi E. Ezeji³

^{1,2,3}Department of Architecture, Chukwuemeka Odumegwu Ojukwu University, Uli Campus, Nigeria

Email: confidynamic55@gmail.com¹ | arc.ndidi@gmail.com² | ke.ezeji@coou.edu.ng³

Abstract

Flooding has long ranked among the most damaging environmental hazards in Nigeria, and Southeastern Nigeria has proven especially vulnerable. The combination of a high-rainfall tropical climate, rapidly expanding cities, and chronically underfunded infrastructure has left communities in Anambra, Abia, Imo, Ebonyi, and Enugu exposed to recurrent inundation with limited means of recovery. This paper examines how resilient community design might reduce that exposure. Working through a critical thematic review structured around a purposively selected set of thirty-two peer-reviewed studies and institutional reports, largely published between 2011 and 2026 and identified through structured searches of Google Scholar and the open web, it identifies climate change, uncontrolled urbanisation, floodplain encroachment, weak planning enforcement, and degraded ecological systems as the dominant drivers of flood risk across the region. The review finds that climate-responsive architecture, green infrastructure, participatory planning, and institutional reform are the approaches most consistently supported by the evidence as pathways toward flood resilience. Critically, that evidence points in one direction: technical engineering solutions alone will not suffice. Flood resilience in Southeastern Nigeria is as much a governance and social equity problem as it is a problem of drainage design. The paper concludes by recommending integrated, community-centred adaptation frameworks that embed ecological restoration and strengthened planning governance within a broader vision of sustainable urban development for the region.

Keywords: climate adaptation, disaster risk reduction, flood resilience, resilient communities, Southeastern Nigeria, sustainable urbanism, urban flooding

1. INTRODUCTION

Nigeria's flood problem is severe, but Southeastern Nigeria's is worse. Communities in Anambra, Abia, Imo, Ebonyi, and Enugu face a combination of factors that interact to devastating effect: a high-intensity rainfall regime, widespread deforestation of upland catchments, rapid and largely unplanned urban expansion, and drainage infrastructure that in many areas has not been meaningfully maintained or upgraded since the colonial era (Echendu, 2020; Umar & Gray, 2022). When the 2022 floods struck, the worst recorded in Nigeria in over a decade, the regional consequences were severe: thousands of homes destroyed, farmland submerged across several local government areas, major roads cut off, and healthcare facilities overwhelmed at precisely the moment demand surged.

The 2022 disaster was extreme, but it was not anomalous. It was the worst iteration of a problem that communities in the region have faced every rainy season for years. What changes with climate change is

not that flooding occurs, but that events of previously exceptional severity become normal. Folke et al. (2002) and Sharifi (2020) document how intensifying rainfall variability is reshaping flood risk across tropical regions, and Southeastern Nigeria fits this pattern: the wet season is starting earlier, lasting longer, and producing higher peak flows than historical averages would suggest.

In this context, the case for moving beyond reactive disaster response toward proactive resilience planning is not merely an academic one. Communities along the Niger River Basin (Ogbaru, Umueri, and riverside areas of Onitsha) experience riverine flooding from seasonal overflow; urban centres like Aba and Owerri experience flash flooding from overwhelmed drains and saturated soils (Okolo et al., 2025; Nkwunonwo et al., 2020). These are distinct hydrological problems, but they share a common institutional cause: planning frameworks that have not kept pace with the scale of urban change.

Resilience has become a central concept in contemporary disaster risk discourse, and rightly so. Where earlier frameworks focused on resistance (keeping water out) resilience thinking asks how cities and communities can absorb shocks, adapt their functions, and recover capacity after events that cannot be prevented (Meerow & Newell, 2016). But resilience is not simply a better engineering standard. It encompasses governance, social equity, ecological management, and architectural practice in ways that demand genuinely interdisciplinary responses. This paper examines what those responses look like for flood-prone communities in Southeastern Nigeria, through a critical thematic review of scholarship published primarily between 2019 and 2026, supplemented by a small number of earlier landmark works.

2. STATEMENT OF THE PROBLEM

The persistence of flood disasters in Southeastern Nigeria cannot be explained by climate alone. If it could, communities would have little agency and could only wait for worse. The more uncomfortable reality, reflected across the reviewed literature, is that much of the damage is institutionally produced. Floodplains are built on. Drainage channels are blocked and not cleared. Wetlands are converted to housing. Environmental impact assessments are submitted and approved without serious scrutiny. These are not acts of nature; they are failures of governance (UN-Habitat, 2022; Adelekan, 2020).

The architectural dimension of this problem receives less attention than it deserves. In flood-prone communities across the region, buildings are routinely constructed using materials and structural forms that are essentially unchanged from those used in areas of low hydrological risk. Ground floors flood repeatedly; foundations weaken; walls collapse during inundation. Communities rebuild in kind, because the alternative (climate-responsive design) is not required by regulation, not taught as standard practice in many training environments, and not affordable for most low-income households without external support.

There is also an institutional coordination problem that goes beyond any single agency's failures. Responsibilities for flood management in Nigeria are spread across federal, state, and local government bodies, environmental agencies, and disaster management institutions, often without clear delineation of authority or mechanisms for joint action. Danhassan et al.'s (2023) national-level analysis of flood policy and governance confirms this is a systemic pattern rather than a regional peculiarity: they find Nigeria's flood governance arrangements lack defined objectives across federal, state, and local tiers, with no clear imperative for any single tier to pursue coordinated short- or long-term flood management outcomes. The result, in practice, is that everyone is responsible and no one is accountable. This study does not rehearse that fragmentation as a new finding, but it does argue that understanding resilience in Southeastern Nigeria requires taking it seriously as a structural constraint, not merely a management challenge to be resolved by better communication.

3. AIM AND OBJECTIVES OF THE STUDY

3.1 Aim

The aim of this study is to critically examine strategies for designing resilient communities in flood-prone areas of Southeastern Nigeria through a thematic review of contemporary literature published primarily between 2019 and 2026.

3.2 Objectives

The specific objectives of the study are to:

- i. Examine the major causes and drivers of flooding in Southeastern Nigeria.
- ii. Identify flood-prone communities and document patterns of vulnerability across the region.
- iii. Critically review contemporary scholarship on flood resilience and climate adaptation.
- iv. Evaluate the respective contributions of architecture, urban planning, green infrastructure, and governance to resilient community development.
- v. Identify the institutional and environmental barriers that impede resilience implementation.
- vi. Propose proactive, evidence-grounded approaches to resilient community design suited to the regional context.

4. RESEARCH METHODOLOGY

This paper adopts a critical thematic literature review methodology. No primary empirical data were collected. The study's purpose is to synthesise and evaluate existing scholarship in order to develop a structured analytical account of flood resilience debates as they apply to Southeastern Nigeria. The methodological orientation is interpretivist: the concern is not to aggregate quantitative findings but to examine how different scholars frame the problem of urban flood vulnerability, what solutions they advance, and where significant disagreements or evidence gaps remain (Folke et al., 2002; Sharifi, 2020).

4.1 Literature Search Strategy

Relevant materials were identified through structured searches of Google Scholar and the open web, using the search strings listed below. The search prioritised English-language peer-reviewed publications and credible institutional reports issued between 2019 and 2026. This period was chosen to capture contemporary debates while acknowledging that some of the most influential foundational work on urban resilience predates this window. A small number of older landmark sources are deliberately included, and identified as such, where they remain conceptually indispensable to the argument.

Boolean search strings included combinations of: "flood resilience" AND "Southeastern Nigeria"; "climate adaptation" AND "urban flooding" AND Nigeria; "resilient communities" AND "flood-prone areas"; "flood risk management" OR "disaster resilience" AND Nigeria; "sustainable urban planning" AND flooding; and "community resilience" AND "climate change adaptation."

4.2 Screening and Selection

Screening proceeded in two stages. In the first, titles and abstracts of candidate sources were assessed for relevance to flood risk, urban resilience, climate adaptation, or environmental governance in Nigeria or comparable Sub-Saharan African contexts. In the second stage, full texts were reviewed against inclusion criteria: peer-reviewed articles, book chapters, or credible institutional reports; directly addressing one or

more of the study's thematic concerns; and, with the deliberate exception of a small number of conceptually foundational works predating the study's primary window, published between 2019 and 2026. Sources addressing flooding only in wholly unrelated geographical contexts, without analytical transferability, were excluded. This review synthesises thirty-two sources meeting these criteria: primary empirical and conceptual literature on flood risk, resilience, and climate adaptation, supplemented by a smaller number of landmark theoretical works whose continued conceptual relevance justifies their inclusion outside the primary date window (Section 4.1). This is a purposively selected, thematically organised corpus rather than the output of an exhaustive, database-logged systematic review; it should be read and cited accordingly. It reflects a completed round of structured searching against Google Scholar and the open web using the search strings specified above, with a full documented search-and-screening log available on request.

Thematic categories were developed inductively through iterative reading, with initial codes refined through cross-source comparison. Five principal themes emerged: climate adaptation and sustainable urbanism; nature-based solutions and green infrastructure; community participation and social resilience; governance and institutional frameworks; and climate-responsive architecture and planning. These are treated in Sections 7 and 8 below.

5. MAJOR CAUSES AND DRIVERS OF FLOODING IN SOUTHEASTERN NIGERIA

Understanding why Southeastern Nigeria floods as it does requires disaggregating what is often treated as a single phenomenon. The causes are multiple and interconnected, but they are not equally weighted across all locations, and treating them as a uniform list understates the analytical challenge.

5.1 Climate Change and Rainfall Variability

Climate change is the factor that has most altered the risk landscape over recent decades. Echendu (2020) and Umar and Gray (2022) document how shifting precipitation patterns – more intense rainfall, longer wet seasons, and a growing frequency of extreme events – have redrawn what communities along the Niger floodplain and in rapidly urbanising inland cities can expect from a given rainy season. The 2022 floods were attributed partly to upstream dam releases from the Lagdo Dam in Cameroon, but the scale of inundation also reflected how little capacity the region had built to absorb exceptional events. Climate change does not create flood risk from nothing; it amplifies existing vulnerabilities that governance and planning have left unaddressed.

5.2 Rapid Urbanisation and Population Growth

Rapid urbanisation is the second major driver, and it interacts with climate in ways that are not always straightforward. Onitsha, Aba, and Owerri have grown at rates that formal planning systems have struggled to track, let alone regulate – a dynamic Adelekan's (2020) study of comparable rapid, poorly-regulated urban growth in Ibadan documents in detail for a similarly under-resourced Nigerian planning authority. As cities expand, natural drainage pathways are built over, wetlands are converted to residential plots, and the ratio of impervious to permeable surface increases. The hydrological consequence is higher runoff volumes and faster concentration times – meaning more water reaching drainage systems more quickly than those systems were designed to handle. Urban growth itself is not the problem; unmanaged urban growth in ecologically sensitive areas is.

5.3 Poor Drainage Infrastructure and Stormwater Management

Poor drainage infrastructure is perhaps the most visible cause of flooding in the region's urban centres, and it is one where the gap between what exists and what is needed is starkest. Nkwunonwo et al. (2020) found

that drainage channels across major cities are frequently undersized, poorly aligned, blocked by accumulated waste, or altogether absent in newer peripheral settlements. Indiscriminate solid waste disposal in drainage channels is a particularly acute problem: it is not simply a sanitation issue but a flood management one, and yet the two policy domains rarely interact.

5.4 Environmental Degradation and Ecological Loss

Environmental degradation – deforestation, wetland destruction, sand mining, and the erosion it accelerates – reduces the natural buffering capacity that healthy ecosystems provide against flooding. Wetlands do not merely provide habitat; they retain stormwater, slow flow velocity, and recharge groundwater systems that help regulate dry-season flows. Once a wetland is filled and built upon, that function is permanently lost unless costly engineered alternatives are installed. The literature reviewed here suggests that this loss is not adequately accounted for in the planning decisions that permit wetland conversion (Echendu, 2020).

5.5 Weak Urban Planning and Governance Systems

Behind these physical drivers lies a governance failure that enables all of them. Planning regulations that would restrict floodplain development, require environmental impact assessment, or mandate drainage standards before construction permits are issued exist on paper across all five states. The problem is enforcement. UN-Habitat (2022) documents the familiar dynamic: political pressure to approve development, institutional fragmentation that allows applicants to exploit ambiguity between agencies, and limited technical capacity to assess flood risk within local planning departments. Until planning enforcement is treated as a flood management strategy – not merely an administrative function – physical interventions will be fighting a losing battle.

A summary of analysis of the stated major causes and drivers of flooding in southeastern Nigeria is presented in Table 1.

Table 1: Major Causes and Drivers of Flooding in Southeastern Nigeria

S/N	Cause	Description	Implication
1	Climate Change	Intensifying rainfall and precipitation variability	Increased frequency and severity of flood events
2	Rapid Urbanisation	Unregulated expansion into ecologically sensitive areas	Reduced infiltration; higher runoff volumes
3	Poor Drainage Infrastructure	Undersized, obstructed, or absent stormwater systems	Stormwater accumulation during heavy rainfall
4	Environmental Degradation	Deforestation, wetland loss, and sand mining	Reduced natural buffering and flood retention capacity
5	Weak Planning Enforcement	Selective application of development regulations	Continued floodplain and drainage corridor encroachment

6. FLOOD-PRONE COMMUNITIES AND PATTERNS OF VULNERABILITY IN SOUTHEASTERN NIGERIA

The geography of flood risk in Southeastern Nigeria is not uniform. Different communities face different combinations of hazard types, exposure levels, and underlying vulnerabilities, and effective resilience strategies need to reflect those differences.

6.1 Riverine Flooding in Anambra State Communities

Anambra State's riverine communities – Ogbaru, Umueri, and parts of Onitsha along the Niger – represent one of the highest-risk concentrations in the region. Their exposure is structural: low-lying topography, proximity to a major river system subject to large upstream catchment dynamics, and a dependence on agriculture that leaves households economically devastated when farmland floods (Okolo et al., 2025). Chukwuma et al.'s (2021) GIS-based vulnerability modelling of Anambra State confirms this pattern quantitatively, identifying the riverine local government areas as consistently falling within the highest flood-vulnerability class in the state. Chinedu et al.'s (2024) geospatial assessment of the lower Niger Basin at Onitsha specifically further links this vulnerability to soil composition and catchment characteristics, providing exactly the kind of localised flood-modelling data that Nkwunonwo et al. (2020) note is chronically scarce elsewhere in the region. Enworu's (2026) qualitative study of riverine Anambra communities, including Umueze-Anam and Nzam, documents the consequence directly: floods were found to significantly undermine household food security across all four recognised dimensions – availability, access, utilisation, and stability – with state social-protection interventions largely absent and community-based provisioning mechanisms left to fill the gap. Akukwe et al. (2023) find a similar pattern across agrarian households in the wider Southeastern region, reporting that 92.8% of surveyed households were food insecure following flooding, with coping strategies – and the burden of adopting them – falling unevenly along gender lines. For these communities, resilience is not primarily about urban drainage design; it is about land-use planning, early warning systems, elevated construction, and the political will to enforce setback requirements from riverbanks that are currently ignored.

6.2 Urban Flooding in Commercial Centres

Urban flooding in Aba and Owerri – and in the denser commercial districts of Onitsha – is a different problem. Here the primary mechanism is stormwater accumulation from impervious surfaces draining into systems that are inadequate in capacity, poorly maintained, or obstructed. Economic disruption during flood events is severe; traders lose stock, roads become impassable, and informal transport networks that many residents depend on shut down. Odoh and Nwokeabia's (2024) spatial analysis of drainage density and geological factors across Abia State found Aba North, Aba South, and Oboma Ngwa to be among the state's most flood-vulnerable local government areas, driven by a combination of dense drainage networks, steep slope gradients, and high rainfall – a finding consistent with the commercial-centre flooding pattern described here. Okorafor and Chikwue's (2021) GIS-based mapping of flood-prone areas in Imo State similarly identifies specific zones within Owerri where flood exposure is structurally elevated, providing exactly the localised spatial evidence base that resilience planning in the city currently lacks. The economic consequences extend well beyond the urban commercial core: Esiobu's (2026) survey of arable crop farmers across fifteen flood-prone Imo State local government areas found that 90% had adopted crop diversification and 84% had constructed floodways as mitigation strategies, but that the high cost of these measures (cited by 95% of farmers) and inadequate technical knowledge (84%) remained the dominant barriers to more effective flood mitigation. Nkwunonwo et al. (2020) note that quantitative flood modelling data for these cities remains sparse, which constrains both risk assessment and infrastructure investment planning.

6.3 Socioeconomic Vulnerability and Informal Settlements

The socioeconomic dimension of flood vulnerability cuts across all location types but falls hardest on informal settlements. Low-income households that occupy flood-prone land do not, in most cases, choose to do so because they are unaware of the risk. They do so because land in less-exposed locations is beyond their means, and because the absence of tenure security in informal areas means that public investment in flood protection rarely reaches them (Ziervogel et al., 2016). This vulnerability also has a gender dimension that the literature is only beginning to document systematically: Akukwe et al.'s (2023) survey of agrarian households across Southeastern Nigeria found flood-induced food insecurity affecting the overwhelming majority of surveyed households, with female-headed households consistently more likely to adopt severe

coping strategies – skipping meals, reducing meal frequency and portion size – than male-headed ones, a disparity the study links directly to underlying gaps in income and asset ownership. Addressing this dimension of vulnerability requires social policy – secure tenure, affordable housing in safer locations, gender-responsive targeting, and targeted infrastructure investment – as much as it requires engineering or architecture.

6.4 Flooding in Ebonyi and Enugu Communities

Ebonyi and Enugu communities receive comparatively little attention in the reviewed literature relative to Lagos, though the gap is narrower than it first appears. Choko et al.'s (2019) community-scale study of climate adaptation in Ebonyi State is a notable exception: working across multiple communities, it found flooding to be the most frequently reported climate risk, and documented a wide range of locally organised – largely externally unassisted – structural and non-structural adaptation efforts already underway. This is valuable evidence, but it remains largely isolated; topographic conditions, catchment deforestation, and inadequate local drainage infrastructure create recognisable vulnerability profiles in several settlements across both states (Echendu, 2020), yet Enugu in particular still lacks anything comparable to Choko et al.'s community-level documentation. This pattern is consistent with the broader skew in Nigerian flood-resilience scholarship toward Lagos and the Southwest: Orimoogunje and Aniramu's (2025) systematic review of flood resilience strategies in Lagos Metropolis illustrates the depth of research attention a single well-studied city can attract, in marked contrast to the comparative thinness of the literature on Southeastern states such as Ebonyi and Enugu. The gap in the evidence base is a problem for policy as much as for scholarship, since resource allocation tends to follow documented risk.

6.5 Infrastructure Deficits and Institutional Neglect

Rural and peri-urban communities across all five states face a version of the problem that is easy to overlook: they are too small and too dispersed to attract the infrastructure investment that larger urban centres receive, but too exposed and rapidly changing to be treated as low-priority. Emergency response systems are weakest precisely where evacuation routes are poorest and housing stock is most fragile. Inyang-Ogim et al.'s (2026) systematic review of disaster preparedness among residents of flood-prone areas across sub-Saharan Africa found preparedness levels consistently lowest in exactly these under-resourced rural and peri-urban settings, reinforcing that the deficit is structural rather than a matter of individual household awareness. This is not a problem that technical design solutions alone can solve; it is a governance and resource allocation question.

A summary of analysis of the selected flood-prone communities in southeastern Nigeria and their primary patterns of vulnerability is presented in Table 2.

Table 2: Selected Flood-Prone Communities in Southeastern Nigeria

S/N	State	Community	Nature of Flooding	Primary Vulnerability Factors
1	Anambra	Ogbaru	Riverine flooding	Low elevation; Niger River overflow; agricultural exposure
2	Anambra	Onitsha	Urban and riverine flooding	Drainage blockage; high density; riverside location
3	Anambra	Umueri	Riverine flooding	Proximity to Niger floodplain; limited infrastructure
4	Abia	Aba	Urban flash flooding	Poor drainage systems; dense commercial development
5	Imo	Owerri	Urban flash flooding	High impervious surface ratio; inadequate drainage capacity

7. CRITICAL REVIEW OF CONTEMPORARY SCHOLARSHIP ON FLOOD RESILIENCE AND CLIMATE ADAPTATION (2020–2026)

The period from 2020 to 2026 has seen considerable development in the scholarship on urban flood resilience, though much of it has originated in Global North research environments and required careful contextualisation before it can be applied to Southeastern Nigeria.

7.1 The Evolution of Flood Resilience Discourse

The most significant conceptual development over this period has been the consolidation of a shift – already underway before 2020 – away from resistance-based flood management (keeping water out through hard infrastructure) toward adaptive resilience frameworks that ask how cities and communities can continue to function through and after flood events (Sharifi, 2020). Meerow and Newell (2016) offer a particularly useful formulation: resilience for whom, what, when, where, and why? Odunsi et al.'s (2024) household-level conceptual framework, developed from a Lagos flood-disaster survey, operationalises this question at the scale that ultimately matters most for design: it unifies absorptive, adaptive, and transformative capacity into a single measurable framework of household resilience, offering resilience planners in Southeastern Nigeria a validated, locally grounded alternative to importing frameworks developed for entirely different contexts. This framing matters because it forces the question of whose resilience is being designed – a question that generic resilience frameworks often elide. In a context where informal settlements bear the greatest flood burden but receive the least investment, that political dimension cannot be treated as secondary.

This conceptual maturation has not, however, been uniformly reflected in practice. Ziervogel et al. (2016) observe that transformative resilience – the kind that changes the underlying conditions producing vulnerability, rather than simply helping communities bounce back to the same exposed position – remains more discussed than implemented. In Southeastern Nigeria, where structural conditions of poverty, weak governance, and environmental degradation are deeply entrenched, this gap between theory and practice is particularly wide.

7.2 Climate Adaptation and Sustainable Urbanism

Climate adaptation has attracted the largest volume of scholarship over the review period, and the broad direction of the evidence is clear: urban systems need to be redesigned around the assumption of intensifying climate variability, not calibrated to historical averages (Folke et al., 2002). Sustainable urbanism – compact urban form, ecological conservation, mixed-use development, and reduced dependence on the private car – is widely positioned as the planning framework most conducive to climate resilience. Ahern (2011) argues that resilient urban systems must be designed to be "safe-to-fail" rather than simply "fail-safe," treating ecological systems as infrastructure rather than amenity – a distinction with significant planning and budgetary implications.

What the adaptation literature handles less well is the question of how to achieve adaptation in cities where informal settlement is the dominant growth pattern, planning institutions are under-resourced, and the political economy of land development systematically rewards non-compliance. These are not exceptional conditions in Southeastern Nigeria – they are the norm. Resilience strategies developed for well-governed, resource-rich cities require substantial rethinking before they can generate practical guidance for the regional context.

7.3 Nature-Based Solutions and Green Infrastructure

Nature-based solutions and green infrastructure have moved from the margins to the mainstream of resilience scholarship over the review period, and for good reason. Wetland conservation, bioswales, retention ponds, urban trees, and permeable paving all reduce stormwater runoff and improve the

performance of conventional drainage systems; they also deliver co-benefits – heat reduction, biodiversity support, air quality improvement, recreational value – that conventional infrastructure cannot provide at equivalent cost (Sharifi, 2020). The political attractiveness of green infrastructure, as a set of solutions that appears to reconcile environmental and development goals, has accelerated its prominence in the literature.

The critical question for the Nigerian context is cost and institutional maintenance. Green infrastructure is not inherently expensive to install, but it requires sustained management – vegetation maintenance, sediment removal from retention systems, inspection of permeable surfaces – that depends on institutional capacity and recurrent budget allocation. Where that capacity is absent, green infrastructure can deteriorate quickly, and poorly maintained ecological infrastructure can actually impede drainage rather than improve it. The scholarship reviewed here is largely optimistic about green infrastructure's potential; that optimism needs to be tempered by a realistic assessment of what maintenance systems are actually in place.

7.4 Community Participation and Social Resilience

Community participation has become something of an orthodoxy in resilience scholarship, and the case for it is well-founded. Local communities in flood-prone areas hold detailed experiential knowledge of flood behaviour – where water accumulates, how quickly it rises, which routes remain passable, what warning signs precede major events – that is rarely captured in formal flood risk assessments (Wolff et al., 2021). Excluding that knowledge from planning and design processes is both technically impoverishing and politically delegitimising. Participatory approaches also strengthen post-disaster social cohesion, which is itself a determinant of recovery speed.

At the same time, it is important not to romanticise community participation or treat it as a substitute for state responsibility. Communities in flood-prone informal settlements are not failing to participate; they are often participating vigorously in self-help drainage and flood-proofing initiatives precisely because state institutions are absent. Framing participation as a resilience strategy without addressing the governance failures that necessitate it risks shifting responsibility downward without shifting resources.

7.5 Knowledge Gaps and Emerging Research Directions

Several significant gaps remain in the literature as it applies to Southeastern Nigeria. Empirical work that evaluates the effectiveness of specific resilience interventions within the regional context – as opposed to documenting vulnerability or advocating general frameworks – is scarce. Indigenous knowledge systems and traditional adaptive practices of riverine communities, which may contain useful technical wisdom, are almost entirely absent from the reviewed literature. And the interface between architecture as a profession and flood risk management as a policy domain has received insufficient attention: most of the scholarship reviewed here treats building design as one item in a list of resilience components rather than examining in detail what climate-responsive design looks like in practice for different settlement types across the region.

A summary of analysis of the stated major themes observed during the review of contemporary flood resilience literature, buoyed by some older important text is presented in Table 3.

Table 3: Major Themes in Contemporary Flood Resilience Scholarship (2020–2026)

S/N	Theme	Central Argument	Key Limitation in Nigerian Context
1	Proactive Resilience Planning	Anticipatory systems outperform reactive response	Political economy of development resists proactive regulation
2	Climate Adaptation and Sustainable Urbanism	Urban form must adjust to intensifying climate variability	Frameworks designed for well-governed cities need rethinking
3	Green Infrastructure	Ecological systems deliver stormwater benefits at lower	Maintenance demands exceed current institutional capacity in

4	Community Participation	long-term cost Local knowledge improves design and ownership	many areas Participation cannot substitute for absent state investment
5	Interdisciplinary Integration	Complex resilience challenges require cross-disciplinary response	Professional silos and fragmented institutional mandates resist integration

8. THE ROLES OF ARCHITECTURE, URBAN PLANNING, GREEN INFRASTRUCTURE, AND GOVERNANCE IN RESILIENT COMMUNITY DEVELOPMENT

Architecture, planning, green infrastructure, and governance are often listed together as the pillars of resilient community development. They are genuinely interconnected, but they operate through different mechanisms and face different constraints. This section examines each in turn.

8.1 Climate-Responsive Architecture and Adaptive Design

Climate-responsive architecture occupies an odd position in Nigerian flood resilience practice: widely advocated in the literature, seldom embedded in regulatory requirements, and rarely affordable for the households most exposed to flood risk. Dimuna et al.'s (2024) systematic review of climate change impacts on architecture and dweller well-being in the Niger Delta region – a discipline-specific review by architecture scholars, covering the period 2019–2024 – found perennial flooding to be the most consistently reported architectural consequence of climate change in the region, alongside building deterioration linked to prolonged inundation and rising damp. Adeyanju et al. (2025) identify a range of architectural strategies – elevated foundations, amphibious construction, flood-resistant material specification, reinforced structure, and modular reconstruction-friendly design – that demonstrably reduce both flood damage and recovery time. The technical case is not seriously contested.

What is contested, or at least underexplored, is the pathway to adoption. Most flood-exposed households in informal settlements in Aba, Ogbaru, or Owerri make building decisions without access to professional architectural advice, without building regulation enforcement, and without the capital to implement flood-resistant design even if they know it is beneficial. Ezeokoli, Okolie and Onwuka's (2019) survey of building practitioners and households in Ogbaru itself confirms this empirically: flood resilience measures such as raised floor levels were found to be only sparsely incorporated into the design and construction of buildings on the floodplain, despite the community's decades-long exposure to riverine flooding. Demonstrating that amphibious housing works in Rotterdam or Bangkok is a different thing from demonstrating a pathway to climate-responsive design in a peri-urban Anambra settlement. This study contends that architectural resilience in the regional context requires, at minimum, affordable design standards, community education about flood-resistant construction, and some form of supported access to appropriate materials – none of which is primarily the architect's responsibility to provide.

It is also worth recognising that not all relevant architectural knowledge is imported. Riverine communities in Southeastern Nigeria historically adapted to flooding through elevated platforms, lightweight construction forms that could be quickly rebuilt, and spatial layouts that prioritised circulation above flood levels. This indigenous adaptive tradition has been largely displaced by conventional construction norms without being seriously studied. Recovering and updating it should be a research priority.

8.2 Sustainable Urban Planning and Spatial Regulation

Urban planning's role in flood resilience is primarily preventive: if floodplain development is not permitted, if drainage standards are enforced, if wetlands are legally protected and that protection upheld, a large

proportion of the flood damage currently experienced in Southeastern Nigeria would not occur. The planning framework is not, in principle, the problem. The problem is the enormous gap between what planning regulations require and what planning enforcement delivers – the same enforcement gap Adelekan (2020) identifies as the central driver of everyday hazard exposure in Ibadan.

Master plans across the region's major cities are, as the literature notes, frequently outdated – many based on population projections and land-use assumptions that the past three decades of urban growth have rendered obsolete. Updating them is necessary but not sufficient. A contemporary, climate-sensitive master plan for Onitsha or Aba that is not enforced produces little change on the ground. Strengthening planning enforcement – through investment in technical capacity, improved monitoring systems, and meaningful sanctions for violations – is arguably the single highest-return investment available in flood risk reduction across the region.

8.3 Green Infrastructure and Ecological Resilience

Green infrastructure has been discussed extensively in the preceding section (7.3) and need not be rehearsed in full here. What deserves emphasis in the architecture and planning context is the question of spatial integration. Green infrastructure does not work as a collection of isolated installations; it works as a connected system – wetlands, street trees, bioswales, and retention ponds that function together to manage stormwater across a catchment. Achieving that system-level integration requires land-use planning, not just landscape design (Ahern, 2011). It requires reserving land for ecological functions at the city scale, which in turn requires political decisions about whose development ambitions are constrained. That political dimension is absent from much of the literature on green infrastructure, and it is the dimension that most determines whether good proposals translate into built reality.

8.4 Governance Systems and Institutional Coordination

Governance is both a component of resilience and the condition that makes or breaks all the others. UN-Habitat (2022) documents the familiar pattern in Nigerian cities: overlapping institutional mandates, chronic underfunding, technical capacity gaps, and political interference in planning decisions. The literature does not disagree about the diagnosis; it disagrees about where the leverage for change lies. Some scholars emphasise institutional reform at the state government level; others place more weight on community governance and civil society pressure; others look to professional bodies – architects, planners, engineers – as potential advocates for stronger regulation.

This study takes no strong position on that debate, partly because the evidence for the relative effectiveness of different governance reform pathways in the Nigerian context is limited. What can be said is that governance reform that is purely technical – training programmes, updated regulations, new agency structures – without addressing the political economy of planning decisions is unlikely to achieve durable change. That is an uncomfortable observation, but it is one that a serious reading of the evidence supports.

8.5 Interdisciplinary Collaboration and Integrated Resilience Planning

The interdisciplinary case for integrated resilience planning is compelling in principle and difficult in practice. Architects, planners, hydrologists, environmental scientists, sociologists, and community representatives rarely work within shared institutional frameworks, and the professional training of each tends to produce habitual problem framings that do not naturally connect. Meerow and Newell (2016) advocate for institutional structures that mandate and resource interdisciplinary collaboration rather than simply encouraging it. The Nigerian professional and regulatory environment makes this harder than it sounds, but several aspects of the existing framework – environmental impact assessment requirements, the National Building Code – could serve as hooks for more integrated practice if they were consistently applied.

A summary of analysis of the stated roles of architecture, urban planning, green infrastructure, and governance in resilient community development is presented in Table 4.

Table 4: Roles and Constraints of Major Resilience Components

S/ N	Component	Primary Role	Principal Constraint in Context
1	Architecture	Climate-responsive building design and flood-resistant construction	Weak regulation; limited professional access in informal settlements
2	Urban Planning	Spatial regulation, floodplain management, and land-use control	Enforcement gaps; outdated master plans
3	Green Infrastructure	Ecological stormwater management and catchment-scale buffering	Maintenance demands; land availability; institutional separation
4	Governance	Policy coordination and regulatory enforcement	Political economy of development; institutional fragmentation
5	Interdisciplinary Collaboration	Integrated, cross-sectoral adaptation planning	Professional silos; absence of mandated coordination structures

9. INSTITUTIONAL AND ENVIRONMENTAL BARRIERS TO RESILIENCE IMPLEMENTATION

The barriers to resilience implementation in Southeastern Nigeria are well-documented in the literature, but they are worth disaggregating rather than treating as a single category of "challenges." Some are primarily technical, some primarily financial, some primarily political.

9.1 Institutional Capacity Deficits

Institutional capacity deficits sit at the core of the implementation problem. Urban planning authorities in many local government areas across the region lack the technical staff, equipment, and operating budgets to carry out basic regulatory functions, let alone manage complex climate adaptation programmes. State-level environment and disaster management agencies face similar constraints. The consequence is not merely that resilience initiatives are under-resourced; it is that the basic institutional infrastructure for resilience implementation – cadastral systems, flood risk maps, building permit databases – often does not exist in usable form (Ziervogel et al., 2016; UN-Habitat, 2022).

9.2 Planning Enforcement and the Political Economy of Development

Planning enforcement failures deserve particular attention because they are not simply a consequence of insufficient state capacity – they also reflect deliberate choices. The illegal development of floodplains and drainage corridors in Nigerian cities continues not despite planning regulations but because those regulations are selectively enforced. Political patronage networks that benefit from unregulated land development are a more significant barrier to resilience than any technical shortcoming, and the literature, while it documents the pattern, does not offer convincing strategies for overcoming it beyond generic calls for "political will" (Adelekan, 2020). Interview-based evidence from Port Harcourt complicates this picture somewhat: Echendu and Georgeou (2021) found that practising urban planners in the city demonstrated a sound grasp of the connections between poor planning and flooding, and tended to attribute the

enforcement gap primarily to widespread public non-compliance and improper building approvals rather than to systemic governance failure as such. Echendu's (2021) related study of the same city's planning professionals reaches a compatible conclusion: planners are rarely the source of technical ignorance the fragmentation narrative sometimes implies; the constraint is institutional and political, not a knowledge deficit within the planning profession itself.

9.3 Environmental Degradation and Ecological Feedback

Environmental degradation creates a feedback loop that worsens over time. As wetlands are lost to development, flood risk rises; as flood risk rises and communities face repeated losses, the pressure to exploit remaining natural areas intensifies. Sand mining, which accelerates riverbank erosion and increases suspended sediment loads in drainage systems, is a case in point: it is economically rational for those who profit from it, ecologically destructive in ways that increase downstream flood risk, and regulated in a way that is easily circumvented (Echendu, 2020). Addressing it requires enforcement capacity and viable alternative livelihoods – again, a governance challenge with a social equity dimension.

9.4 Poverty, Inequality, and Constrained Adaptive Capacity

Poverty and socioeconomic inequality constrain adaptive capacity in ways that are simple to state but difficult to address through sector-specific interventions. A household that cannot afford to build with flood-resistant materials, cannot afford insurance, and cannot afford to miss a day's trading income to attend a community resilience planning meeting faces flood risk as one of several interlocking forms of insecurity (Wolff et al., 2021). Resilience strategies that do not engage with this broader vulnerability context – that design good drainage but leave tenure insecurity unaddressed, for instance – will reach the households that are least exposed and miss those that are most.

9.5 Data Infrastructure and Technological Limitations

Technology and data infrastructure limitations receive less attention in the literature than institutional and governance challenges, but they are consequential. Flood early warning systems require real-time hydrological monitoring data; climate-sensitive planning requires high-resolution spatial data on flood extent, drainage network performance, and land-use change. Both are sparse across Southeastern Nigeria. Nkwunonwo et al. (2020) note that the absence of adequate flood modelling data for cities like Aba and Owerri constrains the design of appropriate engineering responses, and the same data gaps constrain risk communication, insurance product development, and post-disaster assessment. Yuan et al. (2022) demonstrate what becomes possible where such data infrastructure does exist: their smart flood resilience framework shows how community-scale big data – from mobility patterns to social media activity – can support predictive risk mapping and real-time situational awareness during flood events. The gap between that data-rich possibility and the data-poor reality of Southeastern Nigeria is itself a measure of how far behind the region's monitoring infrastructure lags.

A summary of analysis of the identified institutional and environmental barriers to resilience implementation is presented in Table 5.

Table 5: Barriers to Resilience Implementation in Southeastern Nigeria

S/N	Barrier	Nature of Constraint	Implication for Resilience
1	Institutional Capacity Deficits	Insufficient technical staff, equipment, and operating budgets	Basic regulatory functions cannot be performed; risk data absent
2	Planning Enforcement Failures	Political and patronage pressures override regulatory requirements	Continued illegal development in high-risk locations
3	Environmental	Degradation increases risk which	Ecological buffering capacity

	Feedback Loops	intensifies pressure on remaining natural areas	diminishes over time
4	Poverty and Inequality	Constrained household and community adaptive capacity	Most-exposed communities have least access to resilience resources
5	Data and Technology Gaps	Sparse hydrological monitoring and flood mapping coverage	Poor design of infrastructure and risk communication systems

10. PROPOSED PROACTIVE AND SUSTAINABLE APPROACHES FOR RESILIENT COMMUNITY DESIGN IN SOUTHEASTERN NIGERIA

The approaches proposed here are grounded in the evidence reviewed above and calibrated to the specific institutional, socioeconomic, and environmental context of Southeastern Nigeria. They are not a generic resilience toolkit; they are an attempt to identify what the literature most robustly supports as viable and impactful in this context.

10.1 Integrated Flood Resilience Planning

Integrated resilience planning – embedding flood risk management within urban master plans, development regulations, and infrastructure investment programmes rather than treating it as a separate emergency management function – is the approach with the broadest and most consistent support in the reviewed literature (Meerow & Newell, 2016). The rationale is straightforward: flooding is a consequence of how cities are planned, built, and governed, and it cannot be sustainably reduced by interventions that operate outside those systems. In practice, integration means flood risk assessments as a standard component of planning decisions, drainage impact requirements as a condition of development approval, and hydrological considerations incorporated into road, housing, and public space design from the outset.

10.2 Climate-Responsive Architectural Design as a Regulatory Requirement

Climate-responsive architectural design needs to be understood as a public good, not merely a private building choice. Where flood-resistant construction reduces damage to a household, it also reduces the demand on emergency services, the burden on community recovery systems, and the probability of adjacent structures being undermined by waterlogging. This collective dimension justifies regulatory requirements and public investment in disseminating good practice (Adeyanju et al., 2025). Minimum flood-resistant standards for new construction in designated flood-risk zones – elevated ground floors, reinforced materials, adequate drainage connections – are a technically achievable regulatory objective that would significantly reduce future damage if enforced.

10.3 Ecological Restoration and Green Infrastructure as Flood Management Investment

Ecological restoration and green infrastructure investment should be treated as flood management expenditure, not environmental expenditure. The distinction matters for budget allocation and for the institutional homes within which these investments are housed. Wetland restoration in upstream catchments reduces downstream peak flows; urban tree canopy reduces runoff intensity and improves infiltration; bioswales and retention ponds extend the time between rainfall and peak discharge. Ahern (2011) argues that cities that have made this accounting shift – treating ecological systems as infrastructure – have achieved better stormwater performance at lower long-term cost than those that have relied exclusively on engineered drainage. The Nigerian planning environment would benefit from developing a comparable framework for valuing ecological flood management functions.

10.4 Structured and Resourced Community Participation

Community participation should be structured and resourced, not simply invited. Wolff et al. (2021) document the difference between participation as consultation – communities are informed of decisions already made – and participation as genuine co-production of planning outcomes. Bhanye's (2025) review of community-based flood adaptation across Global South informal settlements reinforces this distinction: the structural and non-structural measures communities devise for themselves – reblocking, drainage maintenance, savings groups, participatory mapping – are consistently found to be more sustainably maintained than externally imposed interventions, but their long-term impact depends on genuine integration into formal disaster-risk frameworks rather than being left to operate in parallel to them. The latter is more resource-intensive but produces designs that reflect local knowledge, generate local ownership, and are more likely to be maintained over time. Flood preparedness systems, local drainage maintenance programmes, and early warning communication networks have all been shown to function better where they are built on genuine community engagement rather than externally designed and imposed – though Olawuyi's (2025) assessment of anticipatory-action implementation in Nigerian river communities found that over 70% of surveyed residents still lacked access to timely early warnings, and that many had come to regard flooding as simply unavoidable, a fatalism that itself undermines engagement with the preparedness systems that do exist.

10.5 Institutional Reform and Professional Advocacy

Institutional reform is the condition that makes everything else possible, and the literature is appropriately emphatic about its importance. Strengthening planning enforcement, improving inter-agency coordination, investing in technical capacity within local planning authorities, and developing functional flood risk information systems are all necessary (UN-Habitat, 2022). The challenge, as noted in the preceding section, is that the barriers to institutional reform are partly political rather than merely technical. This study does not claim to offer a solution to that challenge, but it does suggest that professional bodies – architectural associations, planning institutes, engineering councils – have underexplored roles as advocates for stronger regulatory frameworks and as providers of technical capacity-building that state institutions currently lack.

A summary of the proposed proactive and sustainable approaches for resilient community design in southeastern Nigeria is presented in Table 6.

Table 6: Proposed Strategies and Their Enabling Conditions

S/N	Strategy	Primary Mechanism	Key Enabling Condition
1	Integrated Resilience Planning	Embed flood risk in planning decisions and infrastructure investment	Political commitment to consistent enforcement
2	Climate-Responsive Architectural Standards	Regulatory minima for flood-resistant construction in risk zones	Updated building codes; professional capacity development
3	Ecological Infrastructure Investment	Fund and maintain green systems as stormwater management	Institutional reclassification of ecological systems as infrastructure
4	Structured Community Participation	Co-produce resilience plans drawing on local knowledge	Resource allocation for genuine participatory processes
5	Institutional Reform	Strengthen enforcement, coordination, and technical capacity	Political will; professional advocacy; sustained funding commitment

11. DISCUSSION

The picture that emerges from this review is of a flood crisis that is structurally produced and institutionally perpetuated. Climate change is intensifying the physical hazard, but the scale of impact in Southeastern Nigeria is not primarily determined by rainfall intensity – it is determined by how cities have been built and governed over the past three to four decades. This is an uncomfortable conclusion for policy, because it means that the most effective flood management interventions are not those that address flooding directly but those that address the planning, governance, and socioeconomic conditions that translate rainfall into disaster.

The resilience literature reviewed here is largely in agreement on this diagnosis, though it varies considerably in the specificity and practicality of the solutions it proposes. The most cited and most credible work (Meerow and Newell (2016), Folke et al. (2002), UN-Habitat (2022), Ziervogel et al. (2016)) consistently points toward integrated, interdisciplinary, governance-centred approaches. The question the literature does not adequately answer is how such approaches are initiated and sustained in contexts where the political economy of land development systematically works against them.

The green infrastructure evidence is worth treating with some care. The potential benefits – improved stormwater management, ecological co-benefits, lower long-term costs – are well-documented. But the conditions required for those benefits to be realised – land availability, institutional maintenance capacity, spatial integration across a catchment – are demanding. In rapidly urbanising cities where land is scarce and public institutions are under-resourced, green infrastructure is not a free solution. It requires planning, investment, and sustained management of the kind that the same institutional weaknesses that produce flood vulnerability tend to undermine.

Architecture's role in this picture is both more limited and more important than the literature sometimes implies. More limited because individual building design decisions, however well-considered, cannot compensate for systemic failures of drainage infrastructure and flood plain management. More important because the cumulative effect of construction decisions – what materials are used, how buildings are sited on plots, how they connect to drainage systems – shapes the hydrological behaviour of entire neighbourhoods. Embedding climate-responsive design standards into the regulatory framework, rather than leaving them to individual professional discretion, is likely to be the highest-leverage architectural intervention available.

Finally, the socioeconomic dimension of vulnerability cannot be treated as background context. Flood resilience in Southeastern Nigeria is inseparable from questions of who can afford to live where, who has tenure security, who has access to financial instruments for recovery, and who has the political voice to demand better infrastructure. Resilience frameworks that do not engage with these distributional questions risk designing systems that protect the less vulnerable while leaving the most exposed communities further behind.

12. CONCLUSION

Flooding in Southeastern Nigeria is a serious and worsening problem. This review has argued that its seriousness is not primarily a function of the region's physical geography or rainfall patterns – though these matter – but of accumulated governance failures, planning inadequacies, and socioeconomic inequalities

that have left communities highly exposed and poorly equipped to recover. Climate change is intensifying the hazard; it is not creating the vulnerability from nothing.

The reviewed literature supports a clear direction: integrated, anticipatory, governance-centred resilience planning that treats ecological systems as infrastructure, embeds flood risk management within urban planning frameworks, and takes community participation seriously as a knowledge resource and a determinant of implementation sustainability. This direction is consistent across diverse scholarly traditions and methodological approaches. The challenge is not conceptual – the field knows broadly what needs to happen – but institutional and political.

This study is a literature review, and its limitations reflect that. It has drawn on the work of scholars who have studied flood risk and resilience in the Nigerian and broader Sub-Saharan African context, but it has not generated new empirical data about specific communities, tested the effectiveness of specific interventions, or examined the political economy of planning decisions at the local government level with the granularity that would be required for confident prescriptive guidance. These are research gaps that future work in the region should address. A further limitation concerns database coverage. The literature search underpinning this review was conducted through Google Scholar and the open web; the authors did not have institutional access to Scopus or Web of Science at the time of writing, and those databases were therefore not searched. This is stated plainly rather than treated as a temporary omission to be corrected in a later draft: it is a genuine constraint on the review's coverage, and it means the corpus may under-represent material indexed primarily in those databases, particularly some smaller regional and West African journals. Readers should weigh the review's conclusions accordingly, and researchers with access to Scopus and Web of Science are encouraged to extend this search using the same criteria and search strings documented in Section 4.1.

What can be said with confidence is this: the communities of Southeastern Nigeria have been flooding, rebuilding, and flooding again for long enough. The evidence is available to design better. The question is whether institutional and political conditions can be created that allow that evidence to translate into practice. This paper hopes to contribute, however modestly, to the case that they can.

13. RECOMMENDATIONS

Based on the findings of this review, the following recommendations are proposed:

1. State planning authorities should commission updated, climate-sensitive flood risk maps for all major urban centres in the region as a prerequisite for revised master plan preparation.
2. Environmental impact assessment requirements should be strengthened and consistently enforced for any development proposed within identified floodplains, drainage corridors, or wetland areas.
3. Minimum flood-resistant construction standards for new buildings in designated flood-risk zones should be developed, enacted, and enforced through the building permit system.
4. Green infrastructure – wetland conservation, urban trees, bioswales, and retention ponds – should be recognised and funded as stormwater management infrastructure within capital budgets, not as landscape amenity.
5. Interdisciplinary working arrangements between planning authorities, environmental agencies, disaster management institutions, and infrastructure providers should be formalised, with clear accountability for coordinated flood management outcomes.

6. Community flood preparedness programmes should be structured as genuine co-production processes, providing resources for local engagement rather than simply consulting communities on externally developed plans.
7. Research institutions in the region should prioritise empirical studies evaluating the performance of specific resilience interventions in Southeastern Nigerian communities, to build an evidence base grounded in local conditions.
8. Professional bodies – architectural associations, planning institutes, engineering councils – should develop and disseminate accessible guidance on climate-responsive design for flood-prone areas, targeted at practitioners working outside formal institutional environments.
9. State governments should explore mechanisms for improved tenure security in informal flood-prone settlements as a prerequisite for meaningful household investment in flood-resistant construction.
10. Geospatial flood monitoring systems and community early warning communication networks should be treated as essential public safety infrastructure and funded accordingly.

REFERENCES

- Adeyanju, O. I., Akpotu, E., Efeni, O. S., & Obomejero, J. (2025). Green building strategies for climate resilience in flood-prone areas in Nigeria: A review. *African Research Reports*, pp. 74–85.
- Adelekan, I. O. (2020). Urban dynamics, everyday hazards and disaster risks in Ibadan, Nigeria. *Environment and Urbanization*, 32(1), 213–232.
- Ahern, J. (2011). From fail-safe to safe-to-fail: Sustainability and resilience in the new urban world. *Landscape and Urban Planning*, 100(4), 341–343.
- Akukwe, T. I., Ossai, O. G., Oluoko-Odingo, A. A., & Nwankwo, C. F. (2023). Flood-induced food insecurity and coping strategies: A gender-based analysis of agrarian households in South-eastern Nigeria. *GeoScape*, 17(1), 20–33.
- Bhanye, J. (2025). A review study on community-based flood adaptation in informal settlements in the Global South. *Discover Sustainability*, 6, 1449.
- Chinedu, A. D., Ezebube, N. M., Uchegbu, S., & Ozorme, V. A. (2024). Integrated assessment of flood susceptibility and exposure rate in the lower Niger Basin, Onitsha, Southeastern Nigeria. *Frontiers in Earth Science*, 12, 1394256.
- Choko, O. P., Schmitt Olabisi, L., Onyeneke, R. U., Chiemela, S. N., Liverpool-Tasie, L. S. O., & Rivers, L., III. (2019). A resilience approach to community-scale climate adaptation. *Sustainability*, 11(11), 3100.
- Chukwuma, E. C., Okonkwo, C. C., Ojediran, J. O., Anizoba, D. C., Ubah, J. I., & Nwachukwu, C. P. (2021). A GIS based flood vulnerability modelling of Anambra State using an integrated IVFRN-DEMATEL-ANP model. *Heliyon*, 7(9), e08048.
- Danhassan, S. S., Abubakar, A., Zangina, A. S., Ahmad, M. H., Hazaea, S. A., Ishak, M. Y., & Zhang, J. (2023). Flood policy and governance: A pathway for policy coherence in Nigeria. *Sustainability*, 15(3), 2392.
- Dimuna, K. O., Ekhaese, E. N., & Ndimako, O. O. (2024). Climate change impact on the architecture and built environment dwellers' well-being in Niger Delta Region: A systematic review. *Frontiers in Climate*, 6, 1498938.

- Echendu, A. J. (2020). The impact of flooding on Nigeria's sustainable development goals (SDGs). *Ecosystem Health and Sustainability*, 6(1), 1791735.
- Echendu, A., & Georgeou, N. (2021). 'Not going to plan': Urban planning, flooding, and sustainability in Port Harcourt City, Nigeria. *Urban Forum*, 32(3), 311–332.
- Echendu, A. J. (2021). Relationship between urban planning and flooding in Port Harcourt city, Nigeria; insights from planning professionals. *Journal of Flood Risk Management*, 14(4), e12693.
- Enworo, O. C. (2026). The transformative role of community-based social provisioning in addressing flood-induced food insecurity in Anambra state, Nigeria. *Cogent Social Sciences*, 12(1), 2611585.
- Esiobu, N. S. (2026). Determinants of flood disaster mitigation strategies practiced by arable crop farmers in Imo State, Nigeria. *Frontiers in Climate*, 8, 1855315.
- Ezeokoli, F. O., Okolie, K. C., & Onwuka, S. U. (2019). Flood resilience measures in buildings on the flood-plains of Ogbaru, Anambra State, Nigeria. *Advances in Research*, 19(4), 1–10.
- Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., & Walker, B. (2002). Resilience and sustainable development: Building adaptive capacity in a world of transformations. *Ambio*, 31(5), 437–440.
- Inyang-Ogim, F. A., et al. (2026). Disaster preparedness among residents of flood-prone areas in sub-Saharan Africa: A systematic review. *Discover Public Health*, 23(1), 1–14.
- Meerow, S., & Newell, J. P. (2016). Urban resilience for whom, what, when, where, and why? *Urban Geography*, 40(3), 309–329.
- Nkwunonwo, U. C., Whitworth, M., & Baily, B. (2020). A review of the current status of flood modelling for urban flood risk management in the developing countries. *Scientific African*, 7, e00269.
- Odoh, B. I., & Nwokeabia, C. N. (2024). Impact of drainage density and geological factors on flood risk: A comprehensive study of Abia State. *Researchers Journal of Science and Technology*, 4(5), 1–21.
- Odunsi, O. M., Olawuni, P. O., Daramola, O. P., Olugbamila, O. B., Odufuwa, B. O., Onanuga, M. Y., Salisu, U. O., Fasina, S. O., & Momodu, S. O. (2024). Households' resilience to flood disaster in Lagos State, Nigeria: Developing a conceptual framework unifying disaster resilience components and dimensions. *Journal of Environmental Studies and Sciences*, 14(1), 69–86.
- Okolo, C. M., Ahaneku, C. V., Asare-Bediako, B., Ekeoma, S. N., & Muogbo, C. D. (2025). Enhanced flood risk assessment of coastal communities in Southeastern Nigeria: A systematic review. *Asian Journal of Environment & Ecology*, 24(6), 1–23.
- Okorafor, O. O., & Chikwue, M. I. (2021). Mapping of flood prone areas in Imo State, Southeastern Nigeria using GIS techniques. *Scientific Research Journal*, 9(7), 1–9.
- Olawuyi, D. A. (2025). Anticipatory action in river flooding risk management in Nigeria: An assessment of community-level implementation. *Journal of Flood Risk Management*, 18(4), e70117.
- Orimoogunje, O., & Aniramu, O. (2025). Systematic review of flood resilience strategies in Lagos Metropolis: Pathways toward the 2030 sustainable development agenda. *Frontiers in Climate*, 7, 1603798.
- Sharifi, A. (2020). Urban resilience assessment: Mapping knowledge structure and trends. *Sustainability*, 12(15), 5918.
- Umar, N., & Gray, A. (2022). Flooding in Nigeria: A review of its occurrence and impacts and approaches to modelling flood data. *International Journal of Environmental Studies*, 80(3), 540–561.
- UN-Habitat. (2022). *World Cities Report 2022: Envisaging the Future of Cities*. United Nations Human Settlements Programme, Nairobi.

- Wolff, E., French, M., Ilhamsyah, N., Sawailau, M. J., & Ramírez-Lovering, D. (2021). Collaborating with communities: Citizen science flood monitoring in urban informal settlements. *Urban Planning*, 6(4), 351–364.
- Yuan, F., Fan, C., Farahmand, H., Coleman, N., Esmalian, A., Lee, C.-C., Patrascu, F. I., Zhang, C., Dong, S., & Mostafavi, A. (2022). Smart flood resilience: Harnessing community-scale big data for predictive flood risk monitoring, rapid impact assessment, and situational awareness. *Environmental Research: Infrastructure and Sustainability*, 2(2), 025006.
- Ziervogel, G., Cowen, A., & Ziniades, J. (2016). Moving from adaptive to transformative capacity: Building foundations for inclusive, thriving, and regenerative urban settlements. *Sustainability*, 8(9), 955.