FLOODING AND ITS IMPLICATIONS ON THE ECONOMY OF BENUE STATE, NIGERIA: A HISTORICAL REVIEW OF TRENDS, CAUSES, IMPACTS AND MITIGATION

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Abstract

Research Problem:
Environmental disasters increasingly threaten human existence, with flooding emerging as a recurrent hazard in Benue State, north central Nigeria. Its increasing frequency and spatial spread have generated substantial consequences for human lives, infrastructure, agriculture, trade, displacement and food security. However, existing interventions have not adequately addressed the differentiated pathways through which flooding affects urban and rural communities.
Methods/theory:
The study adopts a historical and multidisciplinary approach, drawing on primary and secondary sources. Primary data were obtained through field surveys covering 50 villages across ten Local Government Areas, namely Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina Ala, Konshisha and Vandeikya, alongside household survey data and ward vulnerability classifications for Makurdi.
Results:
Findings reveal two distinct flooding pathways. In Makurdi, flooding is principally associated with overflow of the Benue River mainstem, severely affecting low lying residential and commercial areas, including Wurukum, Wadata and Modern Markets. Ankpa Wadata was identified as the most vulnerable ward, followed by Fiidi, while Bar and Wailomayo were classified as vulnerable. In the ten rural and semi urban LGAs, flooding is driven predominantly by tributary rivers and smaller streams, resulting in farmland destruction and house collapse, particularly affecting rice production in Guma, Gwer and Gwer West.
Conclusion:
Existing mitigation measures remain inadequate relative to the scale,

frequency and geographical distribution of flooding.
Key Contribution to Knowledge:
The study demonstrates that flooding in Benue State constitutes differentiated hydrological pathways requiring context specific interventions rather than uniform policy responses.
Recommendation:
Makurdi requires mainstem dredging, market and ward targeted protection, and improved dam release coordination, while rural LGAs require tributary management, stream channel regulation, farm setback enforcement and support for flood tolerant rice cultivation.

Introduction

Flooding has long been a recurring natural hazard in Nigeria, with devastating consequences for the economy, human lives, and property. In Benue State, flood disasters have become an almost annual threat to human existence, particularly along the banks of the Niger and Benue rivers. Historical records point to several especially destructive episodes, notably the floods of 1969, 1988, 2012, 2018 and 2022. The 1969 flood, among the earliest well-documented events in the region, caused widespread destruction of farmlands and rural settlements and depressed agricultural productivity, leading to food shortages in subsequent seasons. The 1988 flood was marked by the overflow of the Benue River, causing significant damage to roads, bridges and farmlands and disrupting trade and other economic activities.

The floods of July–October 2012 and August–September 2022 affected almost all states of the north-central zone, particularly Benue, Niger, Kogi and Nasarawa, as well as the Federal Capital Territory. These episodes resulted from heavy rainfall combined with the release of excess water from the Lagdo Dam in northern Cameroon. The 2012 flood alone is reported to have affected more than 7 million people, internally displaced over 2 million, physically injured more than 5,000, and destroyed over 5,900 houses along with transport and communication infrastructure. This pattern of recurring disasters underscores the vulnerability of Nigeria's central region to climate-related hazards, flooding chief among them.

A particularly troubling and persistent legacy of these floods is the damage inflicted on the regional economy, especially on agricultural production. Benue State is often described as Nigeria's 'food basket' given its central role in national food security, with farmers producing staple and cash crops such as yam, cassava, sweet potatoes, rice and grains. Over the past four decades, flooding has emerged as a major threat to food production, submerging farms, destroying crops, and reducing yields, thereby exposing the region and the wider country to food insecurity. Recurrent flood waters have also disrupted trade and transport by damaging roads and bridges, cutting off markets, and leaving many rural dwellers without homes or income.

A field survey conducted for this study extended beyond Makurdi to cover 50 villages spread across ten Local Government Areas, namely Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha and Vandeikya, in order to establish whether the pattern of flood damage documented for the state capital also characterizes the wider rural economy, or whether a distinct pattern operates outside the Benue mainstem corridor. As detailed in Sections 7 and 8 below, the survey finds that it is the latter: rural and semi-urban LGAs

experience flooding predominantly through the overflow of tributary rivers and streams rather than the Benue River itself, with distinct consequences for farmland, housing and, in the case of Guma, Gwer and Gwer West, the rice crop specifically. This distinction has not been prominent in the existing literature, which has concentrated heavily on Makurdi's mainstem flooding, and is a central contribution of this study.

Beyond the immediate destruction, recurrent flooding sets in motion a slower-moving economic erosion across both pathways identified in this review: farmers in the ten surveyed LGAs who lose successive rice or other harvests to stream overflow deplete savings and seed stock, while urban business owners in Makurdi who lose stalls and inventory to Benue mainstem flooding struggle to re-capitalize between flood seasons. Households that are repeatedly affected, whether in the city or in the fifty villages sampled across the ten LGAs, fall further behind in asset accumulation, schooling and health outcomes. Understood this way, flooding in Benue State is not merely a series of discrete emergencies but a chronic drag on regional development, one whose cumulative economic cost likely exceeds the sum of its individually reported damages, and one that this review argues cannot be fully captured by attention to the Benue mainstem alone.

Thus, the research complexity is that Benue State is a major hub of food and cash-crop production in Nigeria, contributing significantly to national food security and economic development. Yet environmental disasters, flooding foremost among them, have increasingly threatened this economic base. Flooding in the state has become an annual phenomenon that profoundly affects human lives, economic activity and infrastructure. Although the Nigerian federal government budgets substantial ecological funds each year to support vulnerable areas, including the north-central region, the effectiveness of these interventions remains an open and under-researched question, one complicated by the fact that flooding does not affect all parts of the state through the same mechanism. Existing scholarship and policy attention have concentrated on Makurdi's Benue River flooding, potentially leaving the tributary- and stream-driven flooding experienced across the state's ten surveyed rural LGAs comparatively under-addressed.

This problem can be framed around six specific questions: (i) What is the historical root of flood disasters in Benue State? (ii) What are the propelling factors behind recurring flood disasters in the state, and do these differ between Makurdi and the surrounding rural LGAs? (iii) What is the extent of economic damage caused by these disasters, including to the rice crop specifically? (iv) What is the nature of existing mitigation efforts and ecological interventions? (v) What challenges hinder effective flood and ecological management in Benue State? and (vi) Do rural, tributary-driven flood events require a different policy response from the mainstem flooding experienced in Makurdi?

To this end, the paper has these research objectives:

i. To trace the historic roots of flood disasters in Benue State.

ii. To examine the propelling factors for recurring flood disasters in Benue State, distinguishing Benue mainstem flooding from tributary and stream-driven flooding.

iii. To assess the level of economic damage caused by recurring flood disasters, including damage to houses, businesses, farmland and the rice crop specifically.

iv. To evaluate existing mitigation efforts and policy interventions in the management of flood disasters in Benue State.

Literature Review

Causes and Nature of Flood Disasters

Adamu and Dan'azumi, reviewing the historical occurrence of floods in Nigeria, argue that flooding has become an annual event driven jointly by human action and rainfall patterns, and rank it among the most devastating natural hazards because of its rapid onset, unpredictability and the difficulty of mounting an emergency response. They identify three primary types of flooding in Nigeria (river, urban and coastal) and note that comprehensive early-warning systems, improved reservoir-operation methods, and better maintenance of hydraulic structures are essential to mitigating its effects. Their classification of river flooding is broad enough to encompass both mainstem and tributary flooding, though their review does not examine the two as analytically distinct phenomena within a single state.

Beyond rainfall, floods occur when soil and vegetation can no longer absorb downpours, when rivers overflow their banks onto floodplains, or, less commonly in this context, through seismic or tidal activity. Human-induced causes are equally significant: urbanization increases the likelihood that a river within an urban drainage basin will flood, while inadequate drainage and unplanned urban development compound the risk, particularly in developing countries.

Institutional Response: The Evolution of Disaster Management in Nigeria

According to Nigeria's National Emergency Management Agency (NEMA), organized disaster management in the country dates to the establishment of the Fire Brigade in 1906. This structured approach gave way to ad hoc arrangements in the 1960s and 1970s. The devastating 1972/1973 drought prompted the creation of the National Emergency Relief Agency (NERA) in 1976, which was superseded by NEMA in March 1999 under Act 12 of 1999, as amended by Act 50 of 1999.

Taiwo and Alaba's assessment of NEMA two decades after its founding, drawing on survey, interview and focus-group data from Kogi, Bayelsa and Oyo states, found that the agency's enabling legislation was weak and that it operated within a complex, constraining policy environment. Beyond ecological variables, they identify poor funding, low institutional capacity and bureaucratic corruption as chronic weaknesses, and recommend that NEMA be repositioned to play a more active role in managing emerging disaster and humanitarian threats.

Empirical Studies on the Impact of Flood Disasters

Akera, Ngbede and Asortse's study of perennial flooding in Makurdi (2012–2023) found that the urban area has suffered repeated flood disasters from the overflow of the Benue River, with major events in 2012, 2017, 2018, 2021, 2022 and 2023. They attribute the recurrence to heavy rainfall, the annual release of water from the Lagdo Dam, encroachment on wetlands, failure to dredge the Benue River, institutional neglect, poor drainage, and obstruction of water channels. Residential and industrial districts of Makurdi, including Wurukum, Adeke, Adaka Idye, Wadata, Achusa and Kanshio, have been repeatedly flooded. Because this study is explicitly bounded to Makurdi's urban transformation, it does not extend to the tributary- and stream-driven flooding documented for the ten rural LGAs in the present review, a gap this study addresses directly.

Mfon, Oguike, Eteng and Etim's review of the causes and effects of flooding in Nigeria attributes the hazard to a combination of natural factors and human factors, including poor environmental planning, housing development in flood-prone areas, deforestation, blocked drains, poor waste

disposal, and weak policy enforcement. Okafor's study of flood-driven livelihood displacement and poverty in Nigeria between 2012 and 2018 documents that the 2012 disaster killed 363 people and displaced more than 2.1 million as of early November of that year. Marsh's broader account of the negative impacts of flooding identifies harms to wildlife, humanity, the environment and ecosystems, and highlights the public-health dimension of flooding, including contamination of drinking water and food supplies.

A complementary national-level review by Odiana, Mbee and Akpoghomeh characterizes flooding as a short-term inundation of land that would not ordinarily occur, noting that it remains one of the most common environmental hazards in developing countries such as Nigeria and tends to concentrate in flat or low-lying locations with inadequate or blocked surface drainage. Distinctively, their review foregrounds the socio-economic dimension of exposure, arguing that vulnerability to flooding is shaped not only by physical terrain but by a household's income, occupation, access to information and technology, and access to credit or loan facilities, factors that determine how quickly and completely a household can recover once flood water recedes. This socio-economic framing is directly relevant to Benue State: it suggests that the household-level losses documented for Makurdi in this paper, and the farm and rice losses documented across the ten rural LGAs too, will translate into markedly different recovery trajectories depending on affected households' income and occupation, a dimension the present review's field data are well placed to examine further.

Conceptual and Theoretical Framework

The economy is understood here as the system through which scarce resources, namely land, labour and raw materials, are allocated for the production and consumption of goods and services. This review is anchored on the Emergency Management Theory advanced by David McEntire in 2004, first presented at the Annual Emergency Management Higher Education Conference at the National Emergency Training Center, which holds that disasters are inevitable and will produce unrecoverable harm unless society undertakes deliberate measures across four principles: preparedness, response, recovery and mitigation. Applied to Benue State, the theory frames flood disasters as recurring, largely foreseeable emergencies whose economic damage is a function of the adequacy of these four measures, a framing this review extends by asking whether preparedness, response, recovery and mitigation measures need to be differentiated by flooding pathway (mainstem versus tributary) rather than applied uniformly across the state.

The theory's applicability is not confined to flooding. Ughulu and Igabor's assessment of the Nigerian federal government's management of the COVID-19 pandemic applies the same four principles to a public-health emergency, and, in doing so, articulates a foundational premise directly relevant to this review: that disasters are properly understood as social phenomena, arising from the interaction of a physical hazard with underlying vulnerability, with vulnerability itself functioning as the causative factor that turns a hazard into a disaster. Read alongside the flood-specific literature reviewed above, this premise reinforces the case for treating Benue State's flood losses as a function of preventable vulnerability, such as weak drainage, unmanaged wetlands, and limited institutional capacity, rather than as an unavoidable consequence of rainfall alone, and supports this review's broader argument that pathway-specific vulnerability reduction, rather than uniform disaster response, is the more theoretically consistent policy approach.

Gaps in the Literature

Across the literature reviewed, two gaps stand out in light of the present field survey. First, existing empirical studies of flooding in Benue State are heavily weighted toward Makurdi and the Benue mainstem, leaving the tributary- and stream-driven flooding experienced across the state's wider rural expanse comparatively undocumented in published scholarship, despite affecting a larger number of Local Government Areas. Second, no study identified in this review disaggregates flood-related crop losses by specific crop type at the LGA level; general references to farmland destruction are common, but the rice-specific losses reported in Guma, Gwer and Gwer West in this study's field survey do not appear to have been previously documented as a distinct, geographically concentrated finding. This review is positioned to help close both gaps by extending the evidentiary base beyond Makurdi to the ten-LGA, fifty-village field survey described in the paper.

Study Area and Methodology

Study Area

Benue State lies within the middle-belt of Nigeria, a transition zone between the country's northern and southern regions. The Benue River and its tributaries crisscross the state, providing water for industrial, commercial, domestic and transport use, but this same hydrology underlies the state's high vulnerability to flooding. Abundant arable land and irrigation potential have made the population predominantly crop farmers and livestock producers, with Gwer West in particular recognized as one of the state's leading producers of rice and honey.

Field Sampling: Fifty Villages across Ten Local Government Areas

In addition to the historical and documentary review, the study's field component covered 50 villages spread across ten Local Government Areas: Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha and Vandeikya. These LGAs were selected because they lie along the Benue River's tributary network, rather than directly on the Benue mainstem as Makurdi does, making them well suited to testing whether flood damage in these areas follows the same causal pathway documented for the state capital, or a distinct one. Table 1 lists set of five settlements sampled within each LGA, drawn from each area's recognized wards and settlements.

LGA	Settlements/Wards Sampled (illustrative list)
Gwer West	Naka, Bunaka, Agagbe, Nagi, Kula
Guma	Daudu, Abinsi, Uikpam, Tse-Tule, Madaki
Gwer (East)	Aliade, Mbalom, Mbaikyaan, Mbasombo, Shough
Buruku	Binev, Etulo, Mbaade, Mbaakura, Shorov
Gboko	Yandev, Ukpekpe, Mbatyu, Mbadam, Igyorov
Tarka	Wannune, Mbaayo, Shitile, Tongov, Mbanyagber
Kwande	Adikpo, Mbadura, Mbaikyor, Yaav, Tondov

Katsina-Ala	Katsina-Ala Town, Ikurav Tiev, Iwar (Tongov I), Mbayongo, Yooyo
Konshisha	Tse-Agberagba, Mbagusa/Mbatser, Mbaikyase, Mbatsen, Ikyurav/Mbatwer
Vandeikya	Vandeikya Town, Ankar, Mbayongo, Mbaduku, Ute

Table 1

Within each LGA, informants included farmers, traders, transporters, community and traditional leaders, and officials of relevant ministries and local government departments, consistent with the primary-source instrumentation described below. Interviews probed the source of flood water reaching each village (mainstem, tributary or local stream), the assets damaged (housing, farmland, specific crops), and the timing of flooding relative to the rainy season, in order to build a comparative picture across the ten LGAs and against the Makurdi pattern documented in the literature.

Data Collection: Primary and Secondary Sources

Primary data collection involved oral interviews, photographs and maps gathered within the 50 sampled villages, supplemented by newspapers and administrative and government documents held at the Ministries of Environment, Agriculture, and Humanitarian Management. Secondary sources included textbooks, journal articles, and reports from government agencies and non-governmental organizations, including the Red Cross and UNICEF. Findings from multiple sources were corroborated against one another to enhance credibility, an approach that proved particularly important for distinguishing genuine tributary-driven flooding from generalized claims of 'flooding' that, on closer inspection, traced back to Benue mainstem events reported for Makurdi.

Limitations of the Field Survey

The distance to be covered across ten LGAs represents a wide geographical spread characterized by rivers, hills and valleys that made movement and navigation challenging. Insecurity in parts of the region, including farmer–herder tensions, restricted access to some of the villages originally targeted for sampling. In several villages, flooding had itself destroyed bridges and communication infrastructure, cutting communities off and complicating verification. There is also a risk that some informants, particularly farmers who had lost crops, provided exaggerated accounts in the hope of attracting humanitarian or governmental assistance; the study addressed this by triangulating claims across multiple informants and, where possible, physical observation of affected farmland within each village visited.

Historical Trend of Flood Disasters in Benue State

Table 2 summarizes the major flood events documented for Benue State at the state and Makurdi-city level, spanning 1969 to 2023. As the table shows, the causal signature at this scale, heavy rainfall combined, in the largest events, with Lagdo Dam water releases, is consistent across more than five decades, and the same Makurdi districts recur as flood sites across the 2017–2023 sequence.

Year	Trigger / Cause	Areas Affected	Principal Reported Impact
1969	Heavy seasonal rainfall and river overflow	Rural farmlands and settlements along the Benue corridor	Destruction of farmlands; depressed output; food shortages the following seasons
1988	Overflow of the Benue River	Roads, bridges and farmland across the state	Damage to roads and bridges; disrupted trade
2012	Heavy rainfall plus release of excess water from the Lagdo Dam, Cameroon	Benue, Niger, Kogi, Nasarawa and the FCT	Over 7 million affected; 2M+ displaced; 5,000+ injured; 5,900+ houses destroyed; 363 deaths reported
2017–2023	Benue River overflow; poor drainage; channel obstruction	Makurdi urban districts (Wurukum, Adeke, Adaka Idye, Wadata, Achusa, Kanshio)	Repeated urban flooding of the same districts in 2017, 2018, 2021, 2022, 2023
2022	Heavy rainfall and Lagdo Dam water release	Benue, Niger, Kogi, Nasarawa and the FCT	Large-scale displacement; destruction of farmland, homes and infrastructure

Table 2

Two Distinct Flooding Pathways: Mainstem versus Tributary

A central finding of the field survey is that flooding in Benue State does not operate through a single uniform mechanism across the state. Rather, two distinct pathways can be identified, each with its own geography, causation, and pattern of economic damage.

Benue Mainstem Flooding in Makurdi

In Makurdi, the state capital, flooding is driven principally by the overflow of the Benue River itself, compounded by heavy rainfall and, in major years, by releases from the Lagdo Dam in Cameroon. This pathway is well documented in the literature reviewed in Section 4.3 and produces damage concentrated in the city's low-lying commercial and residential districts, namely Wurukum, Adeke, Adaka Idye, Wadata, Achusa and Kanshio, where houses and businesses are directly inundated by rising river water. Because Makurdi is Benue State's principal urban and commercial centre, this pathway carries an outsized economic weight per flood event: business premises, urban housing stock, and city infrastructure represent concentrated capital investment that is destroyed or damaged each time the river overflows.

Field respondents in Makurdi describe vulnerability to flooding there as a function of physical, climatic and human factors acting together. Beyond the general low relief and drainage-network characteristics of the city, respondents identified specific socio-economic and anthropogenic activities as intensifying flood exposure in particular parts of town. Asked to classify Makurdi's wards by degree of vulnerability, respondents rated Ankpa-Wadata as the most vulnerable ward, Fiidi as more vulnerable, and Bar and Wailomayo as vulnerable. This classification is consistent with independent academic findings: a study by Isma'il and Kersha specifically delimited its assessment of flood impact in Makurdi to the Ankpa-Wadata, Wailomayo, Bar and Fiidi wards, on the grounds that Ankpa-Wadata and Wailomayo sit directly along the banks of the

Benue River while Bar and Fiidi cover an extensive watershed and experience yearly flooding; that study similarly concluded that, although high rainfall and low-lying topography contribute to Makurdi's flood risk, anthropogenic factors are of even greater significance in determining flood severity. A more recent geospatial assessment, combining Geographic Information Systems with a Multi-Criteria Decision-Making Analytic Hierarchy Process across slope, elevation, rainfall, land use, river proximity, soil type, drainage density and road proximity, found that more than 56 percent of the Makurdi area falls within high flood-risk zones, reinforcing the picture of a city where the large majority of the urban footprint carries meaningful flood exposure rather than risk being confined to a small number of isolated pockets.

A heavy rainfall event in Makurdi Local Government Area brought this vulnerability into sharp relief, with reported flooding affecting Achusa, Wurukum, Gyado Villa, the Coca-Cola settlement, the Airforce base settlement, and part of the Breweries settlement. This pattern is consistent with independently reported flood events in Makurdi in recent years: news coverage of the Benue River's surge in October 2024 similarly recorded flooding in the Agwan Jukun area of Wurukum, at Kilometre 3 near the Judges' Quarters, in Wadata, Gyado Villa and Agbouhoul, with water reaching the perimeter fence of the Airforce Quarters near the Wurukum Roundabout, while an August 2024 event separately displaced residents from Achusa, Jerome Hwande Street, Ankpa Quarters Extension, Naka Road and neighbouring areas. Both episodes prompted the Benue State Emergency Management Agency (SEMA) to direct residents in flood-prone areas to evacuate to designated camps, and were reported against a backdrop of red-alert water levels recorded jointly by Nigeria's Hydrological Services Agency and National Inland Waterways Authority for the Benue River at Makurdi and the Niger River at Lokoja.

Markets feature prominently among the study areas affected by mainstem flooding in Makurdi and should be included alongside residential districts in any assessment of economic damage. Wurukum Market, Wadata Market, and the Clerks/Market ward have each been separately reported as flooded or threatened during past Benue River surges, alongside the Wurukum abattoir, plank market and rice mill, whose proximity to the riverbank places them directly in the path of rising water. The Modern Market ward, itself named for the large modern market complex built in the city, illustrates a further, longer-term dimension of flood-related economic damage: constructed with over 1,000 lock-up and open shops, the market was pressed into service as a temporary accommodation site for flood victims following a major disaster, and has subsequently struggled to attract back the volume of traders and commercial activity it was built for, leaving substantial public investment underutilized years after the flood event that first disrupted it. This illustrates that market-based commerce in Makurdi is exposed to flooding both directly, through inundation of trading premises and stock, and indirectly, through the longer-term displacement of commercial activity from purpose-built market infrastructure.

Household and Business-Level Survey Findings in Makurdi

A household-level survey conducted across the selected Makurdi study areas quantifies the pattern of loss described above. In every one of the selected study areas, 20 respondents reported the loss of potential farm yields. Within this group, 5 respondents each reported losing rice crops that would otherwise have yielded up to 15 bags apiece, while 4 further respondents reported that their yam farms had been destroyed. Separately, 11 respondents

reported losing buildings, business shops or supermarkets, and personal belongings to flooding. Taken together with the ward-level vulnerability classification in section on "Benue Mainstem Flooding in Makurdi," these findings indicate that even within a single urban local government area, flood losses are distributed unevenly across both geography (concentrated in Ankpa-Wadata, Fiidi, Bar and Wailomayo) and asset type (farm produce, standing crops, buildings and business premises, and personal belongings), a pattern that should inform how compensation and recovery support are targeted rather than distributed uniformly across the city.

Tributary and Stream-Driven Flooding Across the Ten Surveyed LGAs

Outside Makurdi, across the ten LGAs surveyed, namely Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha and Vandeikya, the field survey found that flooding follows a materially different pathway. Rather than the Benue mainstem itself, it is the overflow of the river's tributaries and smaller streams that drives flood damage in these areas. Villages sampled across the ten LGAs reported that, during periods of heavy rainfall, these smaller watercourses rise rapidly and overtop their banks, a dynamic distinct from the slower, larger-scale rise of the Benue mainstem at Makurdi. The consequences reported were correspondingly different in character from the Makurdi pattern: rather than the inundation of urban commercial buildings, informants reported that farms were washed away and that houses, typically built closer to these smaller watercourses than urban structures are built to the Benue itself, collapsed under the force of the rising streams.

This distinction matters both analytically and for policy. Where Makurdi's flooding is a river-engineering and urban-drainage problem centred on a single, well-identified watercourse, the flooding reported across the ten rural LGAs is a distributed problem involving numerous smaller streams and tributaries, each requiring localized attention to channel capacity, bank stability and building setbacks. A flood-mitigation strategy designed solely around the Benue mainstem, relying on dredging, urban drainage, and dam-release coordination, would not, on the evidence of this field survey, address the flooding experienced by villages in Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha or Vandeikya, since the water reaching these villages does not originate from the Benue mainstem in the same way.

Rice Losses in Guma, Gwer and Gwer West

Within the ten LGAs surveyed, rice was specifically reported as washed away by tributary and stream flooding in Guma, Gwer and Gwer West. This finding is consistent with the broader agronomic profile of the area: Gwer West in particular is recognized as one of Benue State's leading producers of rice, alongside honey, meaning that these three LGAs sit within the state's core rice belt. Rice cultivation in this belt is typically concentrated on lowland and floodplain soils close to streams and minor rivers. The same terrain that supports high rice yields in normal years is the terrain most exposed to stream overflow in years of heavy rainfall. The loss of standing rice crops in Guma, Gwer and Gwer West therefore represents a direct threat to a specific, geographically concentrated component of the state's agricultural output, distinct from the more general farmland damage reported elsewhere in the ten-LGA survey, and warrants a dedicated response within the crop-specific recommendations set out in this paper.

Comparative Summary

Read together, the Makurdi and ten-LGA findings indicate that Benue State's flood-

economic burden is not a single problem but two related, geographically distinct ones. The Makurdi pathway concentrates damage in urban housing and business capital through Benue mainstem overflow. The rural pathway, documented across fifty villages in the ten surveyed LGAs, concentrates damage in farmland and rural housing through tributary and stream overflow, with a specific and economically significant sub-pattern of rice-crop loss in the Guma–Gwer–Gwer West belt. Any assessment of the state's aggregate flood losses, and any mitigation strategy intended to address them, needs to account for both pathways rather than extrapolating from the better-documented Makurdi case alone.

Causes of Flooding: Climatic, Hydrological and Institutional Factors

Heavy seasonal rainfall underlies both flooding pathways described earlier, but its downstream expression differs: on the Benue mainstem, rainfall across the wider catchment, combined with Lagdo Dam releases, produces the large, relatively slow-rising floods documented for Makurdi; on the tributary and stream network feeding the ten surveyed LGAs, the same rainfall produces faster, more localized rises that farmers and residents in the villages sampled describe as harder to anticipate. Human and institutional factors compound both pathways: encroachment on wetlands and river banks, failure to dredge or maintain channels, poor drainage, and the obstruction of water channels are documented for Makurdi in the literature reviewed, while the field survey's informants in the ten LGAs pointed to similar local-scale problems, including unmaintained stream channels, farming and settlement directly on stream banks, and the absence of any organized drainage or channel-clearance programme at the village level, in contrast to the (still inadequate) attention given to the Benue mainstem in and around Makurdi.

Institutional attention has historically concentrated on the mainstem pathway, in part because Makurdi's status as state capital and principal commercial centre makes its flood damage more visible and more readily reported than dispersed rural losses. NEMA's regional office for central Nigeria and SEMA's own operational focus have, on the evidence reviewed here, developed considerably more capacity and documented experience responding to Benue River flood stages at Makurdi than to the rainfall-driven, fast-rising tributary floods reported by informants across the ten LGAs surveyed. This institutional asymmetry compounds the underlying hydrological difference between the two pathways: not only do mainstem and tributary floods arise through different physical mechanisms, but the response capacity built up around each has developed unevenly, with the tributary pathway comparatively under-served.

Recommendations

Because the field survey documents two distinct flooding pathways, the recommendations below are organized accordingly rather than presented as a single undifferentiated list. Table 3 summarizes the targeted measures for each pathway before the discussion elaborates on each.

Flooding Pathway	Targeted Measures
Benue mainstem (Makurdi)	Dredging of the Benue River in priority urban reaches; rehabilitation of drainage in Wurukum, Adeke, Adaka Idye, Wadata, Achusa and Kanshio; bilateral notification protocol with Cameroon on Lagdo Dam releases.
Tributary and stream flooding (rural LGAs)	Clearing and channelling of minor rivers and streams feeding the Benue in Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha and Vandeikya; embankment and setback distances for farms and homesteads along stream banks; village-level early warning tied to upstream rainfall rather than only to the Benue gauge.
Agriculture (rice belt)	Flood-tolerant rice varieties and adjusted planting calendars for Guma, Gwer and Gwer West; seed-stock replacement support and, where feasible, crop insurance for smallholder rice farmers repeatedly affected by stream overflow.
Institutional	Strengthened funding, staffing and legislative footing for SEMA, with a rural-flooding desk distinct from the urban Makurdi response, given the two pathways' different causes and mitigation needs.

Table 3

Measures for Makurdi (Benue Mainstem)

i. Dredge the Benue River in priority urban reaches around Makurdi to restore channel capacity.

ii. Rehabilitate drainage infrastructure in Wurukum, Adeke, Adaka Idye, Wadata, Achusa and Kanshio, prioritizing Ankpa-Wadata and Fiidi wards, rated most vulnerable and more vulnerable respectively by field respondents, followed by Bar and Wailomayo.

iii. Flood-proof market infrastructure, including Wurukum Market, Wadata Market, the High level Market and the underused Modern Market complex, through raised trading platforms, improved drainage around market perimeters, and, where the Modern Market's location and capacity allow, active relocation incentives to draw traders back from more flood-exposed informal trading sites.

iv. Formalize a bilateral protocol with Cameroon for timely notification and phased release of water from the Lagdo Dam.

Measures for the Ten Surveyed LGAs (Tributary and Stream Flooding)

i. Undertake systematic clearing and, where feasible, channelling of the minor rivers and streams feeding the Benue across Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha and Vandeikya, prioritizing the villages sampled in this survey and others identified as similarly exposed.

ii. Establish building and farming setback distances along stream banks in the villages surveyed, to reduce the incidence of house collapse and farm loss during periods of heavy rainfall.

iii. Extend early-warning communication to the village level in all ten LGAs, tied to local and upstream rainfall rather than solely to Benue River gauge readings at Makurdi, given that the two pathways operate on different timescales.

Measures Specific to Rice Losses in Guma, Gwer and Gwer West

i. Introduce flood-tolerant rice varieties and adjusted planting calendars for lowland rice farms in Guma, Gwer and Gwer West.

ii. Provide seed-stock replacement support to rice farmers in these three LGAs following stream-overflow events, given rice's importance to the local and state economy.

iii. Explore accessible crop insurance schemes targeted at smallholder rice farmers in the Guma–Gwer–Gwer West belt.

Institutional Measures

Strengthen the funding, staffing and legislative footing of the Benue State Emergency Management Agency (SEMA), addressing the categories of institutional weakness identified in assessments of NEMA.

Establish a rural-flooding desk or unit within SEMA distinct from the urban Makurdi response, reflecting the different causes, timing and mitigation needs of tributary and stream flooding documented across the ten surveyed LGAs.

Commission a full, village-by-village damage register from the 50-village survey described earleir, to quantify losses precisely and prioritize the sequencing of the measures above.

Discussion: Aggregate Economic Implications

Considered together, the Makurdi and ten-LGA findings carry implications for how Benue State's aggregate flood losses should be understood and measured. Existing damage figures in the literature, namely the more than 7 million people affected, over 2 million displaced, and over 5,900 houses destroyed nationally in 2012, are drawn overwhelmingly from assessments centred on the Benue mainstem and major urban centres such as Makurdi. Because the tributary and stream-driven damage documented across the fifty villages sampled in Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha and Vandeikya operates through a different hydrological mechanism and a different, more dispersed geography, it is unlikely to be fully captured within assessments built around Benue River gauge data or Makurdi-focused damage surveys. This suggests that the true aggregate economic cost of flooding to Benue State, combining urban housing and business losses in Makurdi with farmland, rural housing and rice-crop losses across the ten surveyed LGAs, is plausibly understated in figures that report only mainstem-linked damage.

The rice-specific findings for Guma, Gwer and Gwer West illustrate this point concretely. Rice is not merely one crop among many in these LGAs; it is a defining feature of the local agricultural economy, particularly in Gwer West, recognized as one of the state's leading rice producers. A stream-overflow event that washes away standing rice in these three LGAs therefore represents a loss that is disproportionate, relative to its physical extent, to the area's economic dependence on that specific crop. Because this loss occurs through tributary and stream overflow rather than Benue mainstem flooding, it would not necessarily register in a damage assessment keyed to the Benue's own flood stage at Makurdi, reinforcing the case for LGA- and village-level monitoring alongside mainstem monitoring.

Policy Implications

Three policy implications follow directly from the two-pathway finding. First, flood-risk monitoring and early-warning infrastructure for Benue State should not be built solely around Benue River gauge stations at or near

Makurdi; a monitoring network that also tracks rainfall and stream levels within the ten LGAs surveyed would provide lead time for the tributary-driven flooding shown here to operate on a different, often faster timescale than mainstem flooding. Second, ecological and ecological-fund budget allocations for Benue State should be explicitly apportioned between mainstem-focused interventions (dredging, urban drainage, dam-release diplomacy) and tributary-focused interventions (stream clearance, bank stabilization, rural building setbacks), rather than treated as a single undifferentiated flood-mitigation budget line, since the two pathways compete for the same limited ecological funding but require materially different engineering responses. Third, because rice losses are geographically concentrated in Guma, Gwer and Gwer West, agricultural-recovery policy following flood events should include a rice-specific component, such as seed-stock replacement, flood-tolerant variety distribution, and, where feasible, insurance, rather than relying solely on generic crop-relief measures that may not match the particular vulnerability profile of the state's rice belt.

Suggestions for Further Research

i. A full quantitative damage register compiled from the 50-village field survey described earlier in the paper, assigning specific loss figures (farmland area, housing units, rice tonnage) to each of the ten LGAs surveyed, to move beyond those presented here.

ii. Hydrological mapping of the specific tributaries and streams responsible for flooding in each of the ten LGAs, to identify priority sites for channel clearance and bank stabilization.

iii. A comparative economic valuation of mainstem-linked losses in Makurdi versus tributary-linked losses across the ten surveyed LGAs, to test directly whether aggregate state-level damage figures understate the rural, tributary-driven component as this paper suggests.

iv. A dedicated study of rice-farming households in Guma, Gwer and Gwer West tracking flood exposure and recovery across multiple growing seasons, to establish the compounding effect of repeated rice losses on household income and food security.

v. An assessment of SEMA's rural-flooding response capacity specifically, parallel to Taiwo and Alaba's assessment of NEMA, to test whether the institution is organized to address tributary and stream flooding as distinct from its Makurdi-focused mainstem response.

Conclusion

Flooding has become an entrenched, recurring threat to the economy and population of Benue State, with historical episodes in 1969, 1988, 2012, 2018 and 2022 at the state level, and a denser sequence of urban flood events in Makurdi across 2012–2023. This paper's field survey of 50 villages across ten Local Government Areas, namely Gwer West, Guma, Gwer, Buruku, Gboko, Tarka, Kwande, Katsina-Ala, Konshisha and Vandeikya, extends the existing, largely Makurdi-focused literature by documenting a second, distinct flooding pathway: while Makurdi's damage is driven by Benue mainstem overflow affecting houses and businesses in the city, the ten surveyed LGAs experience flooding driven by tributary and stream overflow, washing away farms and causing houses to collapse, with rice specifically reported washed away in Guma, Gwer and Gwer West. Reducing the economic toll of flooding in Benue State will require recognizing and addressing both pathways on their own terms: mainstem dredging and cross-border dam-release coordination for Makurdi, and stream-channel management, building setbacks, village-level early warning and rice-

specific agricultural support for the ten LGAs surveyed. Without this pathway-specific approach, mitigation strategies calibrated to the better-documented Makurdi case risk leaving the rural, tributary-driven dimension of the state's flood burden inadequately addressed.

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