AN ASSESSMENT OF GOVERNMENT POLICY AND POLICIES ON FLOODING IN NIGERIA 2015-2023

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Abstract

Flooding remains one of the most persistent and destructive environmental challenges in Nigeria, resulting in loss of lives, displacement of communities, damage to property, and disruption of economic and social activities. This study provides a critical assessment of government policies and strategic responses to flooding in Nigeria between 2015 and 2023a period marked by increased frequency, intensity, and spatial spread of flood events, thus requiring thorough policy evaluation. The research adopts a qualitative desk-review approach, examining key policy documents such as the National Water Resources Bill, the National Emergency Management Agency (NEMA) Act, the National Flood Emergency Preparedness and Response Plan, and relevant sections of the National Climate Change Policy. It also analyzes budget allocations, implementation reports, and post-disaster needs assessments to evaluate how effective these frameworks have been in practice.Findings reveal a significant gap between policy formulation and actual implementation. While Nigeria has established various policies and early warning mechanisms, their effectiveness is limited by several challenges, including inadequate funding, weak coordination among federal, state, and local authorities, and a predominantly reactive approach that prioritizes post-disaster relief over preventive measures. Additional issues include insufficient infrastructure, limited community participation, and the lack of comprehensive integration of climate change adaptation into flood management strategies.Consequently, government responses are largely relief-oriented rather than focused on long-term resilience and sustainable mitigation. The study concludes that a fundamental shift in policy direction is necessary to better manage future flood risks. It recommends strengthening institutional capacity,

ensuring dedicated and sustained funding for flood management, enforcing urban planning and zoning regulations, promoting nature-based solutions, enhancing community-driven early warning systems, and fully integrating climate change adaptation into national development planning to build a more resilient Nigeria.

Introduction

Flooding is widely recognized as one of the most frequent, destructive, and economically disruptive natural hazards in Nigeria. During the annual rainy season, large portions of the country experience inundation, leading to significant loss of life, widespread destruction of homes, farmlands, and infrastructure, as well as the displacement of millions of people. The period from 2015 to 2023 has been particularly instructive, as reports from the National Emergency Management Agency (NEMA) and the United Nations highlight some of the most severe flood events in Nigeria's history, including the 2012 and 2022 disasters. These events resulted in hundreds of fatalities and displaced over 1.4 million individuals (NEMA, 2022; UN OCHA, 2022). The scale and recurrence of these floods have drawn increased attention to the effectiveness of government responses and existing policy frameworks.

This timeframe spanning the latter part of President Goodluck Jonathan's administration and the tenure of President MuhammaduBuhariprovides a useful basis for evaluating the consistency, evolution, and effectiveness of flood management strategies in Nigeria. A central concern is whether government approaches have transitioned from reactive, post-disaster interventions toward more proactive, integrated, and sustainable flood risk management systems.

Nigeria has established several policy instruments and institutional mechanisms to address flooding. These include the National Water Resources Policy, the National Emergency Management Policy, and the establishment of agencies such as the Nigeria Hydrological Services Agency (NIHSA), responsible for flood forecasting, and NEMA, which coordinates disaster response efforts. Additionally, Nigeria is a signatory to global agreements such as the Sendai Framework for Disaster Risk Reduction (2015–2030), which emphasizes risk prevention over emergency response. The National Disaster Risk Management Framework further outlines strategies for disaster mitigation (Salami et al., 2017).

Despite these efforts, a significant gap persists between policy design and actual implementation. The recurring nature of flood disasters suggests systemic shortcomings, including ineffective dissemination of early warning information, weak enforcement of urban planning regulations, inadequate investment in drainage and water management infrastructure, and an overreliance on reactive measures. Previous studies (Etuonovbe, 2011; Nkwunonwo et al., 2020) have similarly observed that existing frameworks are often fragmented and poorly executed.

This study, therefore, seeks to critically evaluate Nigeria's flood management policies between 2015 and 2023. It argues that although there have been improvements in forecasting capabilities and institutional development, the overall policy approach remains largely reactive. The persistence of severe flooding reflects deeper structural issues such as weak governance, corruption, institutional

inefficiency, poor inter-agency coordination, and limited integration of climate change adaptation into national planning processes. By analyzing policy documents, budgetary commitments, and outcomes of major flood events within the study period, the research aims to assess the effectiveness of government interventions and propose strategies for developing a more resilient and forward-looking flood risk management system in Nigeria.

Methodology

This study adopts a mixed-methods approach by integrating quantitative and qualitative data analysis to provide a comprehensive evaluation of flood management policies. The quantitative component focuses on identifying trends, patterns, and relationships between policy inputs and outcomes, such as government budget allocations and indicators of flood impacts. To complement this, qualitative analysis is employed to explain the underlying reasons behind observed numerical patterns. This involves the use of case studies and expert perspectives to explore how and why certain policy outcomes occur. The findings from both approaches are then synthesized to enable a more holistic and in-depth assessment. This research design is particularly suitable given the complex socio-environmental nature of flooding, where numerical data alone cannot fully capture policy effectiveness without considering governance structures, institutional capacity, and community participation.

The study draws on a wide range of data sources. Key policy documents include the National Water Policy (2016), the National Water Resources Bill, the National Emergency Management Agency (NEMA) Act, as well as state-level emergency management and environmental policies. Strategic planning materials such as the Annual Flood Outlooks (AFOs) produced by the Nigeria Hydrological Services Agency (NIHSA), alongside reports from the National Environmental Standards and Regulations Enforcement Agency (NESREA) and the Nigeria Meteorological Agency (NiMet), are also examined. In addition, government publications including budgetary allocations, appropriation acts from the Ministry of Finance, and reports from the Ministries of Water Resources and Environment areanalyzed. International perspectives are incorporated through reports on climate resilience and disaster management from organizations such as the World Bank, UNDP, and FAO.

In terms of strategic planning and response, the federal government introduced the National Strategic Plan on Flood Prevention and Management in May 2023. This initiative, developed through stakeholder consultations, outlines a coordinated approach to flood management. It led to the establishment of a National Flood Management Council tasked with harmonizing efforts across federal, state, and local levels, with emphasis on early warning systems, infrastructure improvement, and post-disaster recovery. The plan was largely a response to the devastating 2022 floods, aiming to strengthen flood risk mapping and enhance community resilience. Subsequently, in July 2023, a national response framework was implemented to address seasonal flooding, improving inter-agency coordination and preparedness measures. These efforts included prepositioning relief materials and intensifying monitoring of river levels, particularly in high-risk areas such as the Niger and Benue river basins.

However, assessments within this period reveal the absence of a unified national flood policy, resulting in fragmented and uncoordinated governance. While disaster management functions such as preparedness,

monitoring, and relief distribution are carried out by agencies like NEMA, their effectiveness is limited by overlapping responsibilities and weak policy enforcement mechanisms.

Building on existing humanitarian frameworks, the International Organization for Migration (IOM), in collaboration with partners, developed the Nigeria Crisis Response Plan (2024–2025). This initiative aligns with government strategies and prioritizes community awareness, early warning dissemination, and coordinated flood mitigation efforts. The plan targets over four million people across 34 states, addressing both the human and economic impacts of flooding, including agricultural losses. Additional efforts include partnerships with international organizations such as the Red Cross to strengthen flood warning systems and enhance adaptive capacity in response to increasing climate risks. At the state level, responses such as those implemented in Lagos State demonstrate alignment with the Sustainable Development Goals (SDGs), incorporating measures like green infrastructure development and public sensitization campaigns to improve flood resilience.

Strengths

Between 2023 and 2025, Nigeria's flood management approach shows a gradual transition toward proactive risk reduction. Building on the 2023 strategic framework, more recent initiatives incorporate innovative measures such as flood insurance schemes and community-based forecasting systems. The integration of advanced technologies including Geographic Information Systems (GIS) for spatial mapping and machine learning tools for predictive analysis has strengthened early warning capabilities. In addition, collaborations with international partners, including China and the International Rescue Committee (IRC), have contributed to improving technical capacity and overall resilience.

Humanitarian-Oriented Planning: Recent policy frameworks, particularly the 2025 Humanitarian Needs and Response Plan, place greater emphasis on addressing the broader social impacts of flooding. These include food insecurity, population displacement, and public health challenges. Such efforts are aligned with the Sustainable Development Goals (SDGs), reflecting a more comprehensive approach that links disaster response with long-term development objectives.

Improved Emergency Response: The response efforts of the National Emergency Management Agency (NEMA) during the 2025 flood events indicate notable progress in coordination and timeliness. Enhanced inter-agency collaboration and better preparedness have contributed to more effective emergency interventions, reducing the overall impact on affected populations.

Weaknesses

Policy Fragmentation: Nigeria's flood management framework is characterized by the absence of a single, comprehensive, and enforceable national policy. This has resulted in fragmented governance structures, unclear policy direction, and inconsistencies in implementation. Overlapping responsibilities among federal, state, and local agencies further reduce efficiency and hinder coordinated action.

Implementation Deficiencies: Despite the availability of early warning systems, the persistence of flood events including those recorded in 2025reveals significant shortcomings in implementation. Critical infrastructure, such as drainage systems and flood-resistant housing, remains inadequate. Additionally, broader economic challenges,

including currency devaluation, exacerbate vulnerabilities by limiting government capacity and reducing community resilience.

Gaps in Climate Change Adaptation: Nigeria has yet to develop and publish a comprehensive national adaptation plan, unlike many comparable countries facing similar climate risks. Although research highlights the importance of sustainable solutions such as permeable surfaces, improved drainage design, and rainwater harvesting systems these measures have not been widely adopted. This slow pace of implementation weakens the country's overall preparedness for climate-induced flooding.

Significance of the Study

Examining Nigerian government flood management policies between 2015 and 2023 is important for several reasons. First, it provides insight into the relationship between environmental governance, climate resilience, and sustainable development in a highly vulnerable context. Nigeria consistently ranks among countries with high exposure to flood risks, affecting millions of people annually. This period represents a critical phase in the country's shift toward more proactive strategies in response to increasing climate variability, offering valuable lessons on policy adaptation in resource-constrained environments.

From an academic perspective, the study contributes to key disciplines such as disaster risk management, public policy, and urban planning. It highlights important factors influencing resilience at the household level, including socio-economic conditions, while also emphasizing the growing role of data-driven tools in disaster preparedness and response.

Practically, the findings underscore the need for stronger policy coordination and implementation to reduce the frequency and severity of humanitarian crises. This is particularly relevant across Africa, where flooding continues to displace large populations each year. Furthermore, the study draws attention to issues of equity, emphasizing the need for policies that prioritize vulnerable groups, especially women and children, who are disproportionately affected by flood-related displacement.

Ultimately, continued research in this area can support evidence-based policymaking and advocacy for integrated flood management frameworks, with the potential to significantly reduce economic losses that often amount to hundreds of millions of dollars per flood event.

Is flood Natural or manmade?

Natural Causes of Flooding

Flooding is fundamentally a natural process arising from meteorological, hydrological, and geological factors. One of the most common causes is intense or prolonged rainfall, which can overwhelm rivers, streams, and drainage systems, resulting in widespread inundation. Severe weather events such as tropical storms and cyclones often intensify this effect by generating storm surges and coastal flooding.

In colder regions, rapid snowmelt during seasonal transitions can significantly increase river discharge, leading to overflow. Similarly, rivers may exceed their carrying capacity due to excessive water input from rainfall or melting snow, causing them to spill beyond their banks. Coastal flooding may also occur due to high tides, tsunamis, or hurricanes, which push large volumes of water inland. Additionally, geological processes such as landslides or glacial lake outbursts can obstruct river channels, creating temporary dams that may later collapse and trigger sudden downstream flooding.

Human-Induced Causes of Flooding

Human activities play a critical role in increasing both the likelihood and severity of flooding. Rapid urbanization, for instance, replaces natural land surfaces with impermeable materials like concrete and asphalt, reducing water infiltration and increasing surface runoff. When such development occurs in flood-prone areas without proper planning, the risk of flooding becomes significantly higher.

Deforestation is another major factor, as the removal of vegetation reduces the land's capacity to absorb rainfall, thereby increasing runoff into rivers and streams. In many urban areas, inadequate or poorly maintained drainage systems further worsen the situation, often leading to localized flooding during heavy rains.

Infrastructure failures, such as the collapse of dams or levees, can also result in sudden and catastrophic flooding. Furthermore, human-induced climate change has intensified extreme weather patterns, including heavier rainfall events and rising sea levels, which increase the frequency and magnitude of floods especially in low-lying coastal regions. Agricultural practices, such as excessive irrigation and land modification, can also disrupt natural water flow systems, contributing to flooding in certain areas.

Interaction of Natural and Human Factors

Flood events are often the result of a combination of natural processes and human activities. For example, heavy rainfall may not necessarily cause severe flooding in a well-managed environment; however, in areas with poor drainage infrastructure and extensive urban development, the same rainfall can lead to significant damage. Likewise, climate change largely driven by human activity can intensify natural hazards such as storms, thereby increasing the scale and impact of flooding events. This interaction highlights the need for integrated and sustainable flood management strategies.

Impacts of Flooding on Nigeria's Agricultural Sector (2015–2023)

Between 2015 and 2023, flooding remained a persistent challenge in Nigeria, driven by a combination of climatic changes, inadequate infrastructure, and the overflow of major rivers such as the Niger and Benue. The agricultural sector employing a large proportion of the population and contributing significantly to national economic output has been particularly vulnerable to these events.

Flooding during this period resulted in widespread destruction of farmlands, loss of crops and livestock, declining agricultural productivity, and disruption of food supply chains. These impacts contributed to increased food insecurity, economic hardship, and reduced livelihoods for millions of smallholder farmers. Regions most affected include parts of northern and central Nigeria, such as Benue, Kogi, Jigawa, Anambra, Bayelsa, and Delta States.

One of the major consequences has been the damage to crops and agricultural land. Floodwaters often wash away fertile topsoil while depositing sediments that reduce soil quality, making farmland unsuitable for cultivation in subsequent seasons. Staple crops including maize, rice, cassava, and yam have been particularly affected, with noticeable reductions in national output during flood-impacted years.

Livestock farming and aquaculture have also suffered considerable losses, with animals either perishing or being displaced, and fish farms destroyed. This has reduced access to protein

sources and negatively affected farmers' incomes.

Economically, flooding has resulted in substantial financial losses due to damaged assets, reduced agricultural production, and rising food prices. These factors have contributed to inflation and deepened poverty levels in affected communities.

From a food security perspective, the reduced availability and increased cost of food have heightened the risk of hunger and malnutrition. By 2023, millions of Nigerians were facing food insecurity linked to flood-related disruptions. Vulnerable groups, particularly rural households and women farmers, have been disproportionately impacted.

In the long term, repeated flooding has weakened the resilience of farming communities. Many farmers have been forced to reduce the size of their farms, change crop patterns, or abandon agriculture altogether. These trends pose serious challenges to sustainable development, particularly the achievement of global targets such as Zero Hunger (Sustainable Development Goal 2).

Impacts by Year and Period (2015–2023)

Due to inconsistencies in annual reporting, the impacts of flooding on Nigeria's agricultural sector are best understood by focusing on key years with relatively reliable data. Overall, between 2015 and 2023, flood events resulted in cumulative agricultural losses estimated in the tens of billions of US dollars, while directly and indirectly affecting over 100 million people nationwide.

2015–2017: During this period, flooding was relatively moderate but recurrent, particularly in northern Nigeria. In 2015, areas such as Yola and Numan experienced significant farmland inundation, leading to reduced agricultural output and socio-economic disruptions. By 2016, extreme weather conditions increased the vulnerability of farming households, with the likelihood of harvest failure rising noticeably above baseline levels. In high-risk regions, failure rates were substantially higher, although factors such as education appeared to improve household resilience. While precise economic losses were not fully documented, the cumulative effects contributed to persistent food insecurity.

2018–2019: Flooding intensified in 2018, affecting multiple states and severely damaging rice-producing areas as well as other staple crops. In 2019, flood events impacted approximately 4.6% of the population equivalent to about 13.6 million people. Agricultural losses were significant, with estimated damages reaching hundreds of millions of dollars. Crop productivity declined sharply in affected areas, with losses far exceeding those caused by other environmental stressors such as drought or pests. On average, national harvest reductions linked to climatic events remained notable. Gender disparities were also evident, as farms managed by women experienced higher levels of loss compared to others.

2020–2021: Flooding during this period continued to degrade agricultural land and reduce productivity. States such as Jigawa recorded substantial declines in crop yields, while aquaculture activities were heavily affected, particularly in regions like Rivers State where fish farms suffered extensive damage. Broader consequences included rising food prices and increasing levels of malnutrition, especially in vulnerable regions such as Borno State.

2022: The year 2022 marked the most severe flooding event within the study period. Floods

affected the majority of Nigerian states and led to the destruction of hundreds of thousands of hectares of farmland. A very high proportion of farming households experienced losses, with staple crops such as cassava and maize being the most impacted. Livestock and fisheries sectors also recorded widespread damage.

The economic consequences were substantial, with total direct losses estimated in the range of several billions of US dollars, a significant portion of which was attributed to agriculture. Food systems were severely disrupted, leading to increased food prices and reduced access to nutritious food for a large segment of the population. Rural communities were disproportionately affected, with certain states experiencing near-total impact levels. Overall, the scale of destruction highlighted the vulnerability of Nigeria's agricultural sector to extreme flooding events.

2023: In 2023, the effects of the previous year's floods continued to influence agricultural productivity and food security. Many farmers, burdened by debt and previous losses, reduced their planting activities, thereby limiting food production. Flooding persisted in several regions, causing additional damage to crops and livestock. Aquaculture also remained highly vulnerable, further affecting livelihoods and food supply. As a result, food insecurity remained a major concern, with millions of Nigerians at risk of hunger.

Cumulative and Broader Impacts (2015-2023)

Impact Category	Estimated Scale	Examples
Affected Population	145-170 million (including indirect effects across Africa, with Nigeria as a major contributor)	13.6 million in 2019 alone; 56.4% of households in 2022 flood zones.
Economic Losses	$1 billion+ annually (past two decades average); $352M in 2019; $6.68B median in 2022 (total, ag-heavy)	Crop losses undervalued in macro data by billions; fish farms saw profitability drops.
Land/Farmland Affected	569,000 ha in 2022; 12% of staple crop areas in major events	Inundation in 51-56% of farmlands in sample areas (e.g., Adamawa).
Crop Yield Reduction	62% per plot; 3.19% national harvest loss in 2019	Maize, rice, cassava hit; 88-98% damages in some zones.
Food Security	25M hungry by 2023; malnutrition spikes	Price hikes (19.9% in 2022); reduced nutritious food access (84.9%).

Overview of Flooding in Nigeria (2015–2025)

Over the past decade, flooding has emerged as one of the most frequent and intensifying natural hazards in Nigeria. This trend has been driven by a combination of factors, including climate change, rapid urbanization, weak land-use planning, and ineffective water resource management. Key institutions, particularly the Federal Ministry of Water Resources and its agenciessuch as the Nigeria Hydrological Services Agency (NIHSA)play a central role in shaping national water policy, including dam operations, river basin management, and flood control strategies.

Despite these institutional frameworks, the implementation of Integrated Water Resources Management (IWRM) has faced significant challenges. In practice, gaps in coordination and capacity have often undermined its effectiveness. For example, uncoordinated releases of water from dams, insufficient investment in water storage and drainage infrastructure, and limited cross-border collaboration particularly with neighboring countries such as Cameroon regarding the LagdoDam have contributed to increased flood risks downstream.

Since 2015, recurrent flooding has caused widespread destruction across Nigeria, exposing critical weaknesses in water governance systems. Existing policies have not adequately addressed the vulnerabilities associated with major river basins, especially those of the Niger and Benue rivers, which remain highly prone to seasonal flooding. These structural deficiencies highlight the need for more integrated and adaptive approaches to flood management.

Flooding Events (2015–2025)

Between 2015 and 2025, Nigeria experienced several major flood events that resulted in significant loss of life, large-scale displacement, and extensive damage to infrastructure and livelihoods. Available data indicate a clear upward trend in both the frequency and severity of these events.

This pattern is partly attributable to increasingly unpredictable rainfall associated with climate variability, as well as challenges in water management practices, including poorly regulated dam releases. Flood impacts have been particularly severe in regions located along major river systems and in low-lying urban areas with inadequate drainage infrastructure.

Overview of Flooding in Nigeria (2015-2025)

Over the last ten years, flooding has been a frequent and increasing natural disaster in Nigeria, which has been increased by the emergence of climate change, urbanisation, poor land-use planning and management of water resources. The federal water ministry together with FMI agencies such as the Nigeria Hydrological Services Agency (NIHSA) are in the core of the water policy in the country such as the dams, river basin management, and flood control measures. But there are difficulties in executing the integrated water resources management (IWRM) that have in most instances increased the chances of flooding instead of diminishing them. This comprises problems such as the release of dam water in an uncoordinated manner, the water storage and drain facilities are not adequate, as well as a lack of transboundary collaboration (e.g. with Cameroon on the Lagdo Dam, as a source of downstream flooding in Nigeria). Since 2015, floods have led to massive destruction, and the

policies of water resources in the country have not properly covered the vulnerabilities in river basins, such as the Niger and Benue rivers.

Flooding Events (2015-2025)

The major flooding episodes, highlighting deaths, displacements, and affected regions. Data shows an increasing trend in severity, linked partly to erratic rainfall patterns and mismanaged water releases.

Year	Key Events and Impacts	Deaths	Displacements/Affected People	Regions Primarily Affected
2015	Widespread seasonal floods due to heavy rains and river overflows; poor drainage systems worsened impacts.	53	100,000 displaced	Northern and central states (e.g., Benue, Kogi).
2016	Floods from Niger River basin overflows; inadequate early warning systems contributed.	38	92,000 displaced	Similar to 2015, with focus on agricultural areas.
2017	Intensified rains led to urban and rural flooding; national water management gaps in reservoir control noted.	Unknown	250,000 affected	Widespread, including Lagos and northern states.
2018	Major national floods; linked to Lagdo Dam releases and climate variability.	Over 200	1.9 million affected	12 states, including Kogi and Delta.
2019-2021	Annual floods with varying intensity; health crises from contaminated water sources.	Varies (e.g., 30+ in 2020)	Hundreds of thousands annually	Northern regions dominant.
2022	Worst floods in a decade; over 1.3 million displaced due to extreme rainfall and dam overflows. Economic losses estimated at NGN 2.6 trillion.	Over 600	1.3 million displaced; 2.5 million affected	33 states, worst in Anambra, Bayelsa, and Jigawa.
2023-2024	Persistent seasonal floods; increased focus on climate adaptation but limited implementation.	100+ annually	Millions affected cumulatively	Urban centers like Lagos and rural north.
2025	Series of floods starting April; heavy May-June rains caused catastrophic events in Mokwa (Niger State). Alerts for further flooding in August due to predicted heavy rains.	Over 200 (as of June)	Over 3,000 displaced in May alone; 2.5 million+ at risk nationwide	Niger, Borno, and western states.

These events underscore how national water resources management has often been reactive rather than proactive, with delays in updating the National Water Resources Master Plan contributing to ongoing risks.

Flooding Event and Response (2023): In 2023, flooding remained a persistent national challenge, resulting in over 100 fatalities and placing millions of people at risk across the country. Approximately 32 states were identified as high-risk areas. In response, the National Emergency Management Agency (NEMA) issued its annual flood outlook and provided early warnings, particularly regarding water releases from the Lagdo Dam. The agency also coordinated relief distribution in affected states such as Gombe and Kogi.

While early warnings contributed to timely evacuations in some communities, the overall impact on livelihoods especiallyagriculture remained significant. For instance, notable economic losses were recorded in states like Nasarawa. These outcomes have led to increased calls for stronger accountability and more effective implementation of flood management measures at the state level.

Role of NEMA in Disaster Management: Established under the NEMA Act, the National Emergency Management Agency is mandated to oversee all phases of disaster management, including prevention, preparedness, response, and recovery. Between 2015 and 2023, the agency played several key roles in addressing flood-related disasters.

In terms of preparedness, NEMA regularly issued flood outlooks and early warnings to inform government agencies and the public about potential risks. During emergencies, the agency coordinated response efforts and distributed relief materials such as food supplies and financial support to affected populations. It also worked closely with federal ministries, state governments, and other stakeholders to strengthen disaster management policies, including updates to the National Disaster Risk Management Framework.

Additionally, NEMA utilized digital platforms and media channels to disseminate real-time information and raise public awareness about flood risks and safety measures.

Impacts of NEMA's Activities (2015–2023): The interventions of NEMA during this period produced mixed outcomes, reflecting both achievements and limitations in disaster management.

Economic Impacts: NEMA's relief efforts helped to reduce the severity of losses in some affected communities by providing timely assistance, particularly during major flood events. However, the overall economic impact of flooding remained substantial, with damages reaching billions of dollars in severe years such as 2022. While interventions alleviated immediate hardships, they were insufficient to prevent large-scale economic disruption.

Social and Health Impacts: The agency played a critical role in supporting displaced populations, assisting millions of affected individuals through relief distribution and emergency services. These efforts helped reduce the risk of severe food shortages and malnutrition. Nevertheless, challenges such as the spread of waterborne diseases persisted, largely due to inadequate long-term mitigation strategies and poor sanitation conditions in flood-affected areas.

Environmental Impacts: Through awareness campaigns and policy advocacy, NEMA contributed to promoting environmental resilience. However, recurring flood events continued to cause significant environmental

degradation, including soil erosion and water pollution. Efforts to improve land-use practices and environmental management have not been fully realized in practice.

Policy and Development Impacts: NEMA's activities have supported national and global development goals related to disaster risk reduction and resilience. Despite this, there have been ongoing concerns regarding institutional effectiveness, including calls for reforms to strengthen the agency's operational capacity. Issues such as mismanagement of funds at subnational levels have also limited the overall impact of disaster management efforts.

Role of NIHSA and NEMA in Flood Management: Flood management in Nigeria is primarily coordinated by two key agencies: the Nigeria Hydrological Services Agency (NIHSA) and the National Emergency Management Agency (NEMA). Both institutions are funded through annual federal budget allocations and play complementary roles within the disaster management framework.

NIHSA is responsible for collecting, analyzing, and disseminating hydrological data to support flood forecasting and early warning systems. Its work is essential for predicting flood risks and informing preventive measures. In contrast, NEMA focuses on disaster preparedness, emergency response, and post-disaster recovery, including the distribution of relief materials to affected communities.

An analysis of budgetary trends between 2015 and 2023 suggests a disproportionate emphasis on reactive spending. Funding allocations tend to increase significantly following major flood events, such as those experienced in 2012 and 2022, reflecting a focus on emergency response rather than long-term risk reduction. In comparison, investments in forecasting, prevention, and mitigation primarily under NIHSAhave remained relatively limited.

Budgetary Allocation (2015–2023): Budgetary data for NIHSA and NEMA are derived from the Appropriation Acts of the Federal Republic of Nigeria (2015–2023), as compiled by the Budget Office of the Federation. These records provide insight into government spending patterns on flood management, highlighting trends in resource allocation between emergency response and

Year	Events and Flood Impacts	NEMA's Key Actions	Outcomes and Criticisms
2015	Seasonal floods affected northern and central states; 53 deaths, 100,000 displaced.	Issued early warnings; distributed relief materials to affected communities.	Mitigated immediate needs but highlighted gaps in infrastructure preparedness.
2016	Niger River overflows; 38 deaths, 92,000 displaced.	Coordinated with SEMAs for evacuation and aid distribution.	Limited long-term recovery; agricultural losses persisted.
2017	Intensified urban/rural floods; 250,000 affected.	Enhanced monitoring and relief efforts in Lagos and northern areas.	Health crises (e.g., cholera) surged post-flood due to inadequate follow-up.
2018	Major floods from Lagdo Dam releases; over 200 deaths, 1.9 million affected in 12 states.	Activated emergency operations; provided food and shelter to IDPs.	Effective short-term response but criticized for poor coordination with states.
2019-2021	Annual floods with health impacts; 30+ deaths in 2020,	Social media campaigns for awareness; distributed	Reduced displacement in some areas, but waterborne diseases

	hundreds of thousands affected yearly.		aid amid COVID-19 overlaps.	increased.
2022	Decade's worst floods; over 600 deaths, 1.3 million displaced, NGN 2.6 trillion losses across 33 states.		Issued alerts on Lagdo Dam; flagged off relief in states like Jigawa; coordinated with NEC for palliatives.	Aided millions but faced backlash for unpreparedness and fund mismanagement by states.
Year	NIHSA Allocation (₦)	NEMA Allocation (₦)	Total (₦)	Contextual Events
2015	~ 1.84 Billion	~ 5.45 Billion	~ 7.29 Billion	Post-2012 flood memory fading. Relatively stable year.
2016	~ 1.90 Billion	~ 5.67 Billion	~ 7.57 Billion	Economic recession. Budget focused on core recurrent expenditure.
2017	~ 2.08 Billion	~ 5.79 Billion	~ 7.87 Billion	Moderate flooding reported in several states.
2018	~ 2.30 Billion	~ 6.15 Billion	~ 8.45 Billion	The National Water Resources Bill was proposed.
2019	2.52 Billion	6.83 Billion	9.35 Billion	Significant flooding affected many states, prompting criticism of preparedness.
2020	3.21 Billion	19.72 Billion	22.93 Billion	COVID-19 Impact. NEMA's budget skyrocketed due to its role in pandemic response and palliatives, not solely flooding.
2021	3.85 Billion	24.47 Billion	28.32 Billion	Continuation of high allocation for pandemic-related activities.
2022	4.50 Billion	29.61 Billion	34.11 Billion	Devastating nationwide floods ("worst in a decade") occurred in this year, killing over 600 people.
2023	5.20 Billion	36.03 Billion	41.23 Billion	Allocation passed in the wake of the catastrophic 2022 floods, leading to a major boost, especially for NEMA's response capabilities.

Technological Approaches to Mitigating Flooding in Nigeria

How it worksSatellites such as NASA's MODIS and the European Space Agency's Sentinel series can monitor weather patterns, soil moisture levels, and river basin water levels remotely, eliminating the need for on-site observation.Application in NigeriaAgencies like the Nigeria Hydrological Services Agency (NIHSA) and the National Emergency Management Agency (NEMA) can utilize these data to anticipate river overflows and potential flood zones before they occur, enabling proactive flood preparedness and early warning dissemination.

Hydrological and Weather Modelling Software

How it worksadvanced supercomputers run complex models using data from satellites, weather stations, and river gauges. These models simulate rainfall patterns, forecast river flows, and predict potential inundation areas.Application in Nigeria The outputs of these models can generate highly detailed flood hazard maps for cities such as Lagos, Port Harcourt, and Makurdi, highlighting neighbourhoods at risk and the expected flood depth, aiding urban planning and emergency response.

Urban Planning and Infrastructure: Geographic Information Systems (GIS): GIS integrates data on topography, land use, population density, infrastructure, and historical flood events.Application in NigeriaUrban planners can use GIS to identify natural drainage routes, avoid construction on floodplains, and strategically locate infrastructure such as roads, bridges, and drainage systems. This improves city resilience to flooding and reduces water logging risks.

Response and Rescue Operations: Unmanned Aerial Vehicles (Drones): Equipped with thermal cameras, drones can locate stranded individuals in flooded areas more safely and efficiently than traditional rescue methods.Damage AssessmentDrones can rapidly assess flood severity; detect damaged levees or clogged drains, and survey infrastructure destruction, providing critical information for resource allocation and emergency management.

Post-Flood Recovery and Analysis

Block chain for Aid Distribution: Block chain technology enables transparent tracking of disaster relief funds and material distribution, reducing the risk of corruption and ensuring aid reaches intended beneficiaries.

Data Analytics: Analysis of data collected before, during, and after flood events helps evaluate the effectiveness of response measures, improve predictive models, and enhance preparedness for subsequent flood seasons.

Key Findings

i. **Institutional Challenges:** Fragmentation, insufficient funding, and poor coordination among agencies hinder the development of a robust flood policy framework. The absence of a centralized authority often leads to overlapping responsibilities and reactive strategies rather than proactive management (Ezeomedo&Igbokwe, 2021).

ii. **Reactive Government Approach:** Government interventions have largely focused on immediate relief during disasters rather than long-term mitigation. Emergency resources, including food and blankets provided by NEMA and state emergency management agencies (SEMAs), have been prioritized over investments in durable infrastructure such as dams, dredging, and modern drainage systems (Sholademi, 2022).

iii. **Infrastructure and Environmental Shortcomings:** Rapid urbanization has outpaced the development of effective drainage systems. Many drains are congested with solid waste, reflecting poor urban planning and weak enforcement of environmental regulations (Nkwunonwo et al., 2020).

Discussion

Between 2015 and 2023, Nigeria experienced increasingly severe and frequent flooding events, with far-reaching socio-economic, environmental, and humanitarian consequences. The country's vulnerability to climate change highlights the urgent need for enhanced water management systems and urban planning policies.

i. **2015–2017:** Recurrent floods affected Niger Delta and central Nigeria, as well as communities along the Niger and Benue river basins, causing displacement and farmland damage.

ii. **2018:** Flooding across 12 states displaced hundreds of thousands in over 100 local government areas (NEMA, 2018).

iii. **2019–2020:** Seasonal floods continued, severely affecting states like Kebbi, Anambra, and Bayelsa.

iv. **2022 – Benchmark Flood:** The most catastrophic in a decade, impacting over 4.5 million people, killing more than 600, and displacing 1.4 million. Over 569,000 hectares of agricultural land were inundated, aggravating food insecurity (NEMA, 2022; UNICEF, 2022).

v. **2023:** Flooding persisted, particularly in Adamawa State, where sudden Lagdo Dam releases from Cameroon combined with heavy rainfall to create widespread inundation.

Conclusion

Nigeria faces a recurring cycle of extreme weather events, exacerbated by climate change and amplified by human-induced vulnerabilities, as evidenced by the persistent flooding from 2015 to 2023. The catastrophic floods of 2022 served as a stark reminder of the country's exposure to hydrological hazards and the high costs of reactive disaster management.

While natural processes such as rainfall intensity, river overflows, and geological conditions play a significant role in flood occurrence, human factorsincluding rapid urbanization, deforestation, poor land-use planning, and climate changesubstantially influence the frequency, severity, and impacts of floods. Effective flood management must therefore address both natural and human-induced drivers through comprehensive planning, resilient infrastructure, and environmental conservation.

Budgetary allocations from 2015 to 2023 indicate chronic under-investment in preventive measures, with resources heavily skewed toward post-disaster response. Although recent funding trends have improved, a persistent imbalance between NIHSA (mitigation-focused) and NEMA (response-focused) allocations poses a major challenge to achieving sustainable and proactive flood management in Nigeria.

Recommendations

Based on the analysis of flood management in Nigeria, the following strategic actions are proposed:

i. **Mandatory Preparedness Protocols:** The federal government should collaborate with states to develop and fund pre-season preparedness plans based on NIHSA's flood outlooks. These plans should include pre-positioning relief materials, mapping evacuation routes and shelters, and conducting community drills.

ii. **Grassroots Communication:** Warning systems should be decentralized through local governments, traditional authorities, and community networks. Messaging should leverage SMS alerts in local languages, community radio, and other locally accessible channels to ensure timely and inclusive dissemination of information.

iii. **National Water Resources Bill:** Pass and implement a robust, consensus-driven bill to enable integrated basin-wide water management. This should include coordination for dam operations between Nigeria and transboundary partners such as Cameroon.

iv. **Urban Planning Enforcement:** State governments must demonstrate political will to enforce zoning laws, demolish illegal structures obstructing drainage systems, and invest in sustainable urban drainage solutions (SUDS) to prevent urban flooding.

v. **Grey Infrastructure:** Prioritize the dredging and maintenance of major rivers and tributaries, such as the Niger and Benue, construct retention basins and levees in high-risk areas, and ensure regular clearance of urban drainage systems.

vi. **Green Infrastructure:** Scale up watershed management initiatives, including reforestation programs in upper river basins (e.g., Jos Plateau, Adamawa Highlands), wetland restoration to absorb floodwaters, and the promotion of climate-smart agricultural practices to improve soil retention and reduce runoff.These recommendations aim to shift Nigeria from a predominantly reactive flood management approach toward a proactive, integrated, and sustainable system, enhancing resilience, reducing economic losses, and safeguarding vulnerable communities.

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