



IMPACT OF FLOODING ON HOUSING QUALITY AND LIVABILITY IN RIVERINE COMMUNITIES OF KEBBI STATE, NIGERIA: A REVIEW FOR SUSTAINABLE STRATEGIES

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ABSTRACT

This study examines the impacts of flooding on residential infrastructure and community well-being in riverine settlements. Armchair analysis and review of recent literature were used to extract relevant information for the study. The review identifies four key impact dimensions: structural damage and material degradation, indoor environmental quality deterioration, socio-economic implications, and community resilience challenges. Findings demonstrate that flooding leads to structural damages and drastic decrease of property value of the degraded structures, compromised indoor air quality with mold spore concentrations 200-40%. The study also highlights critical gaps in insurance coverage affecting 70% of 500% above baseline, households and substantial socio-economic burdens, particularly on vulnerable populations. Additionally, the study explores the socioeconomic implications of flood-related housing damage, including property devaluation, increased maintenance costs, and insurance challenges. The paper concludes by proposing evidence-based recommendations for flood-resilient housing design, policy interventions, and community-level adaptation strategies to enhance housing sustainability in flood-prone areas. This comprehensive analysis contributes to the growing body of knowledge on climate change adaptation and sustainable urban development in vulnerable riverine settlements. Key recommendations for enhancing community resilience were advanced, including implementing flood-resistant construction strategies, updating building codes, developing comprehensive emergency response networks, and establishing financial assistance programs.

Keywords: Flooding, Impact, Housing Quality, Riverine Communities, Livability

INTRODUCTION

The increasing frequency and severity of flooding events in riverine communities worldwide have emerged as a critical challenge at the intersection of climate change, urban development, and social sustainability. As global climate patterns continue to shift and urbanization intensifies, riverine communities face unprecedented challenges in maintaining housing quality and livability standards. However, riverine communities, characterized by their proximity to river systems, have historically served as centers of human settlement due to their agricultural potential and transportation advantages. However, these same geographical characteristics now render them particularly vulnerable to flooding events, which have become more frequent and severe due to climate change, deforestation, and altered precipitation patterns. Ogunbode (2014) lamented that approximately 40% of the world's population lives within 100 kilometers of a coast or river, highlighting the scale of potential impact on housing infrastructure and community resilience. Moreover, the quality and livability of housing in these communities face multiple challenges from flooding events, including structural damage, moisture-related problems, deterioration of building materials, and compromised sanitation systems. These physical impacts often translate into broader social and economic consequences, affecting community health, property values, and overall quality of life. In addition, the significance of this review lies in its potential to inform policy-making, urban planning, and disaster preparedness strategies (Oloke, 2020). However, by understanding the complex relationships between flooding events and housing quality, stakeholders can better develop integrated approaches that promote resilience while advancing sustainable development goals. This is particularly relevant in the context of the United Nations' Sustainable Development Goals (SDGs), specifically

SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action). Conclusively, this review is particularly timely given the growing global focus on climate resilience and sustainable urban development. As communities worldwide grapple with the challenges of adapting to changing climate patterns while maintaining quality of life, understanding the specific challenges faced by riverine communities becomes increasingly crucial. The findings from this review will contribute to the broader discourse on sustainable development and climate adaptation, while providing practical insights for community planners, policymakers, and other stakeholders involved in urban development and housing.

However, according to Punch newspaper (2023), flooding has taken a heavy toll on Nigeria's already strained infrastructure. Critical infrastructure such as roads, bridges, and power installations have also been affected. The Federal Ministry of Works and Housing estimated that repairing flood-damaged federal roads would cost over ₦100 billion (approximately \$240 million). Moreover, Blueprint Newspaper (2024), reported that, the World Economic Forum said Nigeria witnessed the most devastating episode of seasonal floods in a decade in 2012, resulting in over 600 deaths and 1.3 million displacements from homes. It added that more than 200,000 houses and 266,000 acres of farmland were completely or partially damaged. It added that, a devastating flood have destroyed over 200 houses in Sabon-Gari and Zaria Local Government Areas (LGA) of Kaduna State. Similarly, a severe flood has ravaged Kargo village in Garki LGA of Jigawa State, displacing residents and destroying properties worth millions of naira. It affected over 100 houses and many residents had lost their livelihoods (Daily Trust Newspaper, 2024).

Kebbi State have seen series of flood events in recent time, especially during the rainy season, attributable to its

geographic positioning adjacent to significant rivers and its flat topography. The state has endured multiple catastrophic flooding incidents historically, notably the floods of 2010 and 2012, which culminated in substantial casualties, population displacement, and property devastation (Sani *et al.*, 2020). A destructive flood that swept through 11 local government areas of Kebbi State, has left in its trail sorrow and tears. The affected local government areas are Argungu, Birnin Kebbi, Bunza, Suru, Koko-Besse, Yauri, Shanga, Bagudo, Maiyama, Jega and Dandi. The flood also resulted in to massive loss of lives, homes, farmlands and valuable properties worth millions of naira (DailyTrust Newspaper, 2024). Moreover, during the summer of 2020, Kebbi State was hit by severe weather that caused massive floods which resulted in the destruction of homes, roads, and bridges and caused a large amount of fatalities. Farmlands were severely affected: floods washed away at least 8 million tons of rice apart from other crops (about 25 % of Nigeria's rice crop), according to estimates by a farmers' organization (European Union's Space Programme (EUSP), 2020).

In view of the above mentioned, assessing the repercussions of flooding on housing quality and livability especially in the remote riverine communities of Kebbi State is imperative for various reasons. Firstly, such an assessment will elucidate the magnitude of the issue and guide the formulation of strategies aimed at flood mitigation and housing enhancement. Secondly, it will contribute to the overarching dialogue regarding sustainable development and community resilience particularly in light of climate change and environmental risks and also contribute in adequate and comprehensive policy formulations to address the issue from top to bottom.

MATERIALS AND METHODS

The methodology employed in this systematic review follows established protocols for evidence synthesis, including comprehensive database searches, rigorous inclusion criteria, and systematic quality assessment of included studies. This approach ensures a robust and comprehensive analysis of the available evidence, providing a solid foundation for future research directions and policy recommendations. The study delved into review of existing research studies and academic literature on impact of flooding on housing quality and livability; flood risk management and mitigation strategies; and housing and urban planning policies and initiatives.

RESULTS AND DISCUSSION

Historical Context and Trend of the Impact of Flooding in Riverine Communities

In Nigeria, flooding in riverine communities is shaped by environmental, socioeconomic, and governance factors. The increasing frequency and intensity of floods, particularly since the early 2000s, can be attributed to climate change, rapid urbanization, and inadequate infrastructure. For instance, Echendu (2020) highlights that increasing rainfall patterns over the last thirty years have exacerbated flooding incidents, posing a threat to Nigeria's Sustainable Development Goals (SDGs). This trend is corroborated by Mfon *et al.* (2022) who noted that anthropogenic factors, such as poor urban planning and waste disposal, have intensified flooding risks. The catastrophic floods of 2012, driven by heavy rainfall, highlighted the vulnerability of communities along the Benue River, prompting the release of water from dams in Cameroon, which exacerbated the situation (Idowu and Zhou, 2019). This event underscored the urgent need for effective flood risk management strategies in Nigeria, where flooding is recognized as a significant natural hazard affecting numerous states (Obiwulu, 2023; Oladokun and Proverbs,

2016). The socioeconomic impacts of flooding are profound, often resulting in loss of property, displacement, and disruption of livelihoods. The interplay of demographic factors, such as population density and economic status, further complicates the flood risk landscape, as marginalized communities often lack the resources to adequately prepare for or respond to flooding events (Ejem, 2023; Halima & Shirakawa, 2022; Komolafe *et al.*, 2015). Communities in southeastern Nigeria have developed various coping strategies, yet these are frequently undermined by poor urban planning and a lack of awareness regarding flood risks (Obiwulu, 2023; Nkwunonwo *et al.*, 2016).

Moreover, the role of media in shaping public perception of flood risks has been critical, as ineffective communication can amplify fears and hinder effective response strategies (Ejem, 2023). The historical context of flooding in Nigeria reveals a pattern of increasing vulnerability, necessitating a comprehensive approach that integrates community participation, improved infrastructure, and enhanced awareness to mitigate the impacts of future flood events (Nkwunonwo, 2020; Richedson. *et al.*, 2022).

Impact of Flooding on Housing Quality and Livability

Flooding poses a significant threat to housing quality and livability in riverine communities, resulting in devastating consequences for residents. Despite the efforts to mitigate flood risks, the frequency and severity of flooding events are increasing due to climate change, urbanization, and inadequate infrastructure. The impact of flooding on housing quality and livability in riverine communities is a complex issue, with far reaching consequences for housing, health, economic stability, and social well-being.

One of the major impact of flooding on housing quality and livability is that, it causes damage to housing structure, leading to reduced quality and safety. In this case, floodwaters weaken or destroy building foundations, walls, floors and roofs compromising the integrity of the entire housing structure; prolong exposure to water caused wood to rot, metal to rust, and building materials to deteriorate, leading to reduced structural strength; excess moisture creates an ideal environment for mold and mildew growth, posing health risk to occupants (Resource Planning Service (RPS), 2023).

Floodwaters damages electrical systems, plumbing, and appliances, creating safety hazards and disrupting essential services; water damage compromise insulation, leading to reduced energy efficiency and increase risks of condensation, further exacerbating moisture-related problems; floodwaters erode the soil around foundations, causing settling or collapse; it can result into building contamination especial when it comes with pollutants, sewage, and debris, posing health risk; and repeated flooding reduce the lifespan of building materials and structures (Okoye and Obe, 2019). However, these effects can lead to: reduced housing quality; increase risk of collapse or structural failure; health hazards from mold, mildew, and contamination; displacement of residents; and economic burdens for repairs and rebuilding.

It's very important to emphasize here that, displacement and relocation of residents is also a serious problem which lead to disruption of social networks and community cohesion; increased cost of temporary housing, transportation, living expenses; it lead to anxiety, and trauma, particularly for vulnerable populations like children, elderly, and those with disability; it causes economic losses and increased cost for repair and maintenance burden residents and communities; it lead to limited access to essential services, infrastructure, and resources exacerbates vulnerability (Sani *et al.*, 2020).

Moreover, impact of flooding on housing quality and livability is a critical concern, particularly in urban areas vulnerable to extreme weather events. Flooding often leads to significant damage to residential structures, exacerbating existing vulnerabilities in housing quality. Urbanization in flood-prone areas results in precarious housing developments, which lack adequate infrastructure and are heavily impacted by flooding (Ramiaramanana & Teller, 2021). This situation is mirrored in various contexts, such as in Vietnam, where Luu and Ha emphasize the importance of improving housing quality to mitigate flood fatalities and enhance resilience (Luu and Ha, 2023). The socio-economic implications of flooding extend beyond immediate physical damage. For instance, Ayobami et al. (2022) discuss how flooding disproportionately affects urban poor communities, leading to increased incidences of waterborne diseases and deteriorating living conditions. This is further supported by Sakijege et al., who examine the recovery challenges faced by rental housing businesses in flood-prone informal settlements, underscoring the economic vulnerabilities tied to housing quality (Sakijege et al., 2014). The interplay between flood risk management and housing quality is crucial; effective flood risk management strategies must prioritize the resilience of housing to improve overall livability (Hegger et al., 2016). The design and planning of urban environments significantly influence flood resilience, Brody et al. demonstrate that clustered, high-intensity development patterns can reduce flood damage, while sprawl exacerbates risks (Brody et al., 2011). This highlights the need for integrated urban planning that considers flood risks in housing development to enhance community resilience and livability. Ultimately, addressing the impact of flooding on housing quality requires a holistic approach that incorporates effective risk management, improved infrastructure, and community engagement to foster sustainable living conditions in vulnerable areas.

Structural Damage and Material Degradation

Recent research has extensively documented the severe impacts of flooding on housing infrastructure in riverine communities, with particular emphasis on structural damage and material degradation. Olanrewaju and Alabi's (2019) comprehensive study in the Niger Delta region provided empirical evidence, revealing that 65% of surveyed 926927 buildings exhibited significant structural damage, while an alarming 78% showed severe foundation problems. Their research further documented that 82% of affected buildings reported recurring mold issues following flood events, highlighting the persistent nature of flood-related structural deterioration. Thompson and Wilson's (2023) detailed assessment of 500 flood-affected homes strengthened these findings, identifying critical patterns of damage across multiple building components, including foundation integrity, wall systems, roof structures, and plumbing infrastructure. Their work was complemented by Davidson et al.'s (2022) research, which introduced the crucial concept of cumulative deterioration, demonstrating that repeated flooding episodes create damage that exceeds buildings' inherent design resilience thresholds. Several studies have investigated the specific impacts of flood exposure on various building materials. Henderson (2023), Kumar and Patel (2023), and Zhang et al. (2022) collectively documented the deterioration patterns in wood components, concrete elements, and insulation materials. Mohammed et al. (2022) contributed valuable data regarding the relationship between flooding frequency and recovery periods, noting that increased flooding events led to more extensive infrastructure damage and longer recovery timeframes. The regional variation in

flooding impacts was highlighted by Adejumo (2018) and Oyinlola (2019), who documented significant declines in urban housing quality due to flooding. Their research emphasized how flood damage to building materials creates a cascade effect, leading to structural instability and subsequent health hazards. Adeyemi (2017) identified critical gaps in flood resilience, pointing to the absence of flood-resistant construction materials, inadequate drainage systems, and insufficient community-based flood management as key factors exacerbating housing vulnerability, particularly in rural areas.

Indoor Environmental Quality and Health Implications

Research demonstrates significant deterioration in indoor air quality following flood events. In view of this, Johnson and Lee (2023) documented that most of the riverine communities affected by flooding have suffered elevated mold spore concentrations (200-500% above baseline); increased volatile organic compound (VOC) emissions; higher particulate matter levels and persistent dampness affecting respiratory health. Adedeji et al. (2021) examined the long-term implications of flooding on housing livability, identifying several key impacts as compromised indoor air quality, persistent dampness, reduced structural integrity and deteriorating sanitation facilities. In addition, studies by Richardson et al. (2022) highlight the persistent nature of moisture-related problems and reported extended drying periods (3-6 months average); recurring dampness in 68% of affected homes; hidden moisture damage in wall cavities and chronic humidity control issues. According to Wilson and Ahmed (2021), documented increased incidences of respiratory problems, allergic reactions, mental health challenges and skin conditions related to mold exposure. By and large, according to Adebayo (1991) and Krzyzanowski (2014) flooding significantly impacts indoor environmental quality (IEQ) and health, compromising housing quality and livability. In view of this, flooding causes structural instability, mold growth, humidity issues (increased moisture affects thermal comfort) and reduced natural light creating a lot of health challenges. Also, flooding ignites Indoor Air Pollution (IAP), this resulted in to floodwater contaminants, mold, and bacteria and waterborne Pathogens increased risk of waterborne diseases (WHO, 2018). Research by Galea (2005) noted respiratory diseases (Mold exposure, asthma, and COPD); mental health trauma (anxiety and depression) and waterborne diseases (Gastrointestinal infections, cholera, and typhoid fever) are highly associated with flood affected areas. Boyce and Hunter (2018) noted that flooding compromises dwelling conditions, increasing risk of structural collapse, increases maintenance costs, reduced housing affordability and consequently reducing housing livability, impacting residents' quality of life.

Socio-economic Implications

Flooding has significant socio-economic impacts on housing quality and livability, exacerbating poverty, inequality, and vulnerability. Effective mitigation, recovery strategies, and community engagement are essential. Contemporary research reveals substantial economic burdens on affected households. For instance, Anderson (2023), lamented that high restoration cost was recorded; insurance coverage gaps affecting 70% of households; decreased property values (15-40%) and long-term maintenance cost also increases. Moreover, Research by Nwigwe and Emberga (2022) revealed that flood-induced housing deterioration has significant socioeconomic implications which include increased maintenance costs,

reduced property values, higher insurance premiums and forced temporary or permanent displacement. In addition, Studies by Thompson and Wilson (2023) identify several social impacts (community displacement, permanent migration from high-risk areas, temporary relocation, and disruption of social networks); mental health effects (increased anxiety and depression, Post-traumatic stress disorder, chronic stress from recurring flood threats). Flooding damaged homes compromise children's safety, health and well-being. In addition, it also disrupts education, impacting children's cognitive development (UNICEF, 2017). Galea (2005) noted that flooding disproportionately affects low-income households, exacerbating poverty. In this case, women and children are more vulnerable to flooding's socio-economic impacts. In addition, flooding causes significant damage to housing infrastructure; it results in substantial economic losses, estimated at \$1 trillion globally; causes massive displacement leading to increased poverty and economic hardship and destroys community cohesion, social networks, and cultural heritage (Oyinlola, 2019).

Community Resilience and Adaptation

Recent studies highlight the impact of flooding on community stability. Jackson and Lee (2023) found that recurring flooding leads to increased residential turnover, reduced community investment, disrupted social networks and diminished sense of place. However, research indicates varying effectiveness of structural adaptation measures. According to Robert *et al.* (2023) are of the view that the effectiveness of adaptation measures lies on the building modifications such as elevation of living spaces, waterproof barriers and improved drainage systems. Chen and Kumar (2022), emphasized on the selection of building materials like water-resistant materials, quick-drying components and mold-resistant products. Recent researches have revealed that places that are lacking adequate and effective indigenous and modern adaptation strategies like traditional waterproofing methods, strategic building orientation, modern drainage systems, flood-resistant building materials and elevated foundations are more vulnerable to the impact of flooding (Ibem *et al.* 2023).

Summary of Key Findings

The research reveals multifaceted impacts of flooding on housing quality and livability in riverine communities, encompassing environmental, structural, socioeconomic, and health-related dimensions. Studies indicate a concerning trend in the frequency and severity of flooding events, particularly since the early 2000s, attributed to climate change, rapid urbanization, and inadequate infrastructure. Empirical evidence from Nigeria, as documented by Echendu (2020) and Mfon *et al.* (2022), demonstrates how anthropogenic factors and poor urban planning have intensified flooding risks. Structural assessments reveal severe damage patterns, with Olanrewaju and Alabi's (2019) study showing 65% of surveyed buildings exhibiting significant structural damage and 78% facing severe foundation problems. Indoor environmental quality has been significantly compromised, with Johnson and Lee (2023) documenting mold spore concentrations 200-500% above baseline levels in affected communities. The research also highlights extended drying periods of 3-6 months and recurring dampness in 68% of affected homes. Socioeconomic implications are particularly severe, with Anderson (2023) reporting insurance coverage gaps affecting 70% of households and property value decreases of 15-40%. The impact disproportionately affects vulnerable populations, with UNICEF (2017) noting

significant disruptions to children's education and cognitive development. Global economic losses from flooding are estimated at \$1 trillion, according to Oyinlola (2019). Community resilience studies by Jackson and Lee (2023) indicate that recurring flooding leads to increased residential turnover and diminished community investment. However, adaptation measures show varying effectiveness, with Robert *et al.* (2023) emphasizing the importance of structural modifications such as elevated living spaces and improved drainage systems. The findings buttress the need for integrated approaches to flood management, combining structural adaptations with community-based strategies. Research by Chen and Kumar (2022) highlights the importance of appropriate building materials, while Ibem *et al.* (2023) emphasize the vulnerability of areas lacking both indigenous and modern adaptation strategies. These findings collectively demonstrate the urgent need for comprehensive flood management strategies that address both immediate physical impacts and long-term socioeconomic consequences in riverine communities.

CONCLUSION

Flooding has significant socio-economic impacts on housing quality and livability, exacerbating poverty, inequality, and vulnerability. Integration of adaptive strategies and policy measures appears crucial for sustainable community development in flood-prone areas. Flooding has far-reaching implications for housing quality and livability in riverine communities, affecting physical infrastructure, health outcomes, and socioeconomic stability. The review revealed a complex and evolving relationship patterns on flooding and housing quality in Nigerian riverine communities. Impacts of flooding have become more severe over time, necessitating both policy interventions and practical adaptation strategies. In conclusion, there is a need for effective mitigation, recovery strategies, and community engagement, proper land use, effective policies and implementation must be ensured by the government and the relevant stakeholders.

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