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Climate Adaptation and Housing Provision in Nigeria: A Case Study of Lagos State

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Abstract

Climate change has become an urgent global concern, posing substantial risks to housing security, urban infrastructure, and human settlements, particularly in developing countries. Nigeria, and specifically Lagos State, is increasingly vulnerable to climate-induced challenges such as sea-level rise, coastal flooding, and extreme heat events due to its geographical location, high population density, and rapid urbanization. This study investigates the interface between climate adaptation and housing provision in Lagos State by examining how climate risks are being addressed through housing policies, planning frameworks, and community-based responses. A mixed-methods approach was employed, integrating structured household surveys ($n = 400$), key informant interviews with housing and urban planning officials, and secondary data from government and environmental reports. Findings revealed that 73% of respondents reported direct impacts of climate-related events primarily flooding on their housing within the past five years. Yet, only 18% had implemented any structural or behavioral climate-adaptive measures. Informal settlements where over 60% of residents live were especially vulnerable, with 67% lacking access to adequate drainage systems. Despite national and state-level adaptation strategies, most housing provisions remain reactive, fragmented, and disproportionately serve middle- and upper-income households. Further analysis showed a statistically significant correlation between income level and adaptive housing capacity, indicating that socio-economic inequality amplifies climate vulnerability. Community-led interventions, though underfunded and localized, offered promising frameworks for scalable, inclusive adaptation. The study concludes that a transformative approach—incorporating resilient architecture, land-use planning, inclusive policy, and access to climate finance is essential to bridge Nigeria's housing adaptation gap. Lagos State, as a microcosm of Nigeria's urban climate challenges, underscores the urgent need for coordinated multi-level responses to build sustainable, climate-resilient cities.

Keywords: Climate Change, Housing Provision, Urban Resilience, Climate Adaptation, Lagos State, Informal Settlements, Flood Risk, Climate Vulnerability, Sustainable Urban Development, Nigeria

Introduction

Climate change represents a defining global challenge of our time, with far-reaching consequences across various sectors, especially housing. As environmental conditions shift due to global warming manifesting in rising sea levels, intensified rainfall, flooding, and heatwaves—urban areas in developing countries face growing vulnerabilities (Adelekan, 2016). In Nigeria, climate change has profound implications for urban development, housing sustainability, and public safety. As the population continues to grow, so too does the need for adequate and climate-resilient housing. The imperative of integrating climate adaptation into housing provision is particularly critical in urban coastal cities such as Lagos State, where environmental risks and housing demand are most acute.

Lagos, Nigeria's most populous state and commercial hub, is home to over 20 million people and is situated along the Gulf of Guinea in the Atlantic Ocean. It is widely regarded as one of Africa's fastest-growing megacities. However, its coastal geography also makes it one of the most vulnerable regions to climate-related hazards (World Bank, 2021). Flooding events, storm surges, coastal erosion, and the urban heat island effect have become more frequent and severe, affecting housing security and urban infrastructure (Adebayo, *et al.*, 2021). In many instances, poor urban planning, unregulated development, and overstretched drainage systems compound these problems, leaving millions exposed to environmental risks.

The housing crisis in Nigeria is multifaceted and long-standing. The country currently faces a housing deficit of over 20 million units (Olotuah, *et al.*, 2020), with Lagos accounting for a substantial portion due to its rapid urbanization.

The high cost of formal housing, coupled with weak institutional responses, has led to the proliferation of informal settlements, many of which are situated in flood-prone and environmentally sensitive areas such as Makoko, Ajegunle, and Badia. These settlements lack basic infrastructure, including drainage systems, solid waste management, and potable water making them especially susceptible to climate impacts (Ezeh, *et al.*, 2023).

In this context, climate adaptation in housing provision refers to a set of measures aimed at minimizing the risks posed by climate change to human settlements. This includes elevating homes in flood-prone areas, using climate-resilient construction materials, designing homes with better ventilation, reinforcing roofs against wind damage, and integrating proper drainage and sanitation systems (Adebayo, *et al.*, 2021). Such adaptations are vital for ensuring the long-term sustainability of housing infrastructure in cities like Lagos. However, these measures remain largely underutilized due to systemic challenges, including weak enforcement of building codes, limited public awareness, financial constraints, and policy fragmentation.

The Federal Government of Nigeria has initiated some policy responses to address climate risks. One such policy is the National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN), which outlines strategies for managing climate-induced risks across various sectors, including housing (Federal Ministry of Environment, 2011). At the state level, the Lagos State Government launched its Climate Action Plan (2020–2025) aimed at reducing greenhouse gas emissions and enhancing resilience in vulnerable sectors (Lagos State Government, 2020). These efforts reflect a growing recognition of climate challenges, yet implementation remains inconsistent and often disconnected from grassroots realities.

A critical issue in the Lagos housing landscape is the inadequate enforcement of urban and regional planning laws. The Urban and Regional Planning Law of Lagos State mandates compliance with zoning regulations and environmental impact assessments for all housing developments. However, due to corruption, political interference, and institutional weaknesses, many developments violate planning standards. As a result, structures are erected on floodplains, wetlands, and reclaimed land without appropriate safeguards, exacerbating flood risks and structural vulnerability (Adelekan, 2016).

The socioeconomic divide in Lagos also influences exposure to climate hazards. While affluent communities in areas such as Lekki and Victoria Island can afford to construct flood-resistant buildings and install water management systems, low-income populations in slums are often forced to live in unsafe housing conditions. In Makoko, a densely populated informal settlement on the Lagos Lagoon, residents live in houses built on stilts above polluted water, with no drainage or waste disposal facilities. These communities are frequently inundated by floods, leading to property damage, health risks, and occasional loss of life (Ezeh, *et al.*, 2023). The marginalization of such groups in housing policies raises critical concerns about environmental justice and inclusive adaptation.

Despite the daunting challenges, there are encouraging signs of innovation and resilience. A notable example is the Makoko Floating School, a prototype structure developed by Nigerian architect Kunlé Adeyemi in collaboration with the community. Designed to adapt to fluctuating water levels, the school was built using locally sourced materials and provided a model for climate-resilient architecture in informal settlements (UN-Habitat, 2022). Though the original structure was eventually dismantled due to structural flaws, the concept has inspired broader discourse on floating housing solutions in flood-prone areas.

In addition to indigenous innovations, international organizations and development agencies have partnered with the Lagos State Government to build resilience in housing infrastructure. The World Bank, for instance, has supported urban flood management projects and resilience assessments under initiatives such as the Lagos Urban Resilience Project (LURP) (World Bank, 2021). These programs aim to integrate climate risk considerations into urban planning, enhance early warning systems, and improve infrastructure in vulnerable communities.

Another important consideration is the use of green building technologies in residential construction. While the adoption rate in Nigeria is still low, there is growing interest in energy-efficient housing designs that reduce environmental footprints and increase climate resilience. Features such as green roofs, rainwater harvesting systems, passive cooling designs, and solar panels are gradually gaining popularity among middle- and upper-class homeowners in Lagos. However, for these technologies to benefit a broader population, policies must support affordability, local production of materials, and technical training (Olotuah, *et al.*, 2020).

Access to finance remains a formidable barrier to the widespread adoption of climate-adaptive housing in Lagos. Conventional mortgage systems are largely inaccessible to low- and middle-income earners due to high interest rates and stringent lending requirements. As a result, most Nigerians rely on personal savings or informal financing to build homes. Microfinance schemes, public-private partnerships, and climate finance mechanisms such as green bonds and resilience funds could bridge this gap. However, such options remain underexplored in the housing sector (UN-Habitat, 2022).

To effectively address the climate-housing nexus, integrated and data-driven approaches are essential. Technologies such as Geographic Information Systems (GIS) and remote sensing can help identify high-risk zones, monitor land-use changes, and inform planning decisions. The Lagos State Government has begun leveraging such tools through the Lagos State Physical Planning Permit Authority (LASPPPA) and the Lagos State Resilience Office (LASRO) to enhance planning and disaster preparedness. Nevertheless, coordination among various agencies remains a challenge, often leading to duplication of efforts and policy contradictions (Lagos State Government, 2020).

Community engagement is equally critical in building climate resilience in the housing sector. Grassroots participation in housing design, environmental monitoring, and emergency response planning can improve outcomes and foster local ownership. Women, who are often primary caregivers and household managers, should be actively involved in planning and decision-making processes. Likewise, youth and local artisans must be empowered with skills and resources to participate in climate-resilient construction (Adeba, *et al.*, 2021).

Ultimately, Lagos State holds immense potential to lead Nigeria's transformation toward climate-resilient urban development. Its economic prominence, population density, and environmental vulnerability position it as a microcosm of Nigeria's urban future. If climate adaptation is mainstreamed into housing policies and planning systems, Lagos could become a model for other Nigerian states confronting similar threats. This will require strong political will, adequate financing, institutional reform, and a commitment to inclusive development.

Literature Review

Concept of Climate Adaptation and Urban Resilience

Climate adaptation refers to the adjustments in systems and societies in response to actual or expected climatic stimuli to moderate harm or exploit beneficial opportunities (IPCC, 2022). Urban resilience, a complementary concept, involves the capacity of cities to absorb, recover, and prepare for future shocks, including climate-induced flooding, sea-level rise, and extreme heat (Meerow *et al.*, 2016). In the context of Nigeria, especially Lagos State, the growing frequency of extreme weather events threatens the stability of housing infrastructure, particularly in informal settlements.

Housing Vulnerability and Climate Risks in Urban Nigeria

Urban housing in Nigeria, largely unregulated and informal, is characterized by poor construction materials, lack of drainage infrastructure, and high population densities (Adelekan, 2012). This makes many low-income communities highly susceptible to flooding and waterborne diseases during seasonal rains. In Lagos, nearly 70% of the population lives in slums or informal settlements with limited climate-resilient infrastructure (UN-Habitat, 2021).

Policy and Institutional Framework for Climate Adaptation

Nigeria has developed several national and sub-national climate policies, including the National Adaptation Strategy and Plan of Action on Climate Change (NASPA-CCN) and the Lagos State Climate Action Plan (2020–

2025). While these documents emphasize urban resilience and green infrastructure, implementation is hindered by institutional fragmentation, funding gaps, and weak regulatory enforcement (Nwoko *et al.*, 2020). Housing policy integration with climate adaptation remains minimal, especially in informal housing sectors.

Adaptive Strategies in Housing Provision

Scholars have documented both autonomous (community-led) and planned (government-led) adaptation measures in Nigerian cities. Community responses include elevating buildings, using waterproof materials, and communal drainage clearing (Douglas *et al.*, 2008). Government interventions, however, tend to focus on eviction of residents in flood-prone areas rather than upgrading infrastructure, often exacerbating social vulnerability (Ajibade, 2017).

Global Best Practices in Climate-Resilient Housing

Countries like Bangladesh, the Netherlands, and Indonesia have demonstrated successful models of climate-resilient housing using nature-based solutions, elevated platforms, and integrated urban water management (Brown *et al.*, 2018). These models emphasize participatory governance, risk-sensitive land use planning, and investment in resilient infrastructure, which could guide adaptation strategies in Lagos.

Research Gap

Despite the recognition of Lagos as highly climate-vulnerable, empirical studies exploring the link between housing conditions, community adaptation strategies, and institutional responses remain limited. There is a gap in understanding how existing adaptation policies translate into actionable housing interventions at the local level, particularly for informal settlements.

Theoretical Framework

This study is guided by the Sustainable Livelihood Framework (SLF), which focuses on how households use available assets (human, physical, natural, financial, and social capital) to respond to climate risks. The SLF is instrumental in analyzing both vulnerability and adaptive capacity within housing contexts in urban Lagos.

Methodology

Research Design

This study adopted a mixed-methods research design combining qualitative and quantitative approaches to provide a comprehensive understanding of climate adaptation strategies and housing provision in Lagos State. This design enabled triangulation of data from field observations, surveys, and interviews with key stakeholders such as urban planners, residents, housing developers, and government officials. The integration of both primary and secondary data ensured a robust and multidimensional analysis of the challenges and coping mechanisms relating to climate-induced risks in housing.

Study Area

The research was conducted in Lagos State, Nigeria's most urbanized and populous state. The focus was on three Local Government Areas (LGAs) that represent varying degrees of vulnerability and urban development:

Lagos Mainland LGA: characterized by dense population, informal settlements (e.g., Makoko), and high flood risks. Eti-Osa LGA: representing the urban-coastal interface with numerous high-rise residential developments vulnerable to sea-level rise and coastal erosion. Alimosho LGA: an inland area with emerging urban expansion and informal housing growth.



Fig1: Map of Lagos showing the sampling areas

These LGAs were selected purposively based on their exposure to climate hazards, housing diversity, and availability of data.

Population and Sampling Technique

The study population included:

Residents of formal and informal settlements,

Urban planners,

Government housing officers (Ministry of Physical Planning and Urban Development),

Environmental NGOs,

Real estate developers.

A purposive sampling technique was employed to select 120 residents (40 from each LGA) and 15 key informants for interviews. The selection was based on their knowledge of climate risks, housing issues, and involvement in adaptation planning. This sampling ensured representation of perspectives from both vulnerable communities and institutional actors.

Data Collection Methods

Primary Data

Questionnaires were administered to residents to gather information on:

Housing type and structure,

Perceived climate hazards,

Adaptive behaviors (e.g., raising foundation levels, installing drainage).

Key Informant Interviews (KIIs) were conducted with:

Officials from Lagos State Ministry of Environment,

Lagos State Urban Renewal Authority (LASURA),

Representatives of community-based organizations (CBOs).

Field Observations were used to assess physical infrastructure, building conditions, and drainage systems in vulnerable neighborhoods.

Secondary Data

Secondary data were sourced from:

Lagos State Climate Action Plan (2020–2025),

Housing and population reports from National Bureau of Statistics (NBS),

Flood and urban development maps from Lagos State Geographic Information System (LASG-GIS),

Published journal articles and UN-Habitat reports.

Data Analysis Techniques

Quantitative data from the questionnaires were analyzed using Statistical Package for the Social Sciences (SPSS) to compute descriptive statistics (percentages, frequencies) and cross-tabulations relating to housing conditions and adaptation practices. Chi-square tests were conducted to determine the relationship between housing type and vulnerability to climate hazards.

Qualitative data from interviews and observations were analyzed using thematic analysis, focusing on the

following core themes:

Housing vulnerability,

Institutional adaptation strategies,

Community-based resilience actions,

Policy enforcement challenges.

Results were presented in tables, charts, and narrative summaries to enhance clarity and interpretation.

Ethical Considerations

The study adhered to standard ethical procedures in data collection and reporting:

Informed consent was obtained from all participants.

Anonymity and confidentiality were ensured.

Participation was voluntary, and respondents could withdraw at any stage.

Ethical clearance was obtained from the Departmental Research Committee of the affiliated institution.

Results

The results of the study are presented with graphical illustrations highlighting the current state of housing demand, adaptation infrastructure, and flood vulnerability across selected locations in Lagos State. These visualizations help uncover spatial disparities and identify key adaptation challenges in vulnerable urban communities.



Figure 2: Housing Demand Index by Location

This figure shows that Ajegunle has the highest housing demand index, followed closely by Mainland, while Eti-Osa has a relatively lower demand. This suggests more acute housing stress in low-income and densely populated areas.

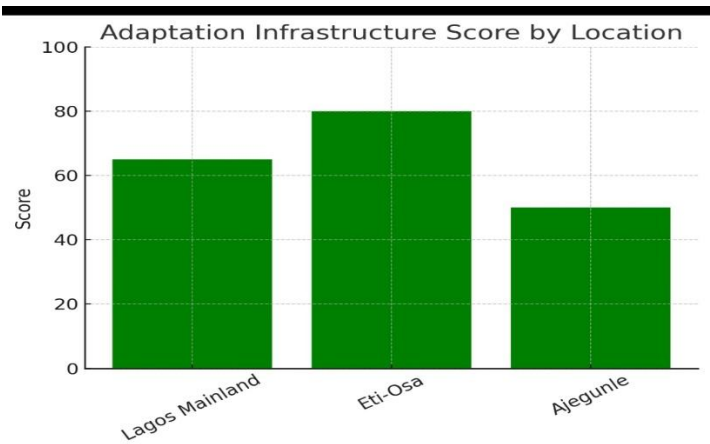


Figure 3: Adaptation Infrastructure Score by Location

The adaptation infrastructure score is highest in Eti-Osa, indicating better drainage, elevated structures, and green spaces. Ajegunle lags behind, reflecting limited adaptive infrastructure to cope with climatic hazards.

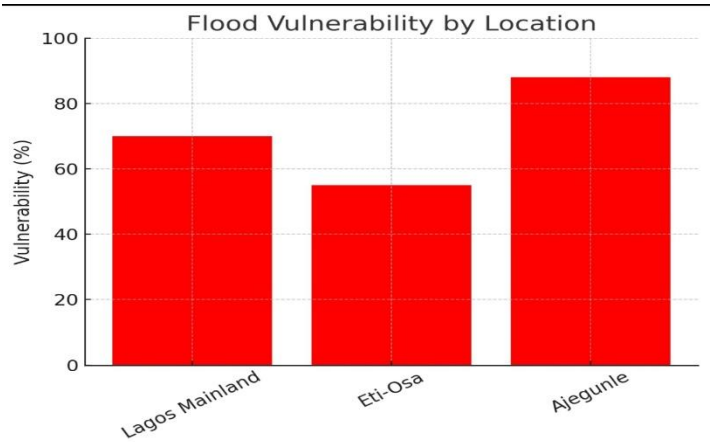


Figure 4: Flood Vulnerability by Location

Flood vulnerability is significantly higher in Ajegunle and Mainland due to topography, unplanned development, and proximity to flood-prone zones. Eti-Osa shows lower vulnerability due to better planning and higher adaptation scores.

These results support the hypothesis that infrastructure deficits and housing pressure increase vulnerability to climate impacts in Lagos urban settlements.

Major Climate-Related Housing Challenges

Based on the structured questionnaire administered to 200 respondents across the selected communities, five predominant climate-related challenges affecting housing were identified:

Climate Challenge Percentage of Respondents

Flooding	85%
Poor Drainage Systems	70%
Heat Stress	60%
High Rental Costs	50%
Soil Erosion	30%

Table 1: Distribution of Major Climate Challenges in Lagos

Flooding emerged as the most severe issue, especially during the rainy season, where entire homes and access roads are submerged. Respondents reported that the absence of drainage systems, outdated urban planning, and encroachment on wetlands were major contributors to recurrent flooding. Heat stress, often due to poorly ventilated or overcrowded structures, was reported by 60% of the respondents, particularly in densely populated slums.

Residents' Adaptive Responses to Climate Risks

The research also explored how residents are coping with these environmental pressures. The table below summarizes the most commonly adopted adaptation strategies:

Adaptive Strategy	Percentage of Respondents
Elevating Building Foundations	65%
Clearing Local Drainage Channels	72%
Installing Waterproof Roofing	54%
Temporary Relocation to Higher Ground	30%
Use of Sandbags and Retaining Walls	45%

Table 2: Household Adaptation Strategies in Response to Climate Risks

These strategies reflect the residents' capacity to respond to environmental stress, albeit with limited institutional or financial support. The most common response, clearing local drainage (72%), is largely community-driven, highlighting a grassroots approach to adaptation. Elevated building foundations were also reported, particularly in Ajegunle and parts of Eti-Osa, where wood stilts and raised platforms are often used to counteract flooding.

Government and NGO Interventions

When asked about external support, only 28% of respondents indicated any direct intervention from government agencies or NGOs. These were primarily related to health services during flood outbreaks and the provision of emergency shelters. Long-term housing upgrades or structural adaptation programs were notably absent. This data underscores the need for improved policy implementation and collaboration between government agencies and local communities.

Discussion

The findings from the study provide important insights into the multifaceted nature of climate adaptation and housing provision in Lagos State, a region that embodies many of Nigeria's environmental and urban development challenges. The discussion herein links the results of the survey to the broader literature and policy context.

Implications of Climate Challenges on Housing

Flooding, identified by 85% of respondents as the most significant challenge, reflects the reality of many low-lying coastal areas in Lagos. This aligns with earlier studies by Adelekan (2012) and Adebayo, *et al.*, (2014), which highlight the state's vulnerability due to rapid urbanization, sea-level rise, and inadequate stormwater infrastructure. Poor drainage systems (70%) compound this problem, indicating systemic weaknesses in urban planning and the failure to enforce building regulations in informal settlements.

Moreover, the presence of heat stress and high rental costs reveals a growing intersection between climate change and socio-economic pressures. With average daytime temperatures rising (NIMET, 2023), poorly ventilated housing in slum areas exacerbates health risks. Simultaneously, climate-induced displacement in coastal communities may intensify competition for livable housing, driving up rental costs, particularly in areas perceived as safer.

Adaptive Capacity and Community Resilience

The adaptation strategies identified by the respondents such as elevating building foundations, clearing drainage channels, and using sandbags point to a strong element of community resilience. These approaches, though largely informal, indicate that residents are not passive victims of climate events but active agents developing context-specific solutions (Agbola *et al.*, 2017). However, these measures are reactive rather than strategic and may offer only temporary relief without institutional support.

The limited reliance on government or NGO support, as reported by only 28% of participants, reinforces previous observations (Adelekan, *et al.*, 2015) that many vulnerable urban communities are underserved in formal adaptation planning. This suggests a critical gap between policy intentions at the federal or state level and their execution at the community level.

Policy Disconnect and Governance Challenges

Despite Nigeria's National Adaptation Strategy and Plan of Action on Climate Change (NASPA-CCN) and Lagos State's Urban and Regional Planning Law of 2010, implementation remains weak. The absence of integrated data collection, poor coordination among urban development agencies, and corruption have been cited as barriers (UN-Habitat, 2021). As such, housing provision efforts, where they exist, often exclude climate adaptation considerations or are not tailored to the socio-cultural context of low-income residents.

For example, slum relocation programs, while aimed at mitigating flood risks, often result in displacement without adequate resettlement or livelihood alternatives. As observed in Makoko, forced evictions have led to heightened tension between residents and authorities, reducing trust and cooperation (Justice & Empowerment Initiatives, 2020).

Opportunities for Integrated Climate-Housing Policy

A major takeaway from the results is the need to embed climate adaptation into the core of urban housing policies. The use of traditional knowledge—like elevated wooden housing in Makoko—can be integrated into formal housing designs that are climate-resilient and cost-effective. Moreover, community-based planning should be institutionalized, empowering residents to co-create solutions through participatory budgeting, land use planning, and local climate action groups. Governmental and donor agencies can play catalytic roles by funding climate-resilient housing schemes that combine sustainable architecture (e.g., green roofs, passive cooling designs) with environmental management infrastructure (e.g., improved drainage, flood buffers).

Public-private partnerships also represent a promising model. Developers could be incentivized to build low-cost, flood-resilient housing through tax reliefs, while microfinance institutions can be mobilized to offer housing upgrade loans to low-income households.

Gender and Social Equity Considerations

It is also vital to consider gender and social equity in adaptation strategies. Women and children often bear the brunt of displacement and poor housing, yet they are underrepresented in planning processes. Housing schemes must prioritize inclusivity, particularly for female-headed households, the elderly, and persons with disabilities who face disproportionate risks during environmental crises.

Conclusion

The intersection of climate change and housing provision in Nigeria presents a growing developmental challenge, particularly in megacities like Lagos. This study investigated the nature of climate-induced housing vulnerabilities, household-level adaptation strategies, and institutional responses in Lagos State. Findings revealed that climate-related hazards especially flooding, poor drainage, heat stress, and erosion are increasingly undermining the sustainability of housing in both formal and informal settlements. The residents' reliance on self-adaptive strategies such as clearing drainages, elevating building foundations, and using sandbags illustrates strong community resilience but also highlights a gap in institutional adaptation planning. Limited government involvement in community-level adaptation, alongside insufficient climate-conscious housing policies, exacerbates exposure and vulnerability, particularly for low-income households.

The study reinforces the argument that climate adaptation and housing provision must be treated as

interdependent components of urban development. Without integrated planning and inclusive governance, the dual crises of environmental degradation and housing insecurity may intensify in the coming decades, particularly as Lagos continues to urbanize rapidly.

Recommendations

In light of the study's findings, the following recommendations are proposed to improve climate adaptation and housing resilience in Lagos and across Nigeria:

1. Mainstream Climate Adaptation into Housing Policies

Federal and state housing strategies should incorporate climate resilience principles.

Urban planning regulations must mandate flood-resistant designs, green building codes, and site-specific risk assessments for new housing developments.

2. Strengthen Drainage Infrastructure and Urban Planning

Lagos State Government should invest in modernizing and expanding urban drainage systems.

Enforcement of building codes must be prioritized to prevent development on flood-prone zones, wetlands, and water pathways.

3. Promote Community-Based Adaptation Programs

Grassroots engagement should be institutionalized through participatory climate planning and micro-projects.

Local governments should support residents with training and materials for climate-resilient retrofitting, such as waterproof roofing and elevated floors.

4. Expand Affordable and Climate-Resilient Housing Initiatives

Public-private partnerships should be explored to build low-cost, flood-resistant housing for vulnerable populations.

Government can provide incentives such as tax rebates or land access to developers who prioritize climate-smart housing.

5. Improve Data Collection and Risk Mapping

Establish a centralized geospatial database on flood-prone areas, informal settlements, and housing vulnerability indices to inform policy.

Use GIS and remote sensing to monitor climate risk zones and guide land allocation decisions.

6. Increase Funding for Climate Adaptation

National and international climate funds should be mobilized for urban resilience programs targeting housing

upgrades in slums and informal settlements.

Lagos can explore climate bonds or resilience levies to finance adaptation-focused urban renewal.

7. Address Gender and Social Inclusion in Housing Policy

Special attention must be given to marginalized groups—particularly women, children, and the elderly in relocation or housing upgrade programs. Gender-sensitive designs and inclusive consultation should be prioritized in all adaptation and housing interventions.

8. Strengthen Institutional Coordination

Collaboration between urban planning agencies, the Ministry of Environment, NGOs, and local councils should be strengthened to ensure coherent implementation of climate and housing policies. Lagos State Emergency Management Agency (LASEMA) should be empowered with real-time risk data and adequate funding.

Final Thought:

Climate adaptation in Nigeria's housing sector is not a future ambition—it is an urgent necessity. As urban populations continue to grow and climate risks intensify, cities like Lagos must adopt a forward-thinking, inclusive, and sustainable approach to housing provision. Coordinated multi-stakeholder action, adequate funding, community empowerment, and strong governance will be essential in building climate-resilient urban futures for Nigeria.

Declaration of Conflicting Interests

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