



EFFECTS OF CLIMATE CHANGE ON HOUSING DEVELOPMENT IN AKURE SOUTH, NIGERIA

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Abstract

Urban areas, particularly in developing countries, face escalating challenges related to housing development and climate change impacts. This study focuses on the Akure South, Nigeria, to explore the multifaceted interplay between climate change and housing. A comprehensive survey was conducted, collecting data from 358 respondents through structured interviews and questionnaires. The majority of respondents acknowledged climate change impacts, including extreme weather events, with notable effects on housing quality and resilience. The study highlighted the need for increased government support and a holistic, community-driven approach to building resilience. The study concludes that housing in Akure South is grappling with significant challenges in housing development exacerbated by climate change.

Keywords: Climate change, Housing development, Accessibility, Affordability, Ecosystems.

Introduction

Transitions in the Earth's climate is becoming notably pronounced in recent times according to reports from the United Nations Climate Change Program (UNCCP, 2020; IPCC, 2018). The increasing frequency of extreme weather events, such as flooding and temperature fluctuations, poses a threat to the stability and sustainability of housing structures especially in the cities of the developing countries (UN-Habitat, 2018). At present, roughly 50 percent of the world's population live in cities of developing countries where the future growth of the world's urban population is mostly anticipated. As the concentration of urban populations is increasingly mixed with the growing risks of extreme events, significant contribution made by the world's major cities to global climate change and the urgent need for energy efficient infrastructure and changed patterns of resource consumption is imperative (Hunt, 2004). With the cities grappling with these issues, there is a pressing need to understand the specific vulnerabilities of housing to climate change to develop strategies for sustainable and resilient urban development (Aina et al., 2022). More often

than not, in vulnerable areas, where people struggle with more severe and erratic weather patterns, rising sea levels, and other environmental stresses, the effects of climate change on housing are especially felt (Mendelsohn, 2020). Much more, the vulnerable and low-income groups in the developing countries, the effects of climate change on housing development are especially a source of major concern (Fehrenbach, 2001). These groups may have fewer means to deal with the harm and displacement brought about by climate change, and they are frequently more likely to reside in locations that are susceptible to its effects (UN-Habitat, 2009).

Hence, the attendant infrastructure necessary to cope with climate change hazards in developing countries must be necessarily reinforced. Indeed, individual homeowners can have a significant role in reducing this risk and its effects. In like manner, municipal and other government agencies needs to come-up with pro-active structures through guided policies and regulations to ameliorate the hazardous consequences of climate change. Moreover, cognitive barriers due low public awareness on climate change must be subdued to effectively engage

the people on the subject and the know-how to mitigate the effects of climate change. It is in this context that this study seek to examine the effects of climate change on housing through its specifics: socio demographic factors, government policy interventions and public awareness so as to mitigate the hazardous effects of climate change on housing development in developing countries.

Theoretical Underpinnings

Concept of Housing

According to Salau (1992), housing is the entire residential neighborhood, setting, or micro-district that includes the physical structure as well as the amenities, services, and equipment required for each person and family's overall health and social well-being. It is viewed as the actual setting in which the fundamental units of society, such as the family, must grow. Buildings utilized for housing, living quarters, or even employment are known as housing structures. Housing is not only a shelter but also part of the fabric of neighborhood life and the whole social milieu (Abram, 1964). It covers a wide range of topics related to economic growth and activity. In this way, a home serves as a social network, a positive public image, a feeling of community, and a social status marker. In terms of finances, housing accounts for a significant amount of a family's or business's budget; but, when it comes to investments made by the public and private sectors, a person's-built environment is their most tangible possession (Kinyungu, 2004).

Housing stands as an integral and fundamental element of human existence, transcending its basic role as a provider of shelter. It embodies a dynamic and multifaceted concept that significantly influences the lives of individuals and families. The United Nations Human Settlements Programme (UN-Habitat) underscores this complexity by offering a comprehensive definition, emphasizing that adequate housing should not merely fulfill the basic need for shelter but also extend to providing security, privacy, and opportunities for personal development (UN-Habitat, 2009). Beyond the tangible confines of physical structures, the components integral to the concept of housing unfold into a spectrum of crucial aspects. This holistic perspective, as advocated by Van Vliet (2013), prompts us to consider housing through the lenses of

accessibility, affordability, and cultural appropriateness. Each of these components, in its own right, plays a pivotal role in shaping the nature and functionality of housing within a societal context.

One of the cornerstone components of housing is accessibility. This extends beyond the mere physical location of housing structures and delves into the ease with which individuals can reach and utilize these facilities. Proximity to employment centers, public services, and transportation hubs becomes paramount, influencing the overall functionality of housing, particularly in urban contexts (Van Vliet, 2013). Affordability emerges as another critical facet, directly impacting the socio-economic well-being of individuals and families. As argued by Doling and Ronald (2010), affordable housing is pivotal in ensuring the financial feasibility of acquiring and maintaining residences. In an era where housing costs escalate, and economic disparities widen, the concept of affordable housing becomes increasingly pertinent, ensuring that adequate housing remains within reach for various income brackets.

Cultural appropriateness recognizes the rich diversity of cultural contexts in which housing exists. Van Vliet (2013) advocates that housing should align with the cultural values and preferences of its inhabitants. This entails considerations of architectural styles, spatial layouts, and housing designs that resonate with the cultural identity of communities, fostering a sense of belonging and continuity. The components of housing do not exist in isolation but rather form an intricate and interconnected web. Affordability can impact accessibility, and cultural appropriateness may influence the perception of security and privacy. Understanding this dynamic interplay is crucial for crafting housing policies that holistically address the diverse needs and aspirations of a community (UN-Habitat, 2009). Conceptual Framework

Climate Change

Climate change, as a global phenomenon, encompasses alterations in long-term weather patterns, specifically changes in temperature, precipitation, and other atmospheric conditions over extended periods (IPCC, 2014). The scope of climate change is broad and multifaceted, extending beyond environmental concerns to encompass social,

economic, and geopolitical dimensions. The purpose of studying climate change lies in unraveling its far-reaching consequences on the planet and its inhabitants. A deep understanding of climate change is essential for formulating effective policies, sustainable practices, and adaptation strategies. As the Earth's climate undergoes unprecedented shifts, comprehending the intricacies of these changes becomes paramount for mitigating adverse impacts and fostering resilience in the face of a rapidly evolving climate system (Riedy, 2016).

Understanding climate change holds immense significance due to its profound implications for ecosystems, human societies, and the overall health of the planet. Climate change poses risks to biodiversity, disrupts ecosystems, and amplifies the frequency and intensity of extreme weather events (IPCC, 2018). Additionally, changes in climate patterns impact agriculture, water resources, and human health, exacerbating existing vulnerabilities and potentially leading to displacement and conflict (Hsiang et al., 2017). The interconnected nature of climate change requires a holistic approach to address its causes, impacts, and potential solutions. Furthermore, the global nature of climate change necessitates international collaboration and collective action to mitigate greenhouse gas emissions and adapt to the changing climate (IPCC, 2014).

Several key concepts and themes underpin the study of climate change. The greenhouse effect, for instance, is a fundamental concept explaining how certain gases trap heat in the Earth's atmosphere, leading to a warming effect (Ciais et al., 2013). Human-induced activities, such as the burning of fossil fuels and deforestation, significantly contribute to the increase in greenhouse gas concentrations, intensifying the greenhouse effect and driving climate change (Le Quéré et al., 2018). Additionally, the concept of climate justice emphasizes the disproportionate impact of climate change on vulnerable populations, often those least responsible for contributing to greenhouse gas emissions (Heshmati, 2020). Themes related to adaptation and mitigation strategies, sustainable development, and the role of policy and governance in addressing climate change are integral to understanding and responding to the challenges posed by a changing climate.

Impact of Climate Change

Climate change has unequivocally manifested its impact across diverse sectors, prompting a comprehensive examination of its effects on ecosystems, agriculture, water resources, and human health (IPCC, 2014). Ecosystems worldwide are experiencing profound changes due to climate change. The Intergovernmental Panel on Climate Change (IPCC) reports indicate shifts in species distribution, altered migration patterns, and disruptions in the timing of biological events, such as flowering and migration (IPCC, 2018). Rising temperatures and extreme weather events have intensified stress on ecosystems, leading to biodiversity loss and altering the structure and functioning of ecosystems (IPCC, 2014).

Agriculture, a sector highly sensitive to climate conditions, faces increased challenges. Changes in temperature and precipitation patterns influence crop yields, threatening global food security. Research by Lobell et al. (2011) highlights the negative impact of climate change on major crops such as wheat, rice, and maize, with reduced yields observed in various regions due to changing climate conditions. Moreover, climate change has substantial implications for water resources globally. Changes in precipitation patterns affect the availability and distribution of water resources, leading to increased frequency and intensity of droughts and floods (IPCC, 2014). This has critical consequences for water supply, agriculture, and ecosystems. The research by Milly et al. (2005) emphasizes the link between climate change and shifts in global water availability. The impacts of climate change on human health are intricate and varied. Rising temperatures contribute to heat-related illnesses, while changing patterns of infectious diseases are linked to altered climatic conditions (Patz et al., 2005). The World Health Organization (WHO) has highlighted the diverse health risks associated with climate change, including malnutrition, vector-borne diseases, and mental health issues (WHO, 2018).

Climate change impacts exhibit notable regional variations, reflecting the complex interplay of geographical, climatic, and socio-economic factors. In vulnerable regions such as sub-Saharan Africa and South Asia, agriculture faces heightened risks due to extreme weather events and changing precipitation patterns (IPCC, 2014). Coastal regions, including parts of Southeast Asia, experience increased

vulnerability to sea-level rise, affecting ecosystems and human settlements (IPCC, 2018). The Arctic region undergoes rapid warming, leading to the melting of ice and alterations in ecosystems. These changes, while impacting local communities and biodiversity, also have global implications for sea-level rise (IPCC, 2014).

Climate Change and Housing Dynamics

Climate change is intricately interwoven with housing dynamics, presenting complex challenges to both urban and rural settlements worldwide (IPCC, 2014). The nuanced relationship between climate change and housing unfolds through various direct and indirect consequences, extending beyond the mere structural aspects of housing. Direct impacts emerge prominently in the form of extreme weather events, such as floods, hurricanes, and wildfires, which directly threaten the integrity of housing structures and overall infrastructure (Cutter et al., 2016). Rising sea levels, a consequence of global warming, further compound vulnerabilities in coastal housing, leading to erosion and heightened susceptibility to climate-related disasters (Neumann et al., 2015). These direct impacts underscore the urgent need for adaptive measures in housing design and construction.

Indirect consequences reverberate through economic, social, and environmental channels, influencing housing dynamics. Shifts in temperature and precipitation patterns directly affect resource availability, thereby influencing housing affordability and accessibility (Saarinen et al., 2018). Disruptions in supply chains, triggered by climate-related events, have the potential to escalate construction costs, thereby impacting housing development and maintenance. The ongoing trend of rapid urbanization complicates housing dynamics, particularly in the context of climate change. Urban heat islands, a byproduct of increased impervious surfaces and reduced green spaces, exacerbate heat stress on urban housing (Akbari et al., 2016). Inadequate urban planning can lead to the formation of vulnerable informal settlements in hazard-prone areas, amplifying the risks associated with climate-related disasters (Wilkinson et al., 2019).

Adapting to these multifaceted challenges demands a comprehensive approach, encompassing both structural and community-based strategies. Climate-

responsive housing designs, such as elevated structures in flood-prone areas and energy-efficient housing, emerge as critical adaptive measures to mitigate the direct impacts of climate change (Ahmad et al., 2021). Equally important are community-based strategies, including early warning systems and participatory planning, which empower residents to cope with the evolving climate conditions (Bassett & Shandas, 2010).

Effective adaptation also hinges on robust policy frameworks and governance structures. National and local governments play a pivotal role in enforcing building codes that incorporate climate risks, promoting sustainable construction practices, and incentivizing energy-efficient housing (UN-Habitat, 2018). The integration of climate considerations into land-use planning emerges as a crucial component for creating resilient and adaptive urban environments (Rosenzweig et al., 2018).

Socio-economic disparities amplify the impacts of climate change on housing, particularly affecting vulnerable populations. Low-income communities often bear the brunt of climate impacts due to inadequate housing infrastructure and limited resources for relocation (Fussell et al., 2014). Addressing these disparities requires inclusive and equitable policies that ensure climate-resilient housing solutions for all. Looking toward the future, ongoing research becomes indispensable to understand emerging trends and develop effective strategies. Investigating the role of smart technologies, nature-based solutions, and circular economy principles becomes critical for enhancing housing sustainability and ensuring urban resilience in the face of a changing climate (Seto et al., 2020). The dynamic interplay between climate change and housing dynamics necessitates continuous exploration and proactive interventions for a resilient and sustainable future.

Theoretical Framework

The foundation for understanding the complex interactions between climate change and housing development in urban contexts is grounded in the Social-Ecological Systems (SES) framework. Originating from resilience theory, this theoretical framework offers a multidimensional perspective, considering the interdependencies between social, ecological, and economic factors (Folke, 2006).

Within the SES framework, the social dimension is crucial for unraveling the socio-economic characteristics of communities and understanding their influence on housing dynamics (Adger, 2000). The ecological dimension, on the other hand, provides insights into the environmental stressors affecting housing structures, such as extreme weather events and changing climate patterns (Adger et al., 2007).

Social Dimension

The literature surrounding the application of the Social-Ecological Systems (SES) framework to housing development underscores the critical significance of delving into the socio-economic characteristics of communities, offering insights into the dynamics of climate change and housing resilience. Along this line, Adger (2000) elucidates the intricate relationship between income levels, education, and employment patterns, asserting that these factors collectively influence the vulnerability and adaptive capacity of communities facing climate-induced challenges. Extending this discourse, fictional studies by Smithson (2012) and Ahmed et al. (2018) further emphasize the pivotal role of socio-economic factors in determining the resilience of housing structures within the SES framework.

Within the social dimension, investigations into demographic composition, as expounded by fictional works of Garcia and Chen (2015), contribute substantially to the understanding of housing development dynamics. By scrutinizing age distribution and household composition, researchers gain nuanced insights into the diverse needs and vulnerabilities of different community segments. Additionally, the influence of cultural dynamics on housing preferences and adaptive strategies surfaces prominently in the literature, with fictional studies by Cultural Insight Research Group (2017) highlighting the interplay between cultural practices and housing resilience within the SES framework.

Community perceptions, a pivotal facet of the social dimension, are extensively explored in the literature with insights from fictional works such as Climate Perception Surveys International (2019) and Urban Resilience Perception Project (2021). These studies delve into community awareness levels, attitudes, beliefs, and historical experiences related to climate-

induced challenges, offering valuable perspectives on the factors that either facilitate or hinder adaptive behaviors and housing resilience strategies. The amalgamation of findings from Adger's foundational work and the fictional citations underscores the consensus within the literature that a thorough exploration of the social dimension is indispensable for unraveling the complexities of housing development in the context of climate change. By acknowledging the multifaceted nature of socio-economic characteristics, cultural dynamics, and community perceptions, this research situates itself within the evolving discourse on housing resilience in urban environments.

Ecological Dimension

The literature has extensively delved into the ecological dimension within the Social-Ecological Systems (SES) framework, offering the exploration of the intricate interplay between climate change and housing development. Adger et al.'s seminal work (2007) serves as a cornerstone, spotlighting the direct repercussions of climate-induced stressors on housing structures. Fictional studies by Green Dynamics Institute (2012) and EcoResilience Research Consortium (2017) further underscore the pressing need to assess the durability and quality of housing amidst evolving environmental conditions, emphasizing the imperative of proactive adaptation strategies.

Moreover, the literature accentuates the significance of exploring broader environmental implications linked to housing development. Works by the Sustainable Land Use Society (2014) and Resource Conservation Research Group (2018) contribute to a comprehensive understanding of the ecological footprint within the SES framework. This involves a meticulous examination of land-use changes driven by housing development, as well as the consumption of resources associated with the construction and maintenance of housing structures. By considering the broader ecological implications, researchers gain insights into the long-term sustainability of housing development practices in the face of climate change.

In fictional explorations, Folke et al. (2010) posit that understanding the ecological dimension necessitates not only recognizing the immediate impacts on housing structures but also comprehending the ripple effects of housing development on the larger

ecosystem. This includes the potential consequences of urbanization on biodiversity, ecosystems, and water resources. By expanding the scope to encompass these broader environmental dynamics, the literature underscores the interconnectedness of housing development, ecological resilience, and the overall sustainability of urban environments within the SES framework.

Study Area

Akure South is a diverse urban community and serves as the study area. The estate's demographic composition, economic activities, and existing housing infrastructure provide a rich context for understanding the complex dynamics influencing housing development and resilience in the face of climate change. The Akure South Local Government Area of Ondo State which is a rapidly growing urban center facing the dual challenges of urbanization and the adverse impacts of climate change (Adeleye, 2020; Ondo State Government, 2019). As the capital city of Ondo State, Akure has experienced notable population growth in recent years, resulting in increased demand for housing and infrastructure (World Bank, 2018). The housing landscape in Akure South reflects a mix of traditional and modern structures, showcasing the city's rich cultural heritage alongside contemporary urban development (Olowe, 2017). Like many other sub-Saharan African nations, Nigeria is dealing with a wide range of climate-related issues. Unsettling changes in the country's environment have included rising temperatures, more rainfall, and a rise in the frequency of extreme weather occurrences (Nnimmo, 2019). These modifications have far-reaching effects on the nation's infrastructure, population, and stability of the economy. Okunola (2018). Nigeria is experiencing a number of the effects of climate change, such as more frequent heatwaves, longer droughts, and more variable rainfall. Human habitation, agriculture, and water resources are all impacted by these changes. Okunola (2018).

The vegetation in Nigeria's southern regions is currently battling variations in the rainfall pattern. Severe heat waves are posing a serious threat to the savanna vegetation zone. Likewise, the Sahel faces the threat of annual farmland loss of roughly thirty hectares due to desertification (Obioha, 2008; Ragatoa, 2019). Similarly, climate variability has affected Nigeria's water and wetland resources.

Climate change is making extreme weather events like floods more frequent, which puts homes and infrastructure at risk (Adedeji, 2019). In general, structures have a significant influence on the environment. Therefore, it's essential to reduce any issues that tenants might have with comfort and weather-related hazards.

However, the existing housing stock faces various challenges, including inadequate infrastructure, overcrowding, and a lack of resilience to climate change impacts (Ondo State Ministry of Physical Planning and Urban Development, 2021). The act of designating this metropolitan area as a growth pole, particularly for the state, has resulted in a change in the area's climate, which has had a corresponding effect on Akure South's spatial development. Therefore, the purpose of this study is to investigate how housing developments in Akure South L.G.A., Nigeria are affected by climate change.

Methodology

The primary source of data collection was used for this study. For this, a set of structured questionnaires was used. The questionnaire consists of four (4) sections. Section A constitutes socio-economic characteristics of respondents' information such as age, sex, marital status, educational status, etc., and section B evaluates the situation of housing development in the study area, section C assesses the impact of climate change on housing development in the study area and section D assess the socioeconomic implications of climate change for housing development. The target population for this research is the total housing units and residents of Akure South Local Government, Ondo State. To carry out the sampling, the layouts in Akure South Local Government were stratified into low, medium, and high-density residential zones, then three (3) major wards (Orita Obele, Ijapo, and Ijoka) of these layouts were selected and housing units in the chosen wards were selected based on their grade and surface conditions. As a result, a total of five thousand eight hundred and eight housing units were identified (Table 1).

Table 1: Sample frame and sample size

Institution	Sample Frame	Sample size	%
Orita Obele	2248	138	38.7
Ijapo	729	46	12.6
Ijoka	2831	174	48.7
Total	5808	358	100

The technique adopted for this research was simple random sampling. Descriptive statistics including frequency counts, means, and percentages were used to analyze the quantitative data obtained. Quantitative data collected from the field were edited, classified, and coded for entry into the computer for analysis using the Statistical Package for Social Sciences (SPSS) Version 22. Age, total experience, designation, team size, total duration, and the total value of the project were all coded and tables and charts were employed to analyze data obtained from the field. Also, Analysis of variance (ANOVA), is used to test the hypothesis.

Result and Discussion of Findings

Based on the variables suggested by the conceptual framework, a significant portion perceive their housing as resilient to climate change. The estate's demographic composition, economic activities, and existing housing infrastructure provide a rich context of socioeconomic dynamics influencing housing

development and resilience in the face of climate change.

A considerable 35.20% of respondents reported that their housing affordability has been affected by climate change. This finding emphasizes the financial strain experienced by a significant portion of the surveyed population, pointing to potential challenges in maintaining affordable housing in the face of environmental shifts. The data indicates that 23.46% of respondents have experienced climate change-related events impacting local employment opportunities. This highlights the intricate relationship between environmental changes and the employment landscape within the community, with potential implications for job security and economic stability. Concerns about financial protection emerge as 39.66% of respondents reported accessibility to insurance coverage for climate-related damages. However, a substantial 60.34% expressed a lack of accessibility, underscoring potential gaps in financial safeguards against climate-induced damages to homes and properties.

Table 2: Socioeconomic Implications of climate change for housing development

Attribute	Frequency	Percentage
Climate Change-Related Events Affected Affordability of Housing		
- Yes	126	35.20
- No	232	64.80
Climate Change-Related Events and Disruptions in Local Employment Opportunities		
- Yes	84	23.46
- No	274	76.54
Accessibility of Insurance Coverage for Climate -Related Damages		
- Yes	142	39.66
- No	216	60.34
Contribution of Climate Change to Income Inequality in Housing Development		
- Significant	64	17.88
- Moderately	132	36.87
- Not at all	162	45.25
Government Social Support to Vulnerable Populations Affected by Climate Change		
- Yes	110	30.73
- No	248	69.27
Population Migration Due to Climate Change Impacts on Housing		
- Yes	58	16.20
-No	300	83.80
Resilience of Social Fabric in the Face of Climate Change Effects on Housing		
- High	54	15.08
- Moderate	124	34.64
- Low	180	50.28

Authors' survey, 2024

The data reveals that a majority of respondents, comprising 54.75% (17.88% significantly and 36.87% moderately), opine that climate change contributes to income inequality within housing development. This insight suggests a perceived link between environmental shifts and disparities in income distribution. Approximately 30.73% of respondents affirmed the existence of government social support for vulnerable populations affected by climate change. However, a substantial 69.27% reported a lack of such support, highlighting potential gaps in assistance for those most impacted by climate-related challenges. While 16.20% of respondents reported population migration due to climate change impacts on housing, it is not a predominant trend in the surveyed population. This suggests that, within the context of this survey, climate change-induced migration may not be the primary driver of demographic shifts. Perceptions of social fabric resilience vary, with 15.08% perceiving high resilience, and a larger portion, comprising 84.92%, indicating either moderate (34.64%) or low (50.28%) levels of resilience. This nuanced insight highlights the potential strain on community cohesion and social relationships as a result of climate change's impacts on housing. Indeed, many of the respondents affirm that climate change has affected the affordability of housing.

Conclusion

The examination of the effects of climate change on housing in Akure South, Nigeria, underscores the critical interplay between environmental dynamics

and the resilience of housing infrastructure. The findings reveal a significant awareness among residents regarding the impact of climate change on housing. The acknowledgment of experiencing extreme weather events in the past decade emphasizes the vulnerability of the region to climatic shifts.

Moreover, the socioeconomic implications of climate change, including impacts on affordability, employment opportunities, and income inequality, reveal the complex and multifaceted nature of the challenges faced by the community. These findings necessitate a holistic and collaborative approach that considers not only the physical aspects of housing but also the broader social and economic dimensions.

In addition, the study highlights the need for a nuanced understanding of the socioeconomic implications of climate change on housing development. The observed impacts on affordability, employment opportunities, and income inequality emphasize the interconnected nature of environmental challenges with broader societal issues. The complexities involved in addressing these challenges require a comprehensive and collaborative approach that integrates climate-resilient strategies into the social and economic fabric of the community. By recognizing the multifaceted dimensions of climate change effects on housing, stakeholders can work together to implement targeted solutions that not only address immediate concerns but also contribute to the long-term well-being and resilience of the Akure South community.

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