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# The Impact of Climate Change on the Real Estate Investment in Northern Eastern Nigeria

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**ABSTRACT**

*Climate change poses substantial challenges to real estate investment, particularly in vulnerable regions like northeastern Nigeria. This study investigates the impact of climate change on real estate investment decisions in states such as Borno, Yobe, Bauchi, Gombe, Taraba, and Adamawa. Employing quantitative research methods, a structured questionnaire was distributed to 300 stakeholders in the real estate sector, with purposive sampling ensuring targeted insights from 50 participants per state. The analysis revealed a significant negative correlation ($r = 0.65$, $p = 0.002$) between climate change impacts and investment value, indicating that increased environmental risks diminish investor confidence and property investments. Regression analysis confirmed this relationship with a coefficient of -0.50 ($p = 0.001$), suggesting that each unit increase in climate change impact correlates with a half-unit decrease in real estate investment. T-test results indicated a significant decline in investments following climate events ($t(298) = 3.45$, $p = 0.001$), while ANOVA results showed significant differences in investment levels across states ($F(5, 294) = 4.20$, $p = 0.001$). These findings underscore the critical influence of climate change on real estate investment decisions in northeastern Nigeria and highlight the urgent need for strategies focused on climate resilience and adaptation within the sector. Policymakers and investors must prioritize integrating climate considerations into their planning to mitigate potential losses and promote sustainable growth in the real estate market.*

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## 1. Introduction

The real estate sector in northeastern Nigeria is under significant stress due to climate change, which has transformed from a regional concern into a pressing economic issue. Northeastern Nigeria, historically reliant on agriculture and characterized by distinct environmental conditions, now faces extreme climate variability, impacting urban infrastructure and investment sustainability (IMF, 2022). Climate-induced challenges like flooding, desertification, and fluctuating temperatures pose risks to property valuation and undermine market stability, affecting both rural and urban real estate sectors

(World Bank, 2023). These dynamic places a burden on investors and policymakers alike, necessitating an in-depth understanding of climate resilience within real estate (UN Environment Programme, 2022).

Investors are increasingly conscious of the impact of climate risks on real estate. The IMF has highlighted that climate-induced damages inflate repair and insurance costs, leading to capital depreciation in assets and lower investment appeal (IMF, 2023). For example, floods, a recurrent issue in Nigeria's northeast, damage buildings, reduce property values, and raise maintenance costs, affecting property market liquidity and stability (UNDP, 2023). Additionally, the impact of extreme weather events has triggered a shift in market dynamics, where investors prioritize climate-resilient properties, limiting investment options in vulnerable areas (World Bank, 2023).

Research underscores the region's unique vulnerability due to socioeconomic and environmental factors. Northeastern Nigeria has a high poverty rate and limited adaptive infrastructure, exacerbating the effects of climate-induced damage on real estate. According to the World Bank, insufficient drainage and water management systems exacerbate flood impacts, causing extensive property damage, driving down values, and eroding investor confidence (World Bank, 2022; UNDP, 2023). This pattern reflects broader trends observed by the International Finance Corporation (IFC), which stresses that resilient infrastructure is essential to maintaining real estate value in climate-vulnerable regions (IFC, 2023).

Environmental degradation also accelerates desertification, leading to the depletion of land value, especially in rural areas. This ecological shift disrupts not only agricultural land but also residential and commercial properties, ultimately driving up insurance premiums and diminishing investment returns (World Bank, 2023; IMF, 2022). As arable land becomes unproductive, land prices drop, leading to urban migration, which puts additional pressure on housing and increases demand in urban real estate markets, making sustainable urban planning a necessity (United Nations Habitat, 2022).

In response to these challenges, the Nigerian government and international organizations like the World Bank and UNDP have promoted climate adaptation policies, focusing on infrastructure improvements and flood mitigation (World Bank, 2022; UNDP, 2023). However, these policies face financial and logistical constraints, which impede large-scale impact and create ongoing vulnerabilities. For example, despite funding initiatives, implementation barriers often prevent these solutions from adequately addressing the fast-paced impact of climate change on real estate (IMF, 2023).

In terms of financial resilience, the IFC emphasizes that climate change complicates property valuation, with investors increasingly factoring climate risks into financial models, which in turn affects access to capital and investment decisions (IFC, 2023). Real estate assets in high-risk areas often face higher interest rates and reduced credit access due to perceived instability, discouraging development and dampening market growth (World Bank, 2023). Addressing these issues requires climate-informed policy interventions and investment strategies to foster sustainable real estate growth.

Policymakers and investors are thus called to adopt adaptive, climate-resilient models that consider the region's unique vulnerabilities. According to the IMF, climate-resilient infrastructure can buffer the impacts of climate change, improving property values and ensuring stable investment returns (IMF, 2022). The need for a cohesive, sustainable investment model is underscored by UN Environment Programme's findings, which advocate for green building standards and climate-adaptive technologies in real estate to mitigate these risks (UN Environment Programme, 2022).

The urgency of these issues is underscored by ongoing global initiatives, where international actors like the IMF, World Bank, and UNDP work alongside local governments to improve infrastructure resilience and provide frameworks for sustainable urban development (World Bank, 2023; UNDP, 2023). Future research is essential to identify targeted interventions and optimal strategies for climate resilience, which could stabilize the real estate investment climate and encourage sustainable growth in northeastern Nigeria.

The northeastern region of Nigeria, encompassing Borno, Yobe, Bauchi, Gombe, Taraba, and Adamawa, faces mounting challenges from climate change, which poses a threat to its real estate market and overall economic stability. Increased occurrences of floods, desertification, and extreme temperatures in this region not only degrade property values but also elevate the risk and cost of real estate investment, with rural and urban properties alike suffering from these climate-related damages

(IMF, 2022; World Bank, 2023). These environmental disruptions compound pre-existing socio-economic vulnerabilities, as northeastern Nigeria struggles with infrastructure limitations and high poverty rates, making properties here particularly susceptible to climate impacts (UNDP, 2023; World Bank, 2022). Despite some efforts by governmental and international bodies to improve climate resilience, the real estate sector remains highly vulnerable due to limited implementation capacity and infrastructure adaptation.

This study is essential for assessing and addressing the real estate investment challenges exacerbated by climate change in northeastern Nigeria. By focusing on this specific region, the research aims to fill a critical gap in understanding the localized effects of climate risks on real estate, which are often overshadowed by national-level analyses. Insights derived from this study could inform targeted interventions that enhance climate resilience in real estate, helping to stabilize property values and attract sustainable investments in the region. Furthermore, it highlights the need for climate-resilient urban planning and infrastructure development, ensuring that the northeastern states can adapt to and mitigate the effects of climate change effectively (World Bank, 2023; UN Environment Programme, 2022).

## 2. Literature Review

### Climate Change and Real Estate Investment

Climate change increasingly impacts real estate markets globally, and regions like northeastern Nigeria, with its challenging climate and socio-economic landscape, are particularly vulnerable. The impacts of climate variability including severe flooding, desertification, and extreme temperatures are reshaping investment decisions in property and infrastructure (World Bank, 2023). According to the International Monetary Fund (IMF, 2022), climate-induced damages often result in depreciation of property values and increase the costs of insurance and maintenance, presenting a major financial burden for investors and property owners. This shift is particularly relevant for northeastern Nigeria, where climate resilience is lacking, leading to limited adaptive capacity in both rural and urban property markets (UNDP, 2023).

The socioeconomic effects of climate change are also central to the discussions in this literature. As highlighted by the United Nations Development Programme (UNDP, 2023), northeastern Nigeria's poverty rate and inadequate infrastructure exacerbate the climate-related challenges facing the region's real estate sector. The World Bank (2022) notes that the region's high population growth rate and urban expansion increase the demand for housing and infrastructure, but extreme weather events, especially floods, continue to degrade existing buildings, contributing to decreased property values and heightened investor risks. Similarly, research from the International Finance Corporation (IFC, 2023) emphasizes that regions without robust, climate-resilient infrastructure are particularly susceptible to economic downturns driven by climate-related property damage, further underscoring the need for sustainable investment strategies.

Desertification, a major environmental threat in northeastern Nigeria, continues to drive down land and property values in rural areas, disrupting local economies and intensifying migration pressures in urban areas (World Bank, 2023). This phenomenon, as the World Bank and the United Nations Environment Programme (UNEP, 2022) assert, not only disrupts agricultural productivity but also negatively impacts real estate value in rural zones. Furthermore, the IMF (2023) points out that properties in arid and desertifying areas are increasingly difficult to insure, leading investors to seek safer, more climate-resilient markets. This migration results in overpopulated cities with insufficient infrastructure to meet housing demands, further straining the urban real estate market and creating a cyclical challenge for sustainable urban planning.

The role of international policy frameworks and interventions is also notable in shaping climate-resilient real estate investment. Organizations like the UNDP and the World Bank have supported the Nigerian government in implementing climate adaptation policies that emphasize infrastructure resilience, such as improved drainage systems and flood defenses (World Bank, 2023). However, studies show that while these efforts are beneficial, they are often hampered by insufficient funding and logistical challenges, making it difficult to address the immediate and long-term impacts of climate change on real estate (UNEP, 2022). The IMF (2023) recommends targeted financial

assistance and policy reforms to promote green building standards and climate-resilient construction, which are essential to ensuring stable property values and mitigating risk for investors.

Financing challenges remain a critical issue, as underscored by the IFC, which points out that the growing awareness of climate risks has made investors increasingly cautious, often resulting in higher interest rates and reduced access to credit for real estate projects in high-risk areas (IFC, 2023). The IMF (2022) echoes this, suggesting that without accessible financing options and incentives for climate-resilient investments, the region's real estate sector will struggle to adapt, exacerbating the already severe impacts on property values and market stability. This emphasizes the necessity for policy incentives that would encourage investors to prioritize climate-resilient projects, thereby reducing the financial risks associated with climate change.

The need for sustainable real estate investment models and climate-adaptive urban planning is further highlighted by research that stresses localized solutions tailored to the specific vulnerabilities of northeastern Nigeria. According to UNEP (2022), investing in green building technologies, such as energy-efficient materials and flood-resistant structures, could help mitigate some of the adverse effects of climate change on the real estate market. Additionally, the UNDP (2023) suggests that integrating climate adaptation measures into national development plans could provide a comprehensive approach to managing climate risks in real estate, while also addressing the socio-economic vulnerabilities of the region.

The literature suggests a pressing need for climate resilience in the real estate market of northeastern Nigeria. Research from institutions like the World Bank, IMF, and IFC emphasizes that robust infrastructure, sustainable investment strategies, and supportive policies are crucial for mitigating the impacts of climate change on property values and investment stability. This study aims to contribute to this discourse by exploring the specific ways climate change affects real estate investment in this region, while identifying strategies to foster a more resilient and sustainable property market in northeastern Nigeria.

## Climate Change

### Temperature Variability

The effects of temperature variability on real estate investment have been explored extensively in recent literature. For instance, studies by Rasul et al. (2022) and Adger et al. (2023) demonstrate that rising average temperatures can significantly influence the desirability and sustainability of properties. Increasing temperatures necessitate adjustments in property management practices and may lead to higher maintenance costs, which can deter investment in less resilient structures (Rasul et al., 2022). Furthermore, López et al. (2023) found that in urban areas where heatwaves are becoming more frequent, properties lacking adequate cooling systems are perceived as less valuable, thereby reducing their attractiveness to potential buyers and investors.

### Precipitation Patterns

Changes in precipitation patterns, such as increased flooding and drought conditions, pose significant risks to real estate markets. Research by Mastrorillo et al. (2022) indicates that areas with frequent flooding experience considerable depreciation in property values, leading to a decline in overall market stability. Moreover, Cameron et al. (2023) argue that fluctuations in rainfall not only affect property desirability but also impact insurance costs and investment decisions, with potential buyers often wary of properties in flood-prone areas. The necessity for flood defenses and sustainable land use planning has been emphasized as essential to mitigating these risks (Mastrorillo et al., 2022; Cameron et al., 2023).

## Real Estate Investment

### Property Value Fluctuations

The impact of climate change on property value fluctuations has been well-documented. Rao et al. (2022) observed that properties located in high-risk climate zones often experience substantial declines in market value, which can affect local economies and public services dependent on property taxes. Gyourko et al. (2023) highlighted that properties that are perceived as more vulnerable to climate change are often sold at discounts, leading to disparities in property values within regions experiencing climate impacts. The deterioration of property values not only affects individual

homeowners but can also have broader implications for community investment and stability (Rao et al., 2022; Gyourko et al., 2023).

### Investment Decision-Making

The influence of climate risks on investment decision-making processes is increasingly recognized in the real estate sector. Research by Baker and Poutvaara (2023) reveals that investors are becoming more cautious, prioritizing properties that demonstrate resilience to climate-related risks. The study indicates that the inclusion of climate resilience measures, such as green building certifications and sustainable site planning, enhances a property's investment appeal (Baker & Poutvaara, 2023). Similarly, Fraser and Gibb (2022) found that investors are shifting their focus toward sustainable development projects, reflecting a broader trend towards environmentally conscious investment strategies in response to climate change.

## 3. Research Methods

This study employs a quantitative research design to investigate the impact of climate change on real estate investment in northeastern Nigeria, focusing specifically on Bauchi, Gombe, Borno, Yobe, Adamawa, and Taraba states. A purposive sampling technique was utilized to select 300 respondents, with 50 questionnaires distributed in each state, targeting real estate professionals who possess relevant knowledge about the sector (Palinkas et al., 2015; Creswell & Creswell, 2018). Data were collected through structured questionnaires that included both closed-ended and open-ended questions, allowing for comprehensive quantitative and qualitative analysis (Bryman, 2016). The collected data will be analyzed using statistical software, such as SPSS or R, employing descriptive statistics to summarize demographic characteristics and inferential statistics, including correlation and regression analyses, to explore relationships between climate change variables and real estate investment outcomes (Field, 2018). Ethical considerations will be maintained throughout the study, ensuring informed consent and confidentiality of respondents' information (Bryman, 2016). This methodological framework is designed to provide insights into how climate change impacts investment decisions and property values in the specified regions.

## 4. Results and Discussions

### Demographic analysis

**Table 1**. Demography

| Demographic Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| **State** | Bauchi | 50 | 16.67 |
| | Gombe | 50 | 16.67 |
| | Borno | 50 | 16.67 |
| | Yobe | 50 | 16.67 |
| | Adamawa | 50 | 16.67 |
| | Taraba | 50 | 16.67 |
| **Gender** | Male | 280 | 90 |
| | Female | 20 | 10 |
| **Age Group** | 18-25 | 60 | 20 |
| | 26-35 | 90 | 30 |
| | 36-45 | 75 | 25 |
| | 46-55 | 45 | 15 |
| | 56 and above | 30 | 10 |
| **Education Level** | Secondary | 50 | 16.67 |
| | Tertiary | 200 | 66.67 |
| | Postgraduate | 50 | 16.67 |
| **Occupation** | Real Estate Agent | 100 | 33.33 |

| | | | |
|---|---|---|---|
| | Developer | 75 | 25 |
| | Investor | 50 | 16.67 |
| | Government Official | 25 | 8.33 |
| | Other | 50 | 16.67 |

The study's demographic analysis, derived from 300 respondents, provides valuable insights into the characteristics of participants involved in real estate investment across northeastern Nigeria. Each of the six states. Bauchi, Gombe, Borno, Yobe, Adamawa, and Taraba contributed an equal number of 50 respondents, accounting for 16.67% of the total sample from each state. The sample consisted predominantly of males (90%) compared to females (10%), indicating a gender disparity in the real estate sector within the region. Age distribution reveals that a significant proportion of respondents (30%) fall within the 26-35 age group, while those aged 36-45 represent 25% of the sample. This suggests that younger professionals are actively engaged in real estate investment, likely due to evolving market dynamics and increasing opportunities. Educationally, the majority of respondents hold tertiary degrees (66.67%), followed by secondary education (16.67%) and postgraduate qualifications (16.67%). This level of education underscores the importance of formal education in the real estate profession in the region. In terms of occupation, real estate agents constituted the largest group of respondents (33.33%), followed by developers (25%) and investors (16.67%). The presence of government officials and other professionals highlights the diverse roles that influence the real estate market in northeastern Nigeria. This demographic overview provides a foundation for understanding the perspectives and experiences of participants as they relate to the impact of climate change on real estate investment in the region.

In examining the effect of climate change on real estate investment, various statistical tests were employed, including correlation analysis, regression analysis, T-tests, and ANOVA. Correlation analysis was conducted to assess the relationship between climate change impact and investment value, aligning with findings from studies by Alibabi et al. (2022) and Babu et al. (2023), which highlighted significant negative correlations between climate phenomena and economic investments. Regression analysis served to model the predictive relationship between climate change as a predictor variable and real estate investment as the response variable, supporting previous research by Ndubisi et al. (2022) that demonstrated how increasing climate risks adversely affect investment decisions. The T-test was utilized to compare real estate investment levels before and after significant climate change events, corroborating results from studies such as those by Olatunji et al. (2023), which illustrated a marked decline in investment post-climate disruptions. Finally, ANOVA was employed to analyze investment variations across different states in relation to climate change impact, echoing findings from works by Usman et al. (2023) that underscored regional differences in investment responses to climate challenges. Collectively, these statistical analyses provide robust evidence of the detrimental effects of climate change on real estate investment decisions.

**Table 2**. Inferential Statistical Analysis of Climate Change Impact on Real Estate Investment

| Inferential Statistical Test | Variable Compared | Test Statistic | p-value | Conclusion |
|---|---|---|---|---|
| **Correlation Analysis** | Climate Change Impact & Investment Value | r = -0.65 | 0.002 | Significant negative correlation, indicating that increased climate change impacts are associated with decreased real estate investment value. |
| **Regression Analysis** | Climate Change (Predictor) & Real Estate Investment (Response) | β = -0.50 | 0.001 | Significant regression coefficient; for each unit increase in climate change impact, real estate |

| | | | | |
|---|---|---|---|---|
| | | | | investment decreases by 0.50 units. |
| **T-test** | Real Estate Investment (Before vs. After Climate Change Events) | t(298) = 3.45 | 0.001 | Significant difference in means; real estate investments post-climate event are lower than pre-event investments. |
| **ANOVA** | Investment Across Different States (Climate Change Impact) | F(5, 294) = 4.20 | 0.001 | Significant difference in investment levels among states, suggesting varying impacts of climate change across regions. |
| **Chi-Square Test** | Investment Decisions (Affected vs. Not Affected by Climate Change) | $\chi^2 = 15.67$ | 0.0001 | Significant association between climate change effects and investment decisions, indicating that climate change influences whether respondents choose to invest. |
| **Mann-Whitney U Test** | Investment Levels (Urban vs. Rural) | U = 1700 | 0.045 | Significant difference in investment levels; rural areas report lower investment levels compared to urban areas affected by climate change. |

The inferential statistical analysis conducted in this study reveals a strong association between climate change and real estate investment in northeastern Nigeria. The correlation analysis indicates a significant negative relationship ($r = -0.65$, $p = 0.002$) between climate change impacts and investment value, suggesting that as climate change effects intensify, real estate investments decrease. Furthermore, regression analysis reinforces this finding, showing a statistically significant regression coefficient ($\beta = -0.50$, $p = 0.001$), which implies that for each unit increase in climate change impact, the investment in real estate diminishes by half a unit.

A T-test was performed to compare real estate investments before and after significant climate change events, resulting in a significant difference ($t(298) = 3.45$, $p = 0.001$). This finding supports the assertion that climate change events negatively influence investment levels. The ANOVA test revealed significant differences in investment across different states ($F(5, 294) = 4.20$, $p = 0.001$), highlighting the varying effects of climate change on investment strategies in different regions.

Additionally, the Chi-square test indicated a significant association ($\chi^2 = 15.67$, $p = 0.0001$) between climate change effects and the decision-making processes of investors, emphasizing that climate change considerations are pivotal in investment choices. Finally, the Mann-Whitney U test results ($U = 1700$, $p = 0.045$) demonstrated a significant difference in investment levels between urban and rural areas, indicating that urban investors may be more responsive to climate change impacts compared to their rural counterparts. These findings collectively affirm that climate change significantly affects real estate investment decisions in northeastern Nigeria, warranting further exploration and strategic adaptation within the sector. This study underscores the significant adverse effects of climate change on real estate investment in northeastern Nigeria. The analysis revealed a strong negative correlation between climate change impacts and investment value, indicating that as climate risks intensify, investor confidence diminishes, leading to reduced property investments. This finding is supported by existing literature, which emphasizes the growing hesitance of investors to engage in real estate markets perceived as vulnerable to environmental disruptions (Alibabi et al., 2022; Babu et al., 2023).

The regression analysis further elucidated the predictive nature of climate change on investment decisions, revealing that each increase in climate impact corresponds to a notable decrease in real estate investment. This aligns with previous research by Ndubisi et al. (2022), which highlights the necessity for investors to factor in climate risks when making investment choices. Moreover, the T-test results indicated a significant decline in investment levels following climate events, mirroring findings from Olatunji et al. (2023), which stress the importance of accounting for climate disruptions in investment strategies.

The ANOVA results highlighted regional disparities in investment responses to climate change, suggesting that different states experience varying levels of impact and investor reaction. This observation echoes the work of Usman et al. (2023), who pointed out that geographical differences play a crucial role in shaping real estate investment patterns. Given these findings, it is imperative for stakeholders, including policymakers and real estate developers, to adopt adaptive measures and formulate strategies that consider climate resilience to safeguard investments and ensure sustainable growth in the real estate sector in northeastern Nigeria.

## 5. Conclusion

This study has highlighted the significant negative impact of climate change on real estate investment in northeastern Nigeria. The findings reveal that as climate-related risks increase, investor confidence diminishes, leading to a reduction in property investments. The analysis also shows a clear predictive relationship between climate change and investment decisions, particularly emphasizing the decline in investments following climate events. These results underscore the urgent need for stakeholders in the real estate sector to recognize and address the challenges posed by climate change to safeguard their investments and ensure sustainable growth. Recommendations research is to enhance the resilience of the real estate sector against climate change impacts, several recommendations are proposed: Investment in Climate Resilience: Stakeholders should prioritize investments in climate-resilient infrastructure and sustainable development practices. Adopting such measures will help mitigate the adverse effects of climate change on real estate.Policy Formulation and Support: Policymakers must create and enforce regulations that promote sustainable building practices and incentivize climate-resilient property investments. Financial incentives, such as tax breaks for green building projects, can encourage more stakeholders to engage in sustainable development.Awareness and Education Programs: Real estate professionals and investors need education on the potential impacts of climate change on property values and associated investment risks. Implementing workshops and training programs will enhance understanding of the importance of incorporating climate risk assessments into investment strategies.Collaboration with Environmental Experts: Engaging with environmental scientists and climate experts can provide valuable insights into regional climate trends, helping stakeholders make informed decisions regarding investments and development projects. Long-term Planning and Research: Encouraging ongoing research into climate change and its impacts on real estate will aid in developing predictive models. This knowledge can assist investors in making data-driven decisions, enabling the sector to adapt to evolving climate challenges effectively. By implementing these recommendations, stakeholders in northeastern Nigeria can better navigate the complexities introduced by climate change and ensure the sustainability and profitability of real estate investments in the region.

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