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# Evaluating Control Strategies for Climate Threat Mitigation in Kogi State, Nigeria: A Survey-Based Approach

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***Abstract***

*Climate change produces adverse effects on a nation's advancement by undermining biodiversity. Nations must work towards the Sustainable Development Goals. This empirical study addresses issues relating to the attainment of SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action), and SDG 15 (Life on Land). The research evaluates the effectiveness of current control strategies in addressing climate-related threats, with emphasis on flood control initiatives and land use planning for flood mitigation and land degradation control. Survey methodology was utilised: 158 residents were randomly selected from Lokoja, Kogi State, Nigeria. Data was collected using a closed-ended questionnaire with a 5-point Likert scale ranging from agree to disagree. The study employed SPSS for data analysis, encompassing descriptive and regression analysis. The cumulative Cronbach's alpha result was 0.717, signifying that the research instrument was appropriate for the study. Upon analysis, the study revealed that flood control initiatives do not have a statistically significant effect on flood mitigation because a significant value of 0.103 was obtained, which is lower than the 0.05 threshold. Similarly, the results indicated that the current land use planning practices do not significantly affect land degradation control, as the p-value of 0.193 is below the stated threshold of 0.05. The study's lack of statistical significance emphasises the need to monitor and evaluate the ineffectiveness of the existing flood control and land use strategies. It calls on the attention of key environmental agencies at the federal, state, and local levels, like the Bureau of Public Procurement (BPP), the Nigerian Meteorological Agency (NiMet), National Emergency Management Agency (NEMA), the Kogi State Emergency Management Agency (KOSEMA), the Kogi State Ministry of Environment (MOE), the Ministry of Lands and Urban Development and the Kogi State Geographic Information System Agency (KOGISA) amongst others.*

***Keywords:*** *Control Strategies, Climate Threats, Flood Control Initiatives, Land Use Planning, Flood Mitigation, Land Degradation*

## 1. Introduction

Like other countries, Nigeria experiences the repercussions of climate change, evidenced by an increase in temperature and other related elements (Sambo & Sule, 2024; Akano et al., 2023; Madaki et al., 2023). The variations in rainfall patterns over time have resulted in extreme weather conditions, including intense wet and dry seasons and floods, impacting various regions of the country. A 2022 assessment indicated that Nigeria ranks among the seven countries most susceptible to climate change, subjecting its population

to several climate-related disasters (Yusuf et al., 2023). The principal threats include floods, heatwaves, high river levels, and erosion, which consistently result in diminished agricultural output (food scarcity), increased poverty, population displacement, and conflicts, among other consequences. In 2021, Nigeria ranked 161 out of 182 countries in the Notre Dame Adaptation Initiative (ND-GAIN) index on its high vulnerability to climate-related disasters. This vulnerability is associated with a large population size, broad coastline, and inadequate public awareness (Ali et al., 2024).

Another concern is the significant occurrences and impacts of forest destruction and flooding in the North, leading to ecosystem disruption (Ifeanacho & Okudu, 2020). Recently (May 2024), over 200 individuals in Adamawa, Northern Nigeria, died due to an intense heatwave, which lasted for 13 days, with temperatures between 47 and 50 degrees (Daily Trust, 2024). This led to elevated heat cramps, exhaustion, measles, septicemia, dehydration, and other health complications. Notably, global concern for climate change issues like heat waves has been increasing consistently. In 2003, Europe experienced a heatwave that caused 70,000 fatalities. In 2010, Russia faced a similar disaster, resulting in 55,000 deaths (Garcia-Herrera et al., 2010; Aditya et al., 2021).

Additionally, the increase in unethical exploitation of the environment has been attributed as the primary cause of climate threats. Ugwuanyi and Kazeem (2023) observed that land degradation is a significant problem, especially in Nigeria's Savannah region. Logging and excessive reliance on firewood for cooking have resulted in a substantial loss of plant cover. In the south, forests are converted into grassland, with settlements and farms severely damaged by erosion. The Niger Delta region experiences severe flooding because of its complex canal network, unethical farming, and oil extraction operations. In 2012, Nigeria began experiencing severe climate variability and intense rainfall in the central and southern regions, resulting in recurring flood disasters that caused approximately $16.9 billion in losses and damages. These floods and other climate-related disasters contribute to a rise in disease, particularly vector-borne diseases (malaria, cholera, etc) (Adamaagashi et al., 2023).

According to econometric estimations, Nigeria might face losses ranging from 147 trillion naira to 676 trillion naira by 2050 if it does not effectively manage climate change (Adamaagashi et al., 2023). Notably, efforts have been made to address the underlying causes to mitigate their impact by establishing climate-related projects. Such projects include Flood Risk Management, Climate-Resilient Agriculture, and the Nigeria Climate Change Response Programme (NCCRP), among others. Nonetheless, these projects have faced criticism for their ineffectiveness, stemming from poor administration and inadequate funding.

Previous studies mainly focused on flood early warning systems or assessing flood risk from a technical perspective to understand the extent and implications of floods, especially in Niger Delta regions (Bayelsa, Akwa Ibom, Cross River, Edo, Delta, Imo, Ondo, Abia, and Rivers state) and Lagos. For instance, Nkwunonwo et al. (2019) utilised Geographic Information Systems (GIS) and remote sensing technology to delineate flood-prone regions in Nigeria, pinpointing susceptible areas. Isiaka et al. (2023) assessed flood risk in Lagos, highlighting the necessity for enhanced urban design and infrastructure to alleviate flood risks. Furthermore, Ugonna (2020) and Ottah (2017) evaluated the efficacy of flood early alert systems from the viewpoint of institutions tasked with mitigating floods. This prior research established a basis for comprehending flood assessment, dangers, and mitigation measures in specific states. However, they did not incorporate

the viewpoints of local community members (residents) who have direct experience with flood occurrences and the effectiveness or ineffectiveness of the implemented measures. Consequently, a thorough investigation is required to assess the effectiveness of current strategies for addressing climate risk (flooding) designed for residents. This study addresses significant gaps by utilising Kogi State as a case study (sub-national), utilising survey techniques to unveil comprehensive findings from stakeholders' (community members) perspectives.

Hence, the specific research objectives include;

i. Assess the effectiveness of flood control initiatives on flood mitigation in Kogi State, Nigeria.
ii. Evaluate the effectiveness of land use planning initiatives in controlling land degradation in Kogi State, Nigeria.

## 2. Literature Review

### *2.1 Conceptual Review*

#### *2.1.1 Climatic Threat (CT)*

The increased variability of weather occurrences, comprising alterations in frequency and intensity, is a hallmark of climate change (IPCC, 2001). Climate change poses a significant threat to industrialised and developing nations, endangering humans and the natural environment. Although the severity of the effect may vary, the consequences are catastrophic in both cases. Dorgbetor et al. (2022) observed that wealthy nations had experienced a relatively milder impact of climate change due to inherent advantages like adaptation structures, modern technology, automated farming practices, and financial stability. In contrast, the effects of climate change are particularly critical for less developed countries like Nigeria, primarily due to high temperature levels, limited capacity for adaptation, and the ineffective early warning system (Ebele & Emodi, 2016). Climate change is a complex issue that presents significant challenges to humanity. The impacts of climate change impede Nigeria's overall economic progress, encompassing the physical, human, and natural capital.

#### *2.1.2 Control Strategies (CS)*

Control strategies are deliberate and systematic approaches to supervise and influence a system, situation, or behaviour to achieve a specific target (Cabeza and Chàfer, 2020). Control strategies for addressing climate change include economic instruments like incentives, subsidies, and taxation; management approaches involving planning, monitoring, and assessments; technological innovations focused on energy efficiency and environmentally friendly infrastructure; educational programs to promote behavioural change; and social and grassroots efforts that encourage public involvement and community-led initiatives (Masud & Khan, 2024). Nigeria has instituted several measures to address climate change, integrating them into national, local, and state strategies. These cover community awareness, forest regeneration, early warning systems, a move to renewable energy sources, and promoting environmentally conscious farming methods. Other programs include the Climate Change Strategy policy, the Nigeria Climate Change Policy Response and Strategy 2021–2030, and others. However, these initiatives have proven ineffective, failing to produce substantial results in climate adaptation or sustainable practices. The nation continues facing multiple climate-related

concerns; in 2024, climatic issues resulted in over 300 deaths, with 1.2 million individuals impacted by floods across 33 states (OCHA, 2025).

*2.1.3 Flooding (Fdg)*

Floods are catastrophic weather conditions caused by natural and human activities. Donuma et al. (2024) claimed that flooding is more common in developing nations because of inadequate environmental management practices. This has been linked to weak institutional and legal structures, like developers constructing buildings without considering the specific places prone to flooding. Developing drainage channels and other management techniques that can lessen floods is further impeded by a lack of funding from the appropriate institutions in Nigeria. The persistent issue of flooding in Nigeria is a significant concern that detrimentally affects individuals' livelihoods and economic and social pursuits (Evan et al., 2017). Several factors contribute to flooding in Nigeria, including improper waste disposal, unethical agricultural activities, excessive discharge from heavy rainfall, dams, population growth, and inadequate enforcement of land use practices. The country is deficient in prioritising specific measures in flood-prone regions, such as proper drainage systems, monitoring and alarm systems, and evacuation housing schemes.

*2.1.4 Flood Control Initiatives (FCI)*

Flood control initiatives are designed to prevent or minimise the adverse effects of flooding, reducing its effect on living and non-living things (Hu et al., 2024). These initiatives encompass floodplain control, watershed oversight, flood warning systems, wetland restoration, flooding insurance coverage, and tech-driven flood risk mapping systems. A significant approach to addressing flood concerns is implementing a Flood Early Warning System (FEWS) (Onafeso & Samuel,2012). In Nigeria, the Federal Government collaborates with the Federal Ministry of Education's Department of Erosion, the National Emergency Management Agency (NEMA), and the Nigerian Meteorological Agency (NiMet) to implement and manage this system. The system is engineered to proactively mitigate flooding events by detecting them six hours in advance (Biantoro et al., 2024). It comprises data acquisition and transmission elements, predictive modelling, and emergency preparedness. The major objective is to implement pre-emptive measures to reduce the likelihood of loss of property and ecosystems. Despite the establishment of these systems at various levels, there has been limited success due to implementation problems, organisational failures, and weak supervisory controls. For instance, in 2012, despite the flood alerts from FEWS, more than 600,000 residents became homeless in Kogi State, and widespread damage occurred (Punch Newspaper, 2016). This was attributed to challenges in real-time response and localised coverage from NEMA and NiMet, leading to diminished rescue rates.

*2.1.5 Land Use Planning (LUP)*

Land use planning is a process wherein relevant stakeholders negotiate and determine the sustainable utilisation of land from the inception phase to implementation (Sangawongse et al. 2021). Sustainable land use planning encompasses allocating land for manufacturing, recreational areas, waste management sites, and infrastructure development, among other purposes. Masoudi et al. (2023) noted that land use planning is sustainable when it aligns with social, environmental, technical, and longevity dimensions. The ecological dimension suggests that land use planning should be rationally acceptable, compatible, and implemented mainly by those affected. On the

other hand, the economic aspect indicates that the planned measures must align with the local population's technological, commercial, and organisational capacities. The social element necessitates consideration of the nature and distribution of benefits that involve socially disadvantaged individuals. LUP must incorporate long-term preservation by developing measures that sustain the natural ecosystem over time. However, the extensive LUP framework remains ineffective in Nigeria. Insufficient enforcement, coordination weaknesses, and corruption are the hallmarks of existing systems, producing widespread flooding issues. There are current issues of urban expansion into wetlands and floodplains. For instance, Bayelsa State's recent land expansion violates LUP standards, leading to the growth of slums and recurrent flood disasters (Ingiabuna, 2020).

### *2.1.6 Land Degradation (LD)*

Land degradation refers to the decline in the quality and productivity of an ecosystem, like soil, water, land, forests, and biodiversity. Land degradation happens by natural causes (excessive or insufficient water) or human activities, damaging crops and land. Consequently, it increases losses before, during, and after harvesting (Molnárová et al., 2023). When rainfall decreases significantly, the land becomes less hot and humid, leading to lower water levels in rivers and streams. Consequently, farmers invest additional effort in sourcing water for irrigation, so they waste time needed for agricultural productivity. Agriculture and forests are critical elements of Nigeria's natural capital, providing substantial employment opportunities and revenue streams. However, climate change significantly threatens the quality and quantity of these assets. Climate change adversely affects livestock production through reduced grazing land, limited water for animals, and elevated pH levels in water caused by higher temperatures and evaporation. This results in a decline in the quantity, quality, and accessibility of animal-based products.

Furthermore, forestry is impacted by induced flooding and extreme wind conditions, reducing forest yield, such as timber. The decline results in diminished income and an escalation in the costs of construction and furnishing supplies. Spanning five years, Nigeria's annual loss due to forest degradation is ₦120 billion (1.7% of the nation's total GDP) (Onuoha, 2009).

## *2.2 Theoretical Framework*

The research is anchored on the theory of externalities.

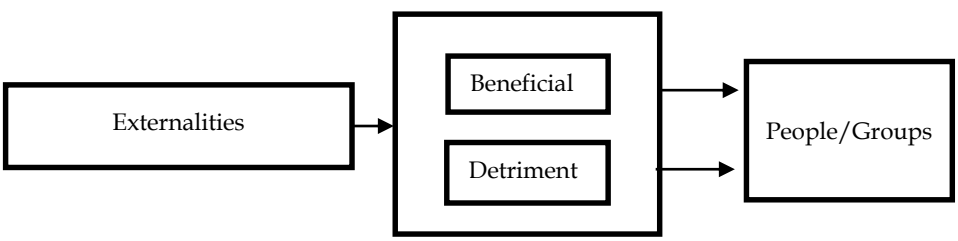


Figure 1: Theoretical Framework
*Source:* Created by the authors

### 2.2.1 Theory of Externalities (ToE)

According to Buckley and Liesch (2023), externalities are the effects that choices or actions have on people or groups that are not directly involved in the process of making the decision or the deal. Regarding floods, externalities manifest as either beneficial or detrimental. Adversely, flooding results in damage to properties, loss of means of living, forced relocation, and damage to facilities. Conversely, allocating resources to flood management initiatives can provide beneficial effects by decreasing the likelihood of floods and related expenses. Floods also have effects that spread outward and affect more than one building or area. For example, floods damage rivers and land sources, which lowers the quality of the water supplied to the affected environment and beyond. Also, floods lead to market failures because it does not take into account the true costs and benefits of flood control methods when setting prices. In these situations, the government may need to step in to make up for the losses through laws or investments. In essence, it either facilitates opportunities or poses threats.

## 2.3 Empirical Illumination (EI)

Bridge and Okwuchukwu (2023) examined flood risk and management strategies in Cross River State, Nigeria. Four hundred questionnaires were distributed to the participants, and data were obtained through questionnaires and interviews using multi-stage random sampling. The research employed descriptive and inferential statistics using frequencies, simple percentages, means (averages), and PPMC. Findings revealed a positive association between flood risk and the effectiveness of flood control strategies. The identified flood risk mitigation strategies in the region were mainly the construction of water drainage channels, waste disposal management, and afforestation. However, the most effective strategy was the development of drainage systems. The study provides significant data regarding flood risks and management, yet limitations are apparent. This research demonstrates subjective responder bias due to its dependence on self-reported surveys, as participants may provide only socially acceptable responses. Secondly, the researcher distributed 400 questionnaires within a specific region (Cross River, Nigeria) but did not define the number of respondents and the demographic mix of the participants, and limited the study to one location. As a result, the findings may be less applicable to a broader or dissimilar demography.

In their study, Effiong et al. (2024) investigated the relationship between land use planning and climatic adaptation in communities. The study employed a mixed-methods approach, collecting data via questionnaires (198 residences), supplemented by interviews (17 residents) and remote sensing tools to evaluate land use changes and community attitudes. The findings demonstrated a significant pattern in which economically disadvantaged farmers experience increased susceptibility to the impacts of climate change due to limited financial resources, as there are no strategies in place for support, which hampered their ability to implement adaptive land use practices. Findings show that farmland owners lacked the necessary information and access to strategies to address climate-related hazards. Additional examination using satellite imagery and mapping methodologies revealed alterations in land cover. At the same time, the flood assessment and vulnerability maps emphasised significant vulnerability throughout the selected area, particularly in downstream regions. The interviews revealed the challenges that hinder effective LUP, including unclear forecasts, inadequate statistics, and limitations in the organisational capacity of flood managers. Overall, the study demonstrates that the current land use planning practices are ineffective in

mitigating climatic threats. Some studies with similar reports came from (Molnárová et al., 2023; Yusuf et al., 2023 and Donuma et al., 2024), while some with dissimilar outcomes came from (Cabeza et al., 2020; Pelemo et al., 2020; Sangawongse et al., 2021; Buckley et al., 2023). The depth attained by mixed methods is acknowledged as the study incorporated surveys and interviews. Nonetheless, 198 residents and 17 participants in the interview are inadequate to capture the whole spectrum of experiences within the study area. Also, the study technique lacks precise criteria for participant selection, limiting the thorough identification of a distinct methodological process, and findings generalizability.

### *2.4 Hypothesis Development*

Stated below are the hypotheses considered:

$H_{01}$**:** There is no statistically significant effect of flood control initiatives on flood mitigation.
$H_{02}$**:** There is no statistically significant effect of land use planning on land degradation control.

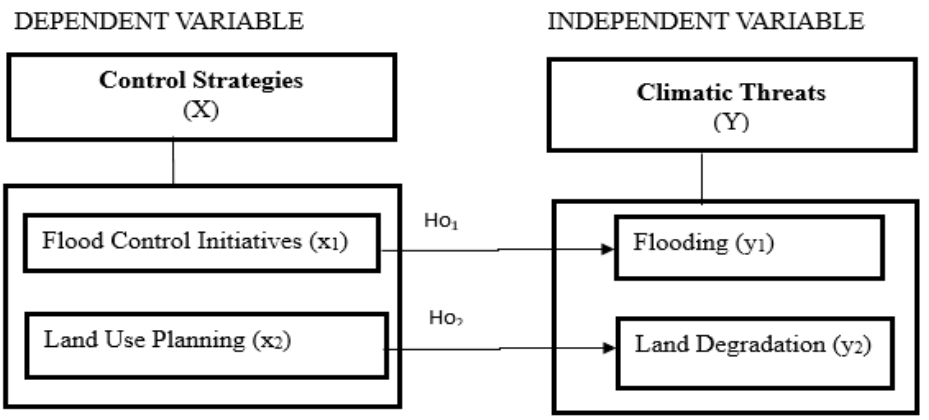


Figure 2: Conceptual Framework
*Source:* Created by the authors

## 3. Methodology

This research utilised a survey methodology to evaluate control measures for mitigating climate threats in Kogi State, Nigeria. Study participants were 158 residents randomly chosen from Ganaja town in Lokoja, the state capital. Participants were selected irrespective of social class or job type; however, only those aged 18 and above were considered. Data was collected using a closed-ended questionnaire with a 5-point Likert scale, which included the options Agree, Disagree, Neutral, Strongly Disagree, and Strongly Agree. The study employed SPSS for data analysis, utilising descriptive statistics (frequencies and percentages) and inferential statistics (regression analysis). Concerning ethical considerations, participants were guaranteed the confidentiality of their identities and informed of their right to withdraw from the study without facing negative repercussions. Cronbach's alpha was employed to assess the reliability of the research instrument with a sample size of 30, producing the following results:

**Table 1**
*The Results of the Test for Reliability*

| **Reliability Statistics** | | |
|---|---|---|
| Cronbach's Alpha | | Individual Item Statistics |
| .717 | Flood Control Initiatives | .787 |
| | Land Use Planning | .761 |
| | Flooding | .752 |
| | Land Degradation | .717 |

*Source:* Data Output from SPSS

As evidenced by the cumulative Cronbach's alpha value of 0.717, the 16-item questionnaire was determined to be internally consistent and valid. Each variable, including land degradation (0.717), land use planning (0.761), flooding (075), and flood control initiatives (0.717), demonstrated significant dependability and internal consistency.

## 4. Data Analysis and Results

The participants were expected to complete a total of 158 surveys. Out of these, a total of 141 were received out of the options provided; however, seven (7) of the questionnaires were deemed unsuitable and eliminated due to their lack of data in certain columns or rows. Consequently, a total of 134 (84.8%) questionnaires were considered appropriate for the analysis and for achieving the study's objectives.

### *4.1 Descriptive Analysis and Interpretation*

In this section, kindly note that:

SD is interpreted as Strongly Disagree

D is interpreted as Disagree

N is interpreted as a Neutral

A is interpreted as Agree

SA is interpreted as Strongly Agree

**Table 2**
*Respondents' Views Concerning Flood Control Initiatives*

| | | Frequency | (%) |
|---|---|---|---|
| The government has established efficient flood control measures. | SD | 110 | 82.1% |
| | D | 11 | 8.2% |
| | N | 6 | 4.5% |
| | A | 1 | 0.7% |
| | SA | 6 | 4.5% |
| | **Total** | **134** | **100%** |
| Flood warning systems and emergency response plans have been implemented. | SD | 106 | 79.1% |
| | D | 18 | 13.4% |
| | N | 5 | 3.7% |
| | A | 3 | 2.2% |
| | SA | 2 | 1.5% |

| | | | |
|---|---|---|---|
| | **Total** | **134** | **100%** |
| Regular maintenance and updating of flood control structures are performed. | SD | 63 | 47.0% |
| | D | 43 | 32.1% |
| | N | 6 | 4.5% |
| | A | 8 | 6.0% |
| | SA | 14 | 10.4% |
| | **Total** | **134** | **100%** |
| The implementation of flood risk mapping and zoning is strictly enforced. | SD | 118 | 88.1% |
| | D | 10 | 7.5% |
| | N | 2 | 1.5% |
| | A | 1 | 0.7% |
| | SA | 3 | 2.2% |
| | **Total** | **134** | **100%** |

*Source:* Data Output from SPSS

Table 2 shows respondents' views on Flood Control Initiatives. The results show that most respondents—110 individuals, or 82.1% of the sample overall—strongly disagreed with the government's establishment of an efficient flood control plan, and 106 individuals, or 79.1% of the sample, strongly disagreed with efficient and timely implementation of flood warning systems and emergency response plans in the area. Of those surveyed, 63 (47%) strongly disagreed that flood control structures are regularly maintained and upgraded, and 118 (88.1%) strongly disagreed that flood risk mapping and zoning are appropriately implemented.

**Table 3**

*Respondents' Views Concerning Land Use Planning*

| | | Frequency | Percentage (%) |
|---|---|---|---|
| The government has put in place efficient land-use planning policies that emphasise protecting the environment. | SD | 101 | 75.4% |
| | D | 23 | 17.2% |
| | N | 4 | 3.0% |
| | A | 3 | 2.2% |
| | SA | 3 | 2.2% |
| | **Total** | **134** | **100%** |
| The government has set aside places that are prone to flooding as off-limits for development. | SD | 93 | 69.4% |
| | D | 23 | 17.2% |
| | N | 2 | 1.5% |
| | A | 12 | 9.0% |
| | SA | 4 | 3.0% |
| | **Total** | **134** | **100%** |
| Land use planning ensures that critical infrastructure, such as hospitals, is located in secure areas. | SD | 100 | 74.6% |
| | D | 22 | 16.4% |
| | N | 6 | 4.5% |
| | A | 3 | 2.2% |
| | SA | 3 | 2.2% |
| | **Total** | **134** | **100%** |
| The environmental impact of each construction is evaluated before approval. | SD | 96 | 71.6% |
| | D | 26 | 19.4% |
| | N | 5 | 3.7% |
| | A | 4 | 3.0% |

| | | | |
|---|---|---|---|
| | SA | 3 | 2.2% |
| | **Total** | **134** | **100%** |

*Source:* Data Output from SPSS

Table 3 illustrates the respondents' perspectives regarding land use planning. The data indicates that a majority of the respondents, specifically 101 individuals, accounting for 75.4% of the total sample, strongly disagreed with the government's implementation of effective land-use planning policies that prioritise environmental protection. Additionally, 93 individuals, accounting for 69.4% of the total sample, strongly disagreed with the government's designation of flood-prone areas as off-limits for development. One hundred respondents, or 74.6%, expressed significant disagreement with the assurance of land use planning in the location of critical infrastructure, such as hospitals, in secure areas. Furthermore, 96 individuals, who constitute 71.6% of the sample, expressed their significant disagreement with the notion that the environmental impact of each construction is assessed before its approval.

**Table 4**

*Respondents' Views Concerning Flooding*

| | | Frequency | Percentage (%) |
|---|---|---|---|
| The frequency of floods in my community destroys property and infrastructure. | SD | 8 | 6.0% |
| | D | 4 | 3.0% |
| | N | 3 | 2.2% |
| | A | 21 | 15.7% |
| | SA | 98 | 73.1% |
| | **Total** | **134** | **100%** |
| The community is socially affected by the constant relocation of individuals as a result of floods. | SD | 3 | 2.2% |
| | D | 6 | 4.5% |
| | N | 3 | 2.2% |
| | A | 23 | 17.2% |
| | SA | 99 | 73.9% |
| | **Total** | **134** | **100%** |
| The community experiences loss of life and health hazards because of floods. | SD | 4 | 3.0% |
| | D | 4 | 3.0% |
| | N | 1 | 0.7% |
| | A | 18 | 13.4% |
| | SA | 107 | 79.9% |
| | **Total** | **134** | **100%** |
| The economic damages resulting from floods hinder the development of the community. | SD | 8 | 6.0% |
| | D | 1 | 0.7% |
| | N | 1 | 0.7% |
| | A | 17 | 12.7% |
| | SA | 107 | 79.9% |
| | **Total** | **134** | **100%** |

*Source:* Data Output from SPSS

The data indicates that a significant majority of the respondents expressed strong agreement on the occurrence of floods in the area. More precisely, 98 individuals, accounting for 73.1% of the entire sample, strongly concurred that the occurrence of floods in their community results in the devastation of property and infrastructure. Similarly, 99 individuals (73.9% of the total sample) strongly agreed that the community

faces social repercussions due to the continuous displacement of individuals caused by floods. Also, 79.9% (107) of the respondents expressed significant agreement with the negative impact of floods on the community's well-being and health, as well as the hindrance of the town's progress owing to economic losses caused by floods.

**Table 5**
*Respondents' Views Concerning Land Degradation*

| | | Frequency | Percentage (%) |
|---|---|---|---|
| Our lands are seriously damaged due to overgrazing and deforestation. | SD | 1 | 0.7% |
| | D | 2 | 1.5% |
| | N | 3 | 2.2% |
| | A | 6 | 4.5% |
| | SA | 122 | 91.0% |
| | **Total** | **134** | **100%** |
| Land degradation results in soil erosion, reducing agricultural productivity. | SD | 11 | 8.2% |
| | D | 4 | 3.0% |
| | N | 3 | 2.2% |
| | A | 11 | 8.2% |
| | SA | 105 | 78.4% |
| | **Total** | **134** | **100%** |
| There has been a decrease in biodiversity due to land degradation. | SD | 4 | 3.0% |
| | D | 5 | 3.7% |
| | N | 4 | 3.0% |
| | A | 15 | 11.2% |
| | SA | 106 | 79.1% |
| | **Total** | **134** | **100%** |
| Land deterioration has left the area vulnerable to floods. | SD | 4 | 3.0% |
| | D | 5 | 3.7% |
| | N | 6 | 4.5% |
| | A | 16 | 11.9% |
| | SA | 103 | 76.9% |
| | **Total** | **134** | **100%** |

*Source:* Data Output from SPSS

Table 5 presents the respondents' perspectives on Land Degradation, revealing that a substantial most of the participants, specifically 122 individuals, accounting for 91% of the total sample, strongly affirmed that their lands have experienced significant harm as a result of overgrazing and deforestation. Furthermore, a significant majority of 105 participants, representing 78.4% of the whole sample, expressed strong agreement that land degradation leads to soil erosion, resulting in a subsequent decline in agricultural output. A total of 106 respondents, accounting for 79.1% of the sample, expressed significant agreement about the negative impact of land degradation on biodiversity, and a significant majority of 76.9% (103) of respondents expressed strong agreement that land degradation had rendered the area very vulnerable to floods.

### *4.2 Hypothesis Results*

$H_{01}$: There is no statistically significant effect of flood control initiatives on flood mitigation.

**Table 6**
*Test of the Effect of Flood Control Initiatives on Flood Mitigation*

| Model | R. | R-Square | t. | Sig.. | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .142[a] | .020 | 23.393 | .103[b] | .475 |
| *a. Predictors: (Constant), Flood Control Initiatives* | | | | | |
| *b. Dependent Variable: Flood Mitigation* | | | | | |

*Source:* Data Output from SPSS

Table 6 displays the findings of the linear regression results about the effect of flood control initiatives on the mitigation of floods. The findings indicate that flood control initiatives have a positive effect on flood mitigation, as evidenced by an R-value of 0.142. However, the low R-squared value of 0.020 shows that flood control initiatives can only account for a mere 2% of the variation in flood mitigation in the selected region of Kogi State, Nigeria; this means that these initiatives only have a minor effect, reducing flood occurrences by just 2%, while the remaining 98% can be attributed to other factors or error terms. Furthermore, the significance level of 0.005 is exceeded by the P-value of 0.103, implying that the regression model is not statistically significant. Consequently, the null hypothesis is accepted, indicating that the existing flood control initiatives do not have significant effects on flood mitigation in the selected area of Kogi State, Nigeria.

$H_{02}$: There is no statistically significant effect of land use planning on land degradation control.

**Table 7**
*Test of the Effect of Land Use Planning on Land Degradation Control*

| Model | R. | R-Square | t. | Sig. | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .113[a] | .013 | 39.735 | .193[b] | .481 |
| *a. Predictors: (Constant), Land Use Planning* | | | | | |
| *b. Dependent Variable: Land Degradation Control* | | | | | |

*Source:* Data Output from SPSS

The results suggest that LUP has a positive effect on mitigating land degradation, as shown by the R-value of 0.113. Nevertheless, the $R^2$ value of 0.013 indicates that the current land use planning accounts for just 1.3% of the variability in land degradation mitigation. The regression model was deemed insignificant based on the P-value of 0.193. Consequently, the null hypothesis was maintained, indicating that there is no statistically significant impact of the current land use planning on land degradation control in the region of Kogi State selected for the study.

## 5. Discussion of Findings

The findings of hypothesis one testing showed that there is no statistically significant effect of existing flood control initiatives on flood mitigation. This discovery aligned with the research conducted by Nkwunonwo (2020), who investigated the present challenges of flood control initiatives such as flood early warning systems and development efforts aimed at addressing flood-related issues in Nigeria. The study concluded that there was no significant statistical effect of flood early warning on the occurrence of flooding in Nigeria. Also, the research findings of Ottah (2017) are consistent with the results of this study. Ottah's study investigated the effects of early warning systems on flooding, specifically focusing on the use of warning mediums before, during, and after floods to increase awareness and encourage communities to

evacuate. The research revealed that despite residents of the study area listening to flood warnings broadcast, there was still no statistically significant effect of flood warnings on the mitigation of floods in the state. Secondly, the findings of hypothesis two testing indicated that there is no statistically significant effect of existing land use planning on land degradation control in the selected area in Kogi State. This finding resonated with the results of Effiong et al. (2024), the study used a mixed-methods (quantitative and qualitative) research strategy. The results revealed that the existing land use planning techniques were ineffective in addressing climate-related risks in the region, such as land degradation.

From the available information, including descriptive, graphical, and hypothesis testing data, and considering its consistency with past research, it can be concluded that flood control initiatives do not have significant effects on reducing floods, same for land use planning in mitigating land degradation. Despite the execution of many programs to address flood and land degradation issues in the chosen area, floods and land degradation continue to pose major dangers to the environment and communities, among other concerns.

### *5.1 Effect of FCI on Fg*

The findings of hypothesis one testing showed that there is no statistically significant effect of existing flood control initiatives on flood mitigation. An outcome that is not consistent with the positions of (Adamaagashi et al., 2023; Awewomom et al., 2024; Biantoro et al., 2024; and Hu et al., 2024). However, this discovery aligned with the research conducted by Ugonna (2020), who investigated the present challenges of flood control initiatives such as flood early warning systems and development efforts aimed at addressing flood-related issues in Nigeria. The study concluded that there was no significant statistical effect of flood early warning on the occurrence of flooding in Nigeria. Also, the research findings of Ottah (2017) are consistent with the results of this study. Ottah's study investigated the effects of early warning systems on flooding, specifically focusing on the use of warning mediums before, during, and after floods to increase awareness and encourage communities to evacuate. The research revealed that despite residents of the study area listening to flood warnings broadcast, there was still no statistically significant effect of flood warnings on the mitigation of floods in the state.

### *5.2 Effect of LUP on LD*

The findings of hypothesis two testing indicated that there is no statistically significant effect of existing land use planning on land degradation control in the selected area in Kogi State. This finding resonated with the results of Effiong et al. (2024). Also, it is consistent with the findings of (Molnárová et al., 2023; Yusuf et al., 2023; Donuma et al., 2024). Though in negation with assertions of (Cabeza et al., 2020; Pelemo et al., 2020; Sangawongse et al., 2021; and Buckley et al., 2023).

From the available information, it can be suggested that flood control initiatives do not consistently have significant effects on reducing floods, same for land use planning in mitigating land degradation. Despite the execution of many programs to address flood and land degradation issues in the chosen area, floods and land degradation continue to pose major dangers to the environment and communities, among other concerns.

## 6. Conclusion

The research investigated the effectiveness of current control strategies in mitigating climatic threats in Nigeria, with a specific emphasis on flood control initiatives, land degradation, flood occurrences, and land use planning. The results obtained from the tested hypothesis indicated that flood control operations had no statistically significant effect on mitigating floods since it had a significant value of 0.103, higher than the threshold of 0.05. This is a major challenge that the selected state is confronting, impeding its growth and development. Therefore, implementing flood control measures is crucial for mitigating the adverse consequences of floods, and establishing structures such as dams, canals, ponds, and flood barriers. Nevertheless, the effectiveness of flood-control measures in reducing floods varies depending on many variables, including the kind and scale of measures, local meteorological conditions, and the length and intensity of rainfall events. Hence, it is important to recognise that no singularly isolated solution can provide adequate protection against floods since successful flood risk management sometimes requires a combination of structural and non-structural measures.

Additionally, the results obtained indicate that land use planning does not have a statistically significant effect on reducing land degradation, since it has a significant value of 0.193 higher than the stated threshold of 0.05. The current issue is an intricate one that has a substantial influence on the expansion and progress of the region. Therefore, the proper implementation of efficient land use planning, using suitable methods and strategies, can successfully reduce land degradation. Land use planning helps identify areas that are prone to land degradation, such as those at risk of deforestation or soil erosion. To prevent further deterioration, appropriate actions can be performed by clearly defining these vulnerable areas.

Furthermore, land use planning can enhance the preservation of natural resources, such as forests and areas with significant biodiversity. It further promotes sustainable development by efficiently addressing economic, social, and environmental needs. The active participation of local communities in the land use planning process is crucial for ensuring its effectiveness. By involving them in the decision-making and implementation process, land use plans are more likely to effectively address the specific needs and concerns of the people residing in the area. As a consequence, this leads to enhanced outcomes in the management and prevention of land degradation. Hence, when implemented cohesively and with a particular focus on sustainability, land use planning can serve as a powerful tool in the management and prevention of land degradation.

## 7. Recommendation

Given that the current flood control operations had no statistically significant effect on mitigating floods and the current land use planning initiatives do not have a statistically significant effect on reducing land degradation, there are implications to be addressed.

These insights necessitate the following recommendations about policy and practice redirection:

### *7.1 Flooding*

Certain policy-making ministries and agencies need to redirect their policies and practices. For instance, NiMet should design area-specific warning systems and forecasting models that match local weather patterns, using scientific data to control

floods. Moreover, the Ministry of Information and Orientation should boost its efforts on flood prevention measures, using languages that natives can understand through local channels. In addition, NEMA, in collaboration with the Kogi State Emergency Management Agency (KOSEMA), should bolster community participation and capability building to enable locals to participate in flood mitigation programs and land use planning initiatives. Furthermore, the Kogi State Ministry of Environment (MOE) should redirect its efforts from building new flood control projects to maintaining existing drainage systems, dams, and canals because these assets require a functional state at all times, especially during high-risk periods.

### *7..2 Land Degradation*

Specific policy-making ministries and agencies need to redirect their policies and practices. For instance, anti-corruption organisations (such as the Economic and Financial Crimes Commission (EFCC), the Code of Conduct Bureau (CCB), and the Bureau of Public Procurement (BPP) should intensify actions to enhance the internal monitoring systems within environmental institutions through checks and balances. This is necessary to prevent mismanagement of resources meant for land use funding initiatives. More so, governments should enforce environmental policies through adequate release of resources and engagement of personnel to deliver actions according to established plans at the community level. Additionally, the government should establish independent evaluators to assess the current degradation to detect the impact and remedies required.

### *7.3 Land Use*

The policy-making ministries and agencies need to redirect their policies. For instance, the Ministry of Lands & Urban Development and KOGISA should embrace the practice of anchoring land use strategies on each region's specific ecological zones, socio-cultural practices, and urban growth trends instead of using identical solutions across the board. Also, the Ministry of Information and Orientation should boost its efforts to educate the public about responsible land practices. In addition, the Kogi State Town Planning Development Board should strictly enforce land use regulations, particularly within flood-prone regions, while establishing definitive consequences for rule breakers.

*An assiduous implementation of the recommendations provided above* would serve the purpose of resolving issues relating to flooding, land degradation, and land use in Kogi State, Nigeria.

### *7.4 Contribution to Knowledge*

The empirical findings from this survey-based study offered relevant insights. For instance, findings from the survey resulted in recommendations that could assist the Kogi State government on policies and practices toward superior mitigation of flood incidence, land degradation, and land use. Moreover, other parts of the world facing natural disasters like flooding could also benchmark the recommendations that emanated from this survey-based work. Also, this survey offered conceptual, theoretical and empirical illumination on variables projected in this paper; hence, this survey has contributed to the body of knowledge as relating to those variables highlighted in this work. More so, in the future, researchers could cite this work to enrich their literature clarifications.

### *7.5 Study Limitations*

The study offers significant insights into flood mitigation strategies and land use practices in Lokoja. Nevertheless, specific constraints are acknowledged. The study's variables were restricted to certain factors, with the geographical scope limited to Kogi State. Findings may not reflect the various environmental and infrastructural realities in other states in Nigeria. Future research may investigate various ecological initiatives across different states in Nigeria for broader, generalizable conclusions. The study methodology was restricted to quantitative methods, and data collection depended entirely on questionnaire responses. It is possible that the data had response biases. Surveys can be paired with qualitative methods (interviews and field observations) to gain in-depth findings and understanding.

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