



## Linking Climate Change to Economic Insecurity Among Vulnerable Groups in Zango Kataf Local Government Area, Kaduna State, Nigeria

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### Abstract

The study links climate change to economic insecurity of vulnerable groups in Zango Kataf Local Government Area. A cross-sectional survey design was employed to collect data from a representative sample of the population, including community leaders, religious leaders, and security personnel. The study area is characterized by a semi-arid climate with increasing temperatures and erratic rainfall patterns. The analysis focuses on the impacts of climate change on agriculture, livelihoods, and food security. The findings reveal that climate change has significantly impacted the region's agricultural productivity, leading to decreased yields and income for farmers. Extreme weather events, such as droughts and floods, have further exacerbated these challenges. The study also highlights the vulnerability of women and marginalized groups, who often bear the brunt of climate change impacts due to limited access to resources and decision-making power. The study concludes that urgent interventions are needed to mitigate the impacts of climate change and enhance the economic security of vulnerable groups in Zango Kataf Local Government Area. These interventions may include promoting climate-resilient agricultural practices, diversifying livelihoods, and strengthening social safety nets.

**Keywords:** Climate Change, Economic Security and Vulnerable Group

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### 1. Introduction

Climate change is increasingly recognized as a major threat to economic security, particularly in regions that are already vulnerable due to social, political, and environmental challenges. In Nigeria, the consequences of climate change are acutely felt in areas such as Zango Kataf Local Government Area (LGA) in Kaduna State, where local communities depend heavily on agriculture for their livelihoods. Rising temperatures, erratic rainfall patterns, and extreme weather events pose significant risks to the stability of local economies, making it imperative to examine the specific impacts of these changes on vulnerable groups such as subsistence farmers, women, and youth. These groups, with limited resources and adaptive capacity, are disproportionately affected by climate-related disruptions.

Zango Kataf, like many other rural regions in Nigeria, relies on rain-fed agriculture for food production and economic sustenance. The agricultural sector is highly sensitive to changes in climatic conditions, with shifts in rainfall patterns and prolonged droughts leading to crop failures and reduced yields (Adebayo, 2015) <sup>[1]</sup>. Such disruptions directly threaten food security, increase poverty levels, and reduce income opportunities for vulnerable populations. This economic insecurity is particularly challenging for small-scale farmers who have limited access to adaptive technologies, credit, or insurance that might help mitigate the impacts of climate variability (Magaji, Musa & Salisu, 2022) <sup>[14]</sup>.

Vulnerable groups, particularly women and youth, are disproportionately affected by the economic repercussions of climate change. Women in rural communities often bear the primary responsibility for food production, domestic labor, and caregiving. When climate change impacts reduce agricultural productivity, women experience heightened economic stress, further exacerbating gender inequalities (Akanle et al., 2017) <sup>[3]</sup>. Similarly, youth face diminished prospects for education and

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employment as climate-induced agricultural disruptions lead to fewer opportunities in the farming sector, prompting migration and further socio-economic challenges (Olaniyan & Omonona, 2019) <sup>[16]</sup>. The intersectionality of climate change with gender and age highlights the need for targeted policies that address the unique vulnerabilities of these groups.

The lack of infrastructure and inadequate access to resources further exacerbates the economic impacts of climate change. Poor road networks, insufficient irrigation systems, and a lack of access to modern farming techniques leave the population vulnerable to the devastating effects of extreme weather events and changing climatic conditions (Hassan & Nhemachena, 2017) <sup>[6]</sup>. These infrastructural deficiencies hinder the community's ability to effectively adapt to climate change, which underscores the importance of developing comprehensive and sustainable strategies for climate resilience that are tailored to the local context (Magaji, Musa, Ikechukwu & Ismail, 2022) <sup>[14]</sup>.

To address the impacts of climate change on economic security in Zango Kataf, it is critical to implement interventions that enhance the adaptive capacity of vulnerable groups. These should include investments in climate-resilient infrastructure, climate-smart agricultural practices, and policies that support women and youth in adapting to the changing climate (Suleiman et al., 2020). By prioritizing community-based solutions and fostering collaboration between local governments, NGOs, and vulnerable populations, Zango Kataf can build resilience to the economic impacts of climate change and ensure a more sustainable future for its people.

## 2. Conceptual Review, Theoretical Framework and Literature Review

### 2.1 Conceptual Review

#### 2.1.1 Concepts of Climate Change

Changing of the climatic system is arguably as is now evident from observations of increases in global average air and ocean temperatures, consistent melting of snow and ice and increasing average sea level (IPCC, 2007) <sup>[8]</sup>. The United Nation Framework Convention on Climate Change, (UNFCCC, 2005) submitted that climate change as a change of climate which is attributed directly or indirectly to human activity, that changes the composition of the global atmosphere, and in addition to natural climate variability, observed over considerable period of time. While the Intergovernmental Panel on Climate Change, (IPCC, 2007) <sup>[8]</sup> defined climate change as any change in climate over time either due to natural variability or as a result of human activity. The most universal concept of climate change therefore, is a change in the statistical properties of the climate element when observed over a long period of time, regardless of the cause. Accordingly, fluctuations over periods shorter than a few decades do not represent climate change. The term is, sometimes, used to refer specifically to climate change caused by human activity, as against changes in climate that may have resulted as part of the earth's natural processes (Magaji & Musa, 2024) <sup>[14]</sup>. In this respect, especially in the context of environmental policy and threat to human survival the term climate change has become synonymous with anthropogenic global warming. However, scientifically, global warming refers to increase in surface temperature while climate change includes global warming and every other thing that rising greenhouse gas levels will

affect. Thus, simply put, Climate change is a long-term shift in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It may be a change in the average weather conditions or a change in the distribution of weather events with respect to an average. For example, more or less extreme weather events. Climate change may be limited to a specific region, or may occur on a larger scale across the globe. In recent usage, climate change usually refers to changes in modern climate.

#### 2.1.2 Concept of Economic Security

Economic security refers to the condition in which individuals, households, and communities have stable access to resources and income necessary to meet their basic needs and ensure their well-being. It encompasses not only the ability to provide for immediate needs such as food, shelter, and healthcare, but also the long-term stability and sustainability of these provisions. Economic security involves protection against economic shocks, such as unemployment, inflation, or natural disasters, and ensures that people have opportunities to improve their socio-economic status over time (Musa, Salisu & Magaji, 2024) <sup>[14]</sup>. The concept is multidimensional, integrating factors such as income security, employment stability, access to essential services, and the ability to build wealth and assets (Chin-Yee (2019) <sup>[4]</sup>. In the context of developing countries, economic security is often tied to broader issues of inequality, social safety nets, and government policies. For vulnerable groups, such as women, children, and rural populations, economic security is particularly precarious due to limited access to education, employment, or healthcare. Disruptions caused by economic instability, climate change, or political conflict can deepen existing vulnerabilities, making it more difficult for these groups to achieve long-term security (Magaji, Musa, Abdulmalik & Eke, 2022) <sup>[14]</sup>. Economic security, therefore, is closely linked to both individual and societal resilience, requiring comprehensive strategies to ensure that all citizens can withstand and recover from economic pressures (Chin-Yee (2019) <sup>[4]</sup>.

### 2.2 Theoretical Framework

#### 2.2.1 Environmental Determinism and Resource Scarcity Theory

Environmental Determinism and Resource Scarcity Theory offer interconnected perspectives on how environmental factors influence human behavior and societal development, particularly in the context of resource availability. Environmental Determinism posits that human cultures and societal structures are largely shaped by the physical environment, suggesting that the characteristics of the land, climate, and resources determine the behaviors and economic activities of a population (Huntington, 1924) <sup>[7]</sup>. In contrast, Resource Scarcity Theory emphasizes how the scarcity of essential resources—such as water, food, and arable land—can lead to competition, conflict, and shifts in social and economic dynamics (Keenan, 2017) <sup>[9]</sup>. Both theories explore the relationship between the environment and human survival, arguing that the availability or absence of resources significantly influences the development of societies, their economies, and their political stability. However, while Environmental Determinism may overemphasize environmental influences, Resource Scarcity Theory highlights the role of human adaptation and the political management of resources in addressing scarcity-induced

challenges (De Soysa, 2002) <sup>[5]</sup>.

### 2.3 Empirical Review

Ojewale (2024) <sup>[15]</sup> examine the theoretical framework of co-existence, convergence, cooperation and competition. It discusses the nature of interaction among armed groups, and their violent activities in northwest Nigeria. The determinants of the connections include geography, recruitment strategy, opportunities for mutual exchange of logistics and co-creation of violence. Bandits are outbidding ethno-religious militias, Ansaru, ISWAP, Boko Haram and herdsmen, and have committed 84% of recorded violence in the region from 2010 to 2022. This study highlights the implications of increasing footprints of armed groups and provides the imperatives for state response to protracted violence in northwest Nigeria. It concludes that the socio-economic problems that allow proliferation of armed groups and violent activities to fester must be addressed by the state. Even if ramped-up security responses turn northwest Nigeria into a police state, violence will continue until poverty, social inequality, injustice and gross failure of governance are tackled.

Adger *et al.* (2021) <sup>[2]</sup> suggested that migration is a key mechanism linking climate change to violent conflict, particularly through migration increasing the risks of conflict in urban destinations. Yet climate change also creates new forms of insecurity through distress migration, immobility and vulnerability that are prevalent in urban destination locations. Here we examine the extent and nature of human security in migration destinations and test whether insecurity is affected by length of residence and environmental hazards. The study develops an index measure of human security at the individual level to include environmental and climate-related hazards as well as sources of well-being, fear of crime and violence, and mental health outcomes. It examines the elements of human security that explain the prevalence of insecurity among recent and established migrants in low-income urban neighbourhoods. The study reports on data collected in Chattogram in Bangladesh through a survey of migrants (N ¼ 447) and from qualitative data derived using photo elicitation techniques with cohorts of city planners and migrants. The results show that environmental hazards represent an increasing source of perceived insecurity to migrant populations over time, with longer-term migrants perceiving greater insecurity than more recent arrivals, suggesting lack of upward social mobility in low-income slums. Ill-health, fear of eviction, and harassment and violence are key elements of how insecurity is experienced, and these are exacerbated by environmental hazards such as flooding. The study expands the concept of security to encompass central elements of personal risk and well-being and outlines the implications for climate change.

Uexkull & Halvard (2021) study of security implications of climate change has developed rapidly from a nascent area of academic inquiry into an important and thriving research field that cut across epistemological and disciplinary boundaries. Here, we take stock of scientific progress by benchmarking the latest decade of empirical research against seven core research priorities collectively emphasized in 35 recent literature reviews. On the basis of this evaluation, we discuss key contributions of this special issue. Overall, we find that the research community has made important progress in specifying and evaluating plausible indirect links between climatic conditions and a wide set of conflict-related

outcomes and the scope conditions that shape this relationship. Contributions to this special issue push the research frontier further along these lines. Jointly, they demonstrate significant climate impacts on social unrest in urban settings; they point to the complexity of the climate–migration–unrest link; they identify how agricultural production Patterns shape conflict risk; they investigate understudied outcomes in relation to climate change, such as interstate claims and individual trust; and they discuss the relevance of this research for user groups across academia and beyond. We find that the long-term implications of gradual climate change and conflict potential of policy responses are important remaining research gaps that should guide future research.

Schnitter and Peter (2019) study climate change, food security and human health nexus in Canada toward developing a framework to protect population health. They observed that Climate change impacts on the Canadian food system pose risks to human health. Little attention has been paid to the climate change, food security, and human health nexus, resulting in a number of knowledge gaps regarding food system components that are most vulnerable to climate change. The lack of understanding of key dynamics and possible future impacts challenges the ability of public health officials and partners in other sectors to prepare Canadians for future health risks. A series of literature reviews were conducted to establish the relationship between climate change, food security, and human health, and to identify vulnerabilities within the Canadian food system. Evidence suggests that key activities within the food system are vulnerable to climate change. The pathways in which climate change impacts travel through the food system and affect the critical dimensions of food security to influence human health outcomes are complex. Climate-related disruptions in the food system can indirectly impact human health by diminishing food security, which is a key determinant of health. Human health may also be directly affected by the physical effects of climate change on the food system, primarily related to the impacts on nutrition and foodborne illnesses. In this study, we propose a novel analytical framework to study and respond to the climate change, food security, and human health nexus.

Chin-Yee (2019) <sup>[4]</sup> studied climate change and human security by linking vulnerable populations to increased security risks in the face of the global climate challenge. Climate change has become ubiquitous in today's socioeconomic and political discourse, being global in scale, climate impacts across ecosystems that cannot be contained by state boundaries. Actions of one country affect regions on the other side of the world, hence the need for a comprehensive and effective global climate regime. In 2015, the Paris Climate Change Agreement was adopted, and in the ensuing years, countries, along with researchers, civil society and industry have been debating how to implement concrete action to address the climate challenge. The link between climate change and human security was first recognised in the early 2000s. This paper examines how climate change has exacerbated uncertainty and instability in vulnerable populations in different regions. It achieves this by looking at diverse national and local experiences through multiple policy lenses, namely, the proliferation of extreme weather events, coastal erosion and sea level rise, internal displacement, cross border migration, and climate change as a threat multiplier. It looks at specific cases in Sub-Saharan

Africa, the Pacific Islands and the Levant to understand how human (in) security is being affected by climate change. It also addresses the future of global climate policy by assessing the current state of climate policies in light of the Paris Agreement. Global action on climate change is urgent. While many developed countries like to avoid notions of climate justice and differentiated responsibilities, the reality for the most vulnerable countries is that supranational policy is crucial if they are to tackle the climate challenge at home. This paper emphasises the importance of having meaningful and focused national climate adaptation and mitigation policies in place in order to address both the avoidable and unavoidable impacts of climate change on the economy, the culture and ultimately the security of a country. This study finds that as climate change plays an increasingly important role in discussions of security, comprehensive strategies are needed to respond to climate-induced security threats and geopolitical (in)stability both nationally and around the world. The Paris Agreement was a good first step in driving countries to commit to curbing emissions and drafting climate adaptation action plans. We now need the global climate regime – including countries, industry, and researchers – to step up to the plate and implement effective policies if we are to limit the serious impacts of climate change. The findings in this paper aims to contribute to the global debate around security and climate change.

Despite extensive studies on climate change impacts in Nigeria, there is a noticeable gap in localized research focusing on Zangon Kataf and its indigenous groups, particularly from the perspective of human security. Existing studies often neglect indigenous knowledge, social and cultural dimensions, and intersectional vulnerabilities such as gender, age, and socioeconomic status. Furthermore, most research relies on quantitative data, overlooking qualitative approaches that explore personal narratives and cultural contexts. Longitudinal studies tracking changes over time, particularly regarding climate-induced migration, food security, and health impacts, are scarce. Additionally, resilience and adaptation strategies of indigenous communities, as well as the interplay between climate change, conflict, and displacement within historical and socio-political contexts, are underexplored. Addressing these gaps through more granular and inclusive studies can enhance understanding and inform more effective policy and intervention strategies to support vulnerable population.

### 3.0 Methodology

#### 3.1 Study Area

Zangon Kataf Local Government Area (LGA) was established in 1987, following the creation of Katsina State and its separation from the old Kaduna State. The LGA is geographically located in southern Kaduna State, bordered by Kachia LGA to the west, Kajuru LGA to the northwest, Kauru LGA to the north and northeast, Kaura LGA to the southeast, Jema'a LGA to the south, and Jaba LGA to the southwest. Its headquarters is in Zonkwa, with other prominent towns including Madakiya, Kamantan, and Samaru Kataf. The LGA spans an area of 2,579 km<sup>2</sup> and had a population of 318,991 in 2006, projected to grow to 471,300 by 2022 (Tauna, 2023).

The climate in Zangon Kataf LGA is characterized by an annual average temperature of 24.8°C, with highs reaching 28.6°C and lows of 18.8°C. The area experiences minimal rainfall at the year's beginning and end, averaging an annual

precipitation of 28.1 mm and a humidity level of 53.7%. The region features prominent geographical landmarks, such as Kacecere Hill, the highest peak at 1,022 meters, along with several other hills like Kankada and Bako, which influence the local climate (Angerbrandt, 2015).

The LGA comprises several administrative wards, including Atak Nfang, Gidan Jatau, and Zango Urban, among others. Its inhabitants predominantly belong to the Atyap ethno-linguistic group, including the Atyap proper, Bajju, Bakulu, Anghan, and Atyecarak peoples, who speak related dialects of the Tyap language. Hausa is also widely spoken due to colonial influences. This diverse linguistic and cultural makeup reflects the area's rich heritage and social complexity (James, 2000).

#### 3.1 Research Design

The study adopted the cross-sectional survey research design. The design is suitable for collecting data through sampling when the population is too large to be investigated as in the case of vulnerable groups in Zango Kataf Local Government Area of Kaduna State. To this end, to collect data, the respondents, interviewees and discussants will be sampled from the entire population of the study. Secondly, survey design made it possible to determine the relationships between climate change and human security in Zango Kataf Local Government Area of Kaduna State, Nigeria (See figure 3.2).

Also, in the use of this research design, it was possible it both employ both quantitative and qualitative methods of data gathering which Plan International (2014) justified as useful tools in reaping the advantages of both methods and improve the study of greater use. Relevant social science research instruments and techniques will be used to gather data from a sample of the study population. To determine the results upon which conclusions were drawn, relevant statistical tools were employed.

##### 3.1.1 Reconnaissance Survey

A reconnaissance survey was carried out in Zango Kataf Local Government Area of Kaduna State. The purpose is to acquaint the researcher with the study area and get first-hand information, particularly the geography of the study area. Also to ascertain the climatic situation, human security situations, availability of facilities which were essential in planning the activities of the researcher and research assistants who will travel to the study area for the purpose of data collection. The locations of institutions useful for this study for the purpose of data collections will equally be ascertain. The reconnaissance survey lasted for four days.

##### 3.1.2 Population, Sample and Sampling Techniques

The population of this study include all men and women aged 40 and above years of Zango Kataf Local Government Area of Kaduna State. These population is considered appropriate because people over 40 years old because they often have more life experience and have witnessed firsthand environmental changes giving them a deeper understanding of long-term trends of events. Also, part of the study population community leaders (men and women), religious leaders (both from Christianity, Islam and traditional worshipers), security personnel (police and military personnel) of Zango Kataf Local Government Area constituted part of the population of the study.

### 3.1.3 Sample, Sampling Techniques

In this study, multi-stage sampling technique was employed to select respondents. According to Nworgu (1991), apart from being cost-effective, this technique allows flexibility since several forms of sampling were introduced at various stages.

#### The stages are as follows:

1. In the first stage, five wards that housed Zonkwa, Gora, Bakulu, Kamantan (Anghan) and adakiya were purposively selected from Zonzon Kataf Local Government Area.
2. The second stage involved the selection of five settlements in each of the selected wards.

#### Settlements in each Wards were randomly selected using table of random numbers.

To determine the sample size for the study, NPC (2006) population data of people of above 40 years were projected for the purpose of updating the data. From the projections, the population of women and men aged 40 and above for Zango Kataf Local Government Area was 39,354. Using Taro Yamane's formula with a population size (N) of 39,354 and a margin of error (e) of 0.05. The sample size of the study was therefore determined using Yamane (1967) formula that states as thus:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n= Sample size required

N= the population size

e= Margin of error (4 percent %) at 95 percent confidence level.

- The sample size (396) of the study was distributed among the selected wards based on their population as indicated in table 3.1.

**Table 3.1:** Distribution of sample size among selected wards

Wards	Communities Sampled	Sample Size
Zonzon	Ung. Ruhogo	20
	Bafai gora	20
	Wawa rafi	20
	Magamiya	20
Gora	Ung. Gankon	20
	Gora gida	20
	Bakin kogi	20
	Kurmin gandu	20
Anghan	Fadan Kamantan	20
	Kanzir	20
	Fadiya	20
Bakulu	Kagal	20
	Dutsen Bako	20
	Anchuna	20
	Akupal	20
Madakiya	Ghidol	20
	Tsoriyang	20
	Aduwan	20
	Wadon	20
	Ayagan	20

Source: Researcher Computation, 2024.

Households were selected using systematic random sampling, where a sample interval (S.I) was determined and used to select households at interval basis until the required households for the survey are exhausted in all the selected settlements.

### 3.2 Types of data and method of data collection

The following data was required to carry out this study;

1. Rainfall and temperature records of Zango Kataf Local Government Area over a period of 30 years (1992-2022) for the authentication of climate change in the study area.
2. Data on the impacts of climate change on economic security among vulnerable groups in Zango Kataf Local Government Area of Kaduna State.
3. Data on the implications of climate change on food security among vulnerable groups in Zango Kataf Local Government Area of Kaduna State.
4. Data on the implications of climate change on health security among vulnerable groups in Zango Kataf Local Government Area of Kaduna State.
5. Data to determine the effects of climate change on environmental security among vulnerable groups in Zango Kataf Local Government Area of Kaduna State.

Data to determine the implications of climate change on personal security, community security and political security among vulnerable groups in Zango Kataf Local Government Area of Kaduna State.

### 3.2 Sources of data

The data for this study were obtained from both primary and secondary sources.

#### 3.2.1 Primary sources of data Survey Questionnaire

The questionnaire is by far the most frequently used instrument in carrying out research, particularly in social science and research. In this study, structured and semi-structured questionnaire was prepared and administered to the respondents for the purpose of gathering data. Structured and semi-structured questionnaire was designed and administered to the respondents. The questionnaires were administered to females and males aged 40 and above years heads of households. The information in the questionnaire which respondents are required to provide were generally broken down in line with the objectives of the study.

#### b. In-depth Interview

In-depth interviews were conducted that involved interviewer asking interviewee questions for detail responses. In-depth interview is often used in research to illicit individual opinions on the topic under investigation. Nwogu (1991) in justifying the use of in-depth interview in a research pointed out that it allows for the collection of in-depth information from the respondents on any issue. Community leaders (men/women), Religious leaders (Christianity/Islam), Security leaders/experts were the participants of the in-depth interview. The participants were selected on account of their experiences on the topic under investigation.

Ten assistants who were indigenes of the localities were recruited and trained for this study. The training was on how

to administered questionnaire and how to take notes and record interview sessions. The consent of the interviewees was sought for before the process.

### 3.2.2 Secondary sources of data

Climatic data (rainfall and temperature data) from 1987 to 2023 from weather stations in Zango Kataf Local Government Area State were obtained from NIMET. Other secondary data include population data which were obtained from National Population Commission.

### 3.3 Techniques for Data Analysis

In this research, the Statistical Package for Social Science (SPSS) 23 was used in the data analysis. The package was used for;

Tabulation and cross tabulation involving frequencies and percentages was employed to present demographic and socio-economic characteristics of the respondents.

The Chi-square test of independence (also known as the Pearson Chi-square test, or simply the Chi-square) is one of the most useful statistics for testing hypotheses when the variables are nominal. The Chi-Square Test of Independence was used to test the association between climate change (independent variable) and each dimension of human security (dependent variables: food, environmental, and health security). The analysis was conducted using the formula:

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where:

$O_{ij}$  = Observed frequency in the  $i, j$ -th cell

$E_{ij}$  = Expected frequency in the  $i, j$ -th cell, calculated as:

$$E_{ij} = \frac{R_i * C_j}{N}$$

$R_i$  = Row total for the  $i$ -th category

$C_j$  = Column total for the  $j$ -th category

$N$  = Total number of observations.

The Chi-Square test results were evaluated at a 95% confidence level ( $\alpha=0.05$ ). A significant result ( $p<0.05$ ) indicates that climate change is associated with the tested dimension of human security. This methodology ensures a rigorous statistical approach to understanding the associations between climate change and food, environmental and health security among the studied population. The data were coded and analysed using SPSS

statistical software.

### 3.3.1 Testing the Strength of Association Using Phi and Cramer's V

This study further assesses the strength of association between climate change and three dimensions of human security food security, environmental security and health security using the Phi and Cramer's V. These measures complement the Chi-Square Test of Independence by quantifying the degree of association between the variables.

### 3.4 Justification of Methods

According to Usuala (2005) validity of a questionnaire must be established before its use. The researcher ensures that each question relates to the topic under investigation and adequate coverage of the overall topic. In addition, pre-test exercise, which is the pilot administration of questionnaire. Questionnaire survey: some respondents that are not part of the sampled respondents were for the pre-test exercise. Errors related to the understanding of the questions and grammar by the respondents were noted and adjustments in the questionnaire were carried out.

## 4.0 Results and Analysis

### 4.1 Climatic Elements Trend Assessment in Zangon Kataf LGA of Kaduna State

Zangon Kataf LGA is located in the Guinea Savannah (tropical grassland region) is characterized by a mix of wet and dry seasons, with its climate heavily influenced by temperature and rainfall patterns. Assessing climate change/variability are usually achieved by observing the trend of weather elements like temperature, rainfall, relative humidity, surface soil wetness/moisture that directly impact its ecosystems, agriculture, and livelihoods.

### 4.2 Surface Temperature Trend in Zangon Kataf LGA of Kaduna State

In Zangon Kataf Local Government Area of Kaduna State, between 1991 to 2022 the mean annual surface temperature is 24.640C in the range of 22.830C to 26.460C. The year 2022 had the lowest surface temperature (22.830C) while the year 2005 had the highest surface temperature of 26.460C). Figure 4.1 clearly depicts an increase trend in surface temperature with  $y = 0.0355x + 24.015$  and  $R^2 = 0.1212$  which signify 12% average increase from 1989 to 2022 in Zangon Kataf LGA of Kaduna State. The monthly trend of surface temperature shows that the mean monthly surface temperature is 24.650C in the range of 21.830C to 29.130C. December had the lowest surface temperature with 21.830C while March had the highest surface temperature of 29.130C. Figure 4.2 shows a declining monthly trend in surface temperature with  $y = -0.5111x + 27.975$  and  $R^2 = 0.5249$  which signify 52% average monthly decrease of surface temperature from January to December in Zangon Kataf LGA of Kaduna State.

**Table 4.1:** The Impacts of Climate Change on Economic Security Among Vulnerable Groups in Zango Kataf Local Government Area

Question	In order of ranking please specify the livelihood sector most sensitive to climate change				
Options	Crop Farming	Livestock Farming	Trading	Hunting/Fishing	
Frequency (%)	270 (67.5%)	45 (11.3%)	80 (20%)	5 (1.3%)	
Question	What is the major climate-induced stress affecting crop farming?				
Options	Dry Spell	Heatwave	Heavy Storm	Flood	
Frequency (%)	90 (22.5%)	10 (2.5%)	30 (7.5%)	270 (67.5%)	
Question	Manifestation of climate-induced stress				
Options	Loss of Soil Nutrients	Physical Damage of Plants	Increase in Crop Diseases	Destruction of Farmlands	Poor Yield
Frequency (%)	70 (17.5%)	165 (41.25%)	60 (15%)	110 (27.5%)	90 (22.5%)
Question	How would you rate the implication of climate change on farm produce				
Options	Severe	Mild	Minimal		
Frequency (%)	170 (42.5%)	140 (35%)	90 (22.5%)		
Question	Implication of Climate-induced Stress				
Options	Low Yield	High Yield	Poor Quality of Yield	High Post Harvest Loss	Crop Failure

Source: Researcher Fieldwork and Analysis, 2024.

### 4.3 Test of Hypotheses

Impacts of climate change on economic security among vulnerable groups in Zango Kataf Local Government Area of Kaduna State.

**Table 2**

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	100.076 <sup>a</sup>	20	.000
Likelihood Ratio	112.856	20	.000
Linear-by-Linear Association	23.752	1	.000
N of Valid Cases	400		

a. 17 cells (40.5%) have expected count less than 5. The minimum expected count is .44.

A chi-square test of independence was conducted to assess the relationship between climate change impacts and economic security among vulnerable groups in Zango Kataf. The results of the Pearson Chi-Square revealed a statistically significant association,  $\chi^2(20) = 100.076$ ,  $p < .001$ . This suggests that climate change has a significant impact on the economic security of vulnerable populations.

Symmetric measures of association were also calculated to assess the strength of the relationship between climate change impacts and economic security among vulnerable groups in Zango Kataf. The Phi coefficient was 0.500,  $p < .001$ , indicating a moderate to strong association. Similarly, Cramer's V was 0.500 further confirming the substantial relationship between the two variables. These findings suggest a meaningful connection between climate change impacts and economic security, emphasizing the need for targeted interventions to mitigate the effects of climate change on vulnerable populations.

**Table 3**

Symmetric Measures		Value	Approximate Significance
Nominal by Nominal	Phi	.500	.000
	Cramer's V	.500	.000
N of Valid Cases		400	

### 4.4 Major Findings

The study highlights significant trends and impacts of climate change in Zangon Kataf LGA of Kaduna State, spanning environmental, economic, and social dimensions. Surface temperature has increased by an average of 12% from 1989 to 2022, with March recording the highest temperatures and December the lowest. Rainfall patterns exhibit a declining trend, with August having the highest mean rainfall. Similarly, surface soil wetness varies across months, peaking in September and August, and showing significant annual fluctuations. These environmental shifts underscore the changing climatic conditions affecting the region.

The socio-economic impacts are pronounced, with most respondents noting disruptions to agriculture, food security, and livelihoods. Crop farming is identified as highly sensitive to climate change, with low yields, crop failure, and destruction of farmlands frequently reported. Livestock farming has similarly suffered, with losses of pasture and increased livestock diseases. Climate change exacerbates food insecurity, health issues, and economic vulnerabilities, with significant portions of the population reporting concerns about running out of food and experiencing related health problems such as malaria and typhoid. Despite these challenges, traditional environmental management practices and community-level conservation efforts remain prevalent. Statistical analyses reveal strong associations between climate change and its impacts on economic, food, health, and environmental security. The results indicate that climate change intensifies vulnerabilities, particularly among economically disadvantaged groups. While many respondents recognize the importance of traditional knowledge and seek financial and technical support to mitigate these impacts, awareness of climate change and active community participation in adaptation initiatives remain limited. These findings highlight the urgent need for comprehensive strategies to address the multi-dimensional effects of climate change on this vulnerable population.

### 5.0 Conclusion and Recommendation

This study has delved into the intricate relationship between climate change and economic security among vulnerable

groups in Zango Kataf Local Government Area of Kaduna State, Nigeria. The analysis of climatic data, coupled with empirical evidence from the field, underscores the significant impact of climate change on the region's agricultural sector and livelihoods. The study reveals that rising temperatures, erratic rainfall patterns, and extreme weather events have led to reduced agricultural productivity, increased food insecurity, and economic hardship for vulnerable populations. The findings also highlight the disproportionate impact of climate change on women and marginalized groups, who often face limited access to resources, decision-making power, and social safety nets.

To mitigate the impacts of climate change and enhance the economic security of vulnerable groups in Zango Kataf Local Government Area, several recommendations are proposed. These include promoting climate-smart agricultural practices, diversifying livelihoods, strengthening social safety nets, implementing climate change education and awareness programs, fostering community-based adaptation initiatives, and strengthening policies and institutions to address climate change. By adopting these measures, it is possible to build a more resilient future for the region.

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