

UNDERSTANDING THE NEXUS OF CLIMATE CRISIS AND NATURAL ASSET CAPITAL: AN EVIDENCE FROM NORTHERN AND SOUTHERN AGRO-ECOLOGICAL ZONES OF KATSINA STATE, NIGERIA

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Abstract

<https://doi.org/10.65760/sjgs.v4.i2.7>

This study investigates the effect of the climate crisis on natural assets capital between the northern and southern agro-ecological zones of Katsina State. The specific objectives of the study are to find out the effect climate crisis on natural capital asset and the climate shocks and pressures affecting natural capital asset governance. Data for this study were generated by administering structured questionnaires, and the data analysis was achieved using descriptive statistics. The significant findings of this study revealed that 30.1% of the respondents reported a very severe effect of climate crisis on natural asset capital across the two distinct ecological zones of the State. Furthermore, the results also show that increase in temperature regime and decline in the availability of water or water scarcity were the climatic shocks affecting the sustainability of the natural assets capital in the study area with 33.3% and 28.1% respectively. The result also identified reduction in pastoral land, increased water scarcity and stressed, loss of natural livelihood assets, increased competition for arable land and loss of biological diversity as the major problems arising the climate crisis in the study area. The study concluded that communities were becoming more vulnerable to the climate crisis, and the possibility of natural resources asset and capital to continue degrading is very enormous and high. The study therefore, recommended for a community-based resource management and climate governance ensuring that both northern and southern perspectives inform a shared pathway toward sustainable resource use in the face of the climate crisis and also call for strengthening the capacity of institutions and communities to prepare for, respond to, and recover from climate-related shocks while maintaining sustainable development.

Keywords: *Nexus, Effect, Climate crisis, Natural capital assets, Agro-ecological zones.*

Introduction

Globally, climate crisis is identified as one of the most pressing environmental challenges facing contemporary human societies today. This is evidenced as in increased temperatures and prolonged flood or drought conditions, variability in patterns and distribution of rainfall, which has multiple effect on natural resources conservation and management. In turn poses a serious on the livelihood options of communities, particularly those who depend on agricultural activities and other natural resources. Mafulul and Emmanuel (2026), stressed that poor natural resource governance increases climate risks, while good governance strengthens resilience and reduces conflict.



Kushawaha et al (2021) argued that natural resources play a vital role in regulating the economic, social, and cultural values of the people. For instance, water which is a basic need for all life, and its cycle is closely linked with climate change. In this regard water resources scarcity is the major issue of concern. Forest resources play an important role towards tribal community and are important to the development of any society and fundamental threat to these natural resources cannot be overlooked by responsible society.

Yaro et al., (2025) argued that both climate shocks and crisis are threatening the global community effort of ensuring the achievement of the UN Sustainable Development Goals (SDGs) especially Goals 13 (climate action) and 15 (life on the land). The study further reported that it is anticipated and projected that climate change and crisis will affect several aspects of global natural resources such as ecosystems, biodiversity, forestry, hydrology and water resources, among others. No doubt the climatic crisis will continue to increase pressure on the natural resources such as land, forest and grazing reserves from intensive and extensive farming, overgrazing, deforestation, and desert encroachment. This will pose a significant challenge to ecological degradation, such as loss of vegetation cover, decline in crops and livestock production and water scarcity and stressed among the inhabitants (Yaro et al., 2025).

Furthermore, in Nigeria, climate crisis and shocks are having serious negative and devastating impacts, with the emergence and prevailing of various climate crises across the country, flooding has been identified as one of the most pressing issues. For instance, the 2022 floods affected around 2.8 million people, displaced about 1.4 million, and destroyed 70,566 hectares of farmland (Federal Ministry of Education, 2025). Natural capital assets such land, forest and water resources which serves as the major sources of rural livelihood activities such as crop and livestock production are commonly influenced by climate change/variability and in turn affected by climate crisis. Pastoralism which mainly comprises the rearing cattle, goats and sheep is also common in the study area. Overgrazing and trampling reduce the vegetative cover and making the soil vulnerable to erosion and desertification. In this ecosystem, the main agent of soil erosion is the water and wind, which is supported by dry climatic conditions with an impact on natural resources. SPRiNG Programme (2025) maintained that climate change in Nigeria has close relationship with the increase of ecological change, leading to natural ecosystem degradation resulting in pasture replacement and subsequent woody invasion, migration natural resources conflict as well as deforestation along river basin as a following the expansion of irrigated horticulture and encroachment grazing reserves and stock routes.

The IPCC predicts that rainfall and high rate of evaporation is increasing in this zone, which further contributing to desertification pressures (IPCC, 2001). The semi-arid areas of Nigeria including Katsina State are also faced with other environmental challenges, such as uncontrolled expansion in agriculture, and fuel wood collection, over exploitation of water resources, poor irrigation practices, bush fires, human settlements, land degradation and de-vegetation. This is exacerbated by rapidly growing population and the impacts of climate change, which have led not only to natural resources conflicts between herdsmen and farmers but also insecurity, such as cattle rustling and banditry.

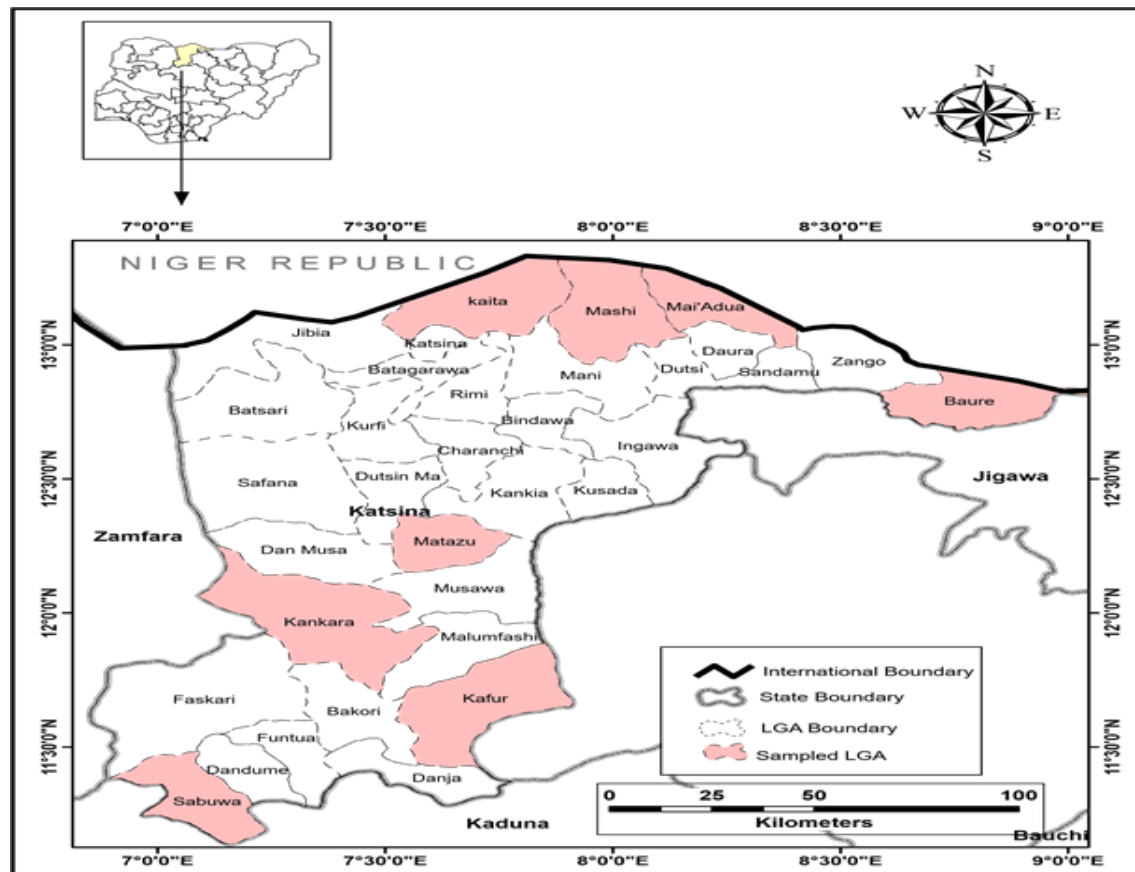
Katsina State, as a semi-arid area with a degraded and fragile ecosystem coupled with low, erratic and unreliable rainfall pattern, which falls within the Sudan and Sahel savanna belt where climate variability is greatest. Already the State has indices of climate crisis such as desertification and land degradation, flooding, drought, water scarcity, heatwaves, food Insecurity, health impact, migration and displacement which become a threat to the sustainable

use of natural resources. This contributes significantly to increased poverty and food insecurity, leaving many people vulnerable to numerous socio-economic problems (Draft of Katsina State Environmental Management Policy, 2026; Draft of Katsina State Climate Change Policy, 2025).

Furthermore, the aspect of natural resources sustainability is drawing the attention of so many stakeholders both from the research and policy making dimensions. It is based on this background, that the study aimed at carrying out investigation on the nexus of effect of climate crisis on natural capital assets. The specific objectives are to find out the effect climate crisis on natural capital asset and the climate shocks and pressures affecting natural capital asset governance based on the user groups perception between northern and southern agro-ecological zones of Katsina State.

Study Area and Research Methods

Katsina State, is a state in the North–Western geopolitical zone of Nigeria. The State was created on September 23, 1987, with Katsina as its capital. The total landmass of the State is 24,192 km² (9,341 square miles) and has a total population of 3,753,133 persons, as per the 1991 census, and 5,801,584 persons in 2006 (NPC, 2006). The State is bounded at the south by Kaduna State, at the East by Jigawa and Kano States, at the West by Zamfara State and the North by the and the republic of Niger (Figure 1).



The Map of the Study Area

Source: GIS LAB. FUDMA



Geographically the State is located approximately between latitude 12°15' 00" and 12°25' 00" N and longitude 7°30' 00" and 7°50' 00" E of the Greenwich meridian (Lawal, 2013; Murtala, Arokoyo and Weli, 2020; Yaro et al., 2025). The temperature in the State is consistently high throughout the year, with the highest values recorded from March to early May, ranging from 43°C to 46°C, and the lowest values of 18°C to 25°C from November to December (Murtala, Arokoyo, and Weli, 2020; Yaro et al., 2025). The vegetation of the State is mainly made up of Sudan Savannah in the southern agro-ecological zone, with the presence of Guinea savannah in the extreme southern part of Dandume and Sabuwa LGAs. While at northern fringes of the State, evidence of Sahelian vegetation is becoming more pronounced, enriched with a variety of grasslands, shrubs, and drought-resistant trees (Murtala, Arokoyo, and Weli, 2020; Yaro et al., 2025). The rainfall pattern between the southern and northern part of the State varied greatly, with southern part of the State experiences an annual rainfall of 800-1000 mm, while the north usually experience rainfall between 500 mm and 700 mm per annum, with an uneven distribution throughout the year (Murtala, Arokoyo, and Weli, 2020; Yaro et al., 2025).

The dominant economic activities of the people in the State are mainly agricultural production (in particular crop and livestock production), with about 75% of the State population engaged in to agricultural production. The usually produced or cultivate crops such as rice, millet, guinea corn, onions, tomatoes, sorghum, maize, groundnuts, and beans, among others (Lawal, 2013; Murtala, Arokoyo, and Weli, 2020; Yaro et al., 2025). They also engaged in to livestock productions, domesticated animals such cattle, sheep, goat, camel, horse and poultry, among others are being raised, beside off farm activities including cottage industry, in which some goods and services are produce e.g. groundnut oil, and brown sugar. All these socio-economic activities are very sensitive and can be easily affected by climate change (Lawal, 2013; Yaro et al., 2025).

Research Method

This research adopted a cross-sectional design. The study was conducted in Kaita, Mashi, Mai'adua, and Baure, located in the northern agro-ecological zone. While in the southern zone, the LGAs where the study was conducted include Kankara, Kafur, Matazu and Sabuwa. Simple random sampling was used to select the sampled LGAs by using shuffle card in which the name of the LGAs was written in card, this is to allow every LGA an equal chance to be selected, it was through this process all the sampled LGAs were selected, the data for this study were generated from the administration of a questionnaire to respondents in the study area. Quantitative and qualitative data were used in this study, and they were generated from both primary and secondary sources. The types of data utilised by the study include perception of the respondent probable effects and severity of climate crisis on natural resources, types and nature of natural resources affected by climate crisis, among others.

The target respondents who are mainly various natural resources users, were selected from the eight (8) Local Government Areas of the two agro-ecological zones (northern and southern). The respondents were selected using snowball, a non-probability sampling technique. Thus, the respondents were derived from seven natural resources user groups (see Table 1). The total of 334 respondents participated in the survey as shown in Table 1.

Table 1: Types and Number of the Survey Participants

LGAs	Number of participants from each of the natural Resources user groups					Total
	Farmers (Crop producers)	Herders (Pastoralist)	Wood sellers & charcoal	Wild fruit sellers and herbalist	Others including Women in natural resource utilization	
Baure	13	08	08	06	06	41
Kaita	13	08	07	07	06	41
Mai'adua	12	09	08	07	07	43
Mashi	12	10	08	06	06	42
Kafur	12	08	07	07	07	41
Kankara	12	07	11	06	06	42
Matazu	12	07	08	07	07	41
Sabuwa	13	07	08	08	07	43
Total	99	64	65	54	52	334

Source Field Survey (2025)

The questionnaires for the study were distributed based on the determined sample size of 334 respondents participated in the survey as shown in Table 1. The outcomes or responses of the respondents were generated for data analysis. The data used in this study were analysed using descriptive statistics, and the results were presented in frequencies, percentage and in tables. SPSS version 26 was used to analyse the data. The results of qualitative data (key informant interviews) were presented in narrative statements and incorporated where necessary and appropriate in the discussion of the results.

Results and Discussion

User Groups Perception on the Effect of Climate Crisis on the Natural Capital Assets

The result in Table 2 shows the magnitude of the effect of climate crisis on natural asset capital from the two agro-ecological zones which account for 30.5% of the responses, but it is more prevalent in the northern agro-ecological zone with about 16.3% of the responses. The result further indicates that 29.7% of the respondent's responses reported that the effect is not severe across the ecological zone. It was observed that the continued emergence desert like condition and drought were also critical but more pronounced in the northern agro-ecological (Table 2). The study further observed increase in the heat waves which result in water scarcity also posed a threat to the sustainability of natural resources such as wetlands, lakes, rivers and dams. FME (2025) argued that climate crises and shocks have significantly impacted Nigeria's economy. Addressing these crises requires a multi-faceted approach that involves government policies, community engagement, and individual actions. Furthermore, Sule et al., (2025) and Agbeja et al., (2021) further aligned with this study that the impact of climate crisis can be noticed from shocks such as drought. Prevalence of parasites and diseases mortality of the livestock, reduction of animal feed and fodder, reduction on the availability of surface and groundwater among others.

Table 2: Perception of the effect of climate crisis on natural capital assets

LGAs	Responses on the effect of climate crisis on natural capital assets					Total (%)
	Very severe (%)	Severe (%)	Moderately severe (%)	Less severe (%)	Not severe (%)	
Baure	4	0.6	0.5	3	4.2	12.3
Kaita	4	1.2	0.6	3	3.5	12.3
Mai'adua	4.3	1.1	1.1	2.6	3.5	12.6
Mashi	4	1.2	1.7	2.3	3.4	12.6
Kafur	3.2	1.5	1.5	2.1	4	12.3
Kankara	3.5	0.6	1.1	3.1	4	12.3
Matazu	3.9	1.6	0.3	4	3	12.8
Sabuwa	3.6	0.6	0.5	4	4.1	12.8
Total	30.5	8.4	7.3	24.1	29.7	100

Source: Field Survey (2025)

Yaro et al., (2025) and Abdulkadir et al., (2013) pointed out that climate change pressures have been identified as a significant contributor to the drastic ecological and socio-economic changes observed in Nigeria's semi-arid region. While maintaining that the temperature has increased, rainfall has been declining in nearly all parts of the Country, resulting to the degradation of natural resources such as land, forest and grazing reserves which in turn give birth to significant ecological degradation, such as loss of vegetation cover, decline in the productivity of cropping land as well as poor livestock productivity and water scarcity and stressed among challenges (Oyekale, 2021). This study calls for a multi-dimensional approach integrating indigenous and scientific measures from community-level to national climate governance ensuring that both northern and southern perspectives inform a shared pathway toward sustainable resource use in the face of the climate crisis.

Perceived Influence of climate shocks and pressures affecting natural capital assets governance

The findings of this study in table 3 reveals that majority of the respondents (33.3%) are of the opinion that climate crisis may likely cause serious problems in the management of natural capital assets, these include increased in temperature regime in the study area, with opinion varied slightly between the northern and southern agro-ecological zone, out of 33.3% of the respondents 17% who are from the northern zone believed in the occurrence of increased temperature regime against 16.3% of the responses from the southern zone. This followed by increase water scarcity due to high rate of combine effect of evaporation and transpiration which accounts 31.1% of the total responses. The risk of increased extreme weather events accounts for 23.2% of the responses as shown in Table 3.

Table 3: Observed climate shocks and pressures affecting natural capital assets governance

LGAs	Responses on climate crisis pressures affecting natural capital assets governance					Total (%)
	Increased Temperature Regime (%)	Changed Rainfall pattern (%)	Biodiversity loss (%)	Increased Risk of extreme events (%)	Increased Water scarcity (%)	
Baure	4	0.6	0.3	3	4.4	12.3
Kaita	4	1.2	0	3	4.1	12.3
Mai'adua	4.5	0.6	0.6	2.1	4.8	12.6
Mashi	4.5	1.2	1.2	2.3	3.4	12.6
Kafur	4.3	1.2	1.5	2.1	3.2	12.3
Kankara	4	0.6	0.6	3.1	4	12.3
Matazu	3.9	1.6	2.3	3	2	12.8
Sabuwa	4.1	0.6	3.3	2.6	2.2	12.8
Total	33.3	7.6	9.8	21.2	28.1	100

Source: Field Survey (2025)

This study aligned with Gökçekuş and Kassem (2023) that reported that climate change and natural resources are closely linked, as changes in the climate can have significant impacts on the availability and quality of natural resources such as water, air, land, forests, and oceans. Furthermore, the FME (2025), Sule et al., (2025) and Yaro et al., (2025) argued that climate crisis are likely to caused changes in the planet's climate, including weather extremes and natural disasters, ocean acidification and sea-level rise, loss of biodiversity, food and water insecurity, health risks, economic disruption, displacement, and even violent conflicts among other calamities.

Perceived observed outcomes of the effect of climate crisis on natural capital assets and ecosystem services

This study discovered increased competition for arable due to crisis remains the major issue with about 8.8% of the total responses, this is followed by the reduction in pastoral land 8.6%. While increased water scarcity both surface and underground and loss of natural resources assets account for 8.2 % and 7.0% respectively with increased in the number of environmental refugee account for only 6.8% (see table 4). In this regard, the Intergovernmental Panels on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC) have identified climate change as one of the most important and greatest threat of the century and reported that the earth's average temperature has risen by 0.740^C. This corroborates with UNDP (2023) that argued climate crisis is resulting to various environmental issues such as rising sea levels, violent downpours resulting in over flooding and consequent migration of animal species; heat waves leading to desertification, depletion of water availability, reduced animal metabolism and agricultural food production, loss of biodiversity, food insecurity, decreased animal production and health etc. This study calls for a multi-scalar approach and bottom-up approach in the resource management and climate governance ensuring that both northern and southern perspectives and pathways toward sustainable resource use in the face of the climate crisis are fully considered and adopted.

Table 4: Observed consequences of the effect of climate crisis on natural capital assets and ecosystem services

Consequences	observed outcomes of climate crisis on natural capital assets			Total
	High (%)	Moderate (%)	Low (%)	
Reduction in pastoral land	8.6	5.4	5.6	19.6
Increased water Scarcity	8.2	6.6	5.4	20.2
Loss of natural livelihood assets	7	6.6	6.4	20
Increased competition for arable land	8.8	5.6	6.3	20.7
Increased environmental refugee	6.8	6.7	6	19.5
Total	39.4	30.9	29.7	100

Source: Field Survey (2025)

Kushawaha et al., (2021) is of the view that climate change has various type of effects, it can bring drought condition in one geographical area and flooding other places. These conditions ultimately affect primary productivity, adversely affecting the lives of poor people and reducing access to food.



Among all the other effects, the rise in temperature will lead to enhanced water demand by humans and animals as severe heatwaves and drought deplete the quality of water and also reduce the availability. The lakes, rivers, and aquifers are facing water-stressed conditions and also getting polluted day by day. More than 50% of the wetlands have been dried up as a result of the effect of climate pressures.

Conclusion and Recommendations

The study concludes a complex and interconnected linkage of how climate crisis indicators affect natural resource sustainability between the two agro-ecological zones, in particular in the northern zone, where desertification, drought, and erratic rainfall dominate, and communities emphasize the immediate threats to water availability, soil fertility, and pasturelands. Conversely, in the southern zone, biodiversity loss and prevalence extreme weather events such as flooding are more pressing, shaping user groups' concerns about long-term agricultural productivity and forest resources. Despite this spatial variations and differences, a unifying theme emerges: both zones recognize that climate change is not a distant phenomenon but a lived reality undermining livelihoods, food security, and ecological balance. The divergence in perceptions underscores the need for localized adaptation strategies that respect ecological diversity while fostering a unified cohesion in climate action. By aligning traditional knowledge with scientific innovation, and tailoring interventions to sectoral vulnerabilities, and build resilience across the agro-ecological zones. Therefore, the following recommendations were made:

- This study calls for a community-based resource management and climate governance ensuring that both northern and southern perspectives inform a shared pathway toward sustainable resource use in the face of the climate crisis.
- There should be strengthening the capacity of institutions and communities to prepare for, respond to, and recover from climate-related shocks while maintaining sustainable development.
- There is need to integrate climate risks into development planning, which will consider the protection of natural resources, supporting climate-smart agriculture, promoting sustainable water management and encouraging community participation.
- There is need for an investment in early warning and preparedness for building resilience before risks and disasters occur by aligning traditional knowledge with scientific innovation, and tailoring interventions to sectoral vulnerabilities, and build resilience across the agro-ecological zones.

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