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Analysis of Factors Influencing Harnessing Opportunities in Climate Change for Livelihoods in Niger North Senatorial District, Niger State, Nigeria

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Abstract

This study examined the opportunities in climate change that can be harnessed for livelihood sustainability in Niger North Senatorial District, Niger State, Nigeria. It identified the types of threats posed by climate change in the study area and assessed the climate change opportunities that can be harnessed for the sustainability of livelihood activities in the study area. Multi-stage sampling technique was adopted, and 384 respondents were randomly sampled. A structured questionnaire and KII were used to gather the data. The data were analyzed using descriptive and inferential statistics such as percentages, means, frequency and multiple linear regression models. The findings of the study indicated that livelihood activities in the study area are threatened by climate-induced hazards such as increased flooding and soil erosion (48.18%,) increased temperatures and water stress (33.59%). These climatic changes lead to heat stress on crops and livestock, reduce water availability, and exacerbate drought conditions, thus reducing agricultural yields. The finding of the study identifies weak financial support for adopting climate change opportunities as a major issue highlighted by the pooled results across all LGAs with a significant negative coefficient of -0.50 at the 10% level, technical complexity nature is another constraint with pooled results across all LGAs with a significant negative coefficient of -0.64 at the 5% level. The study concludes that climate change poses significant threats to livelihood sustainability in the study area. To harness climate change opportunities for the sustainability of livelihoods, it is imperative to promote sustainable agricultural practices and enhance water management strategies and to enable the people to harness the climate change opportunities, key challenges highlighted need to be tackled. The study recommends that Government and climate change-related NGOs should support the people with adequate knowledge and funding to utilize technologies

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that optimize the opportunities in climate change such as rainwater harvest, dumping rain run off-water and use of solar energy for sustainability of their livelihoods.

Keywords: Opportunities, Climate change, Livelihoods, Harnessing

INTRODUCTION

Climate change is viewed as a shift from the average weather condition of climatic elements, which persists for several decades or longer Inter-governmental Panel on Climate Change[IPCC] (2020).

The basic livelihood activities in Niger North Senatorial District, Niger State are mostly driven by agricultural activities which mostly depends on rainfall, the major agricultural product of the town are maize, rice, cowpea, sorghum, soybean, cassava, fish and livestock. Some other people in the area also engage in various formal and informal activities such as trading, tailoring, welding, and grinding, among others, very few are civil servants. Niger State Agricultural and Mechanization Development Authority [NAMDA] (2018).

Ajetomobi et al., (2015) observed that there is a large uncertainty with respect to climate change predictions and impacts on future water availability and quality especially in Sub-Saharan African countries like Nigeria.

Niger State Agricultural and Mechanization Development Authority annual report] [NAMDA] (2022), the report shows that the livelihood activities of rural people were negatively affected by 2012, 2018 and 2020 flooding. Niger State Emergency Management Agency [NSEMA] (2020) reported extreme weather events such as floods in different communities of the state with various degrees of damages; Agwara, Borgu, Kontagora, Magama, Mariga, Mashegu, Rijau and Wushishi, are among the Local Government Areas (LGAs) that have consistently experienced flooding with huge loss of lives and properties including their livelihoods. In combating the menace of climate change, it is necessary to increase the resilience of the affected communities' livelihood and ensure food security. Therefore, it is necessary to look inward and take advantage of the prospects of climate change and harnessed the opportunities available for livelihoods sustainability. In resource-poor small-scale farming systems, climate change opportunities [referred to as climate smart agricultural (CSA) technologies], these technologies and practices are anticipated to enhance adaptive capacity, food security, make a contribution to climate change mitigation and enhance livelihood sustainability (Hellin and Fisher, 2019). Harnessing climate change opportunities and implementing CSA practices and technologies individually or in combination can significantly reduce the negative impact of climatic variability on agriculture (Ali and Erenstein, 2017). Harnessing the opportunities presented by climate change comes with its own set of challenges.

Wamalwa (2017) examined factors influencing adoption of climate smart practices among farmers of Kitutu and Nyaribari Chache in Kisii County Uganda, the study revealed that there was an emerging appreciation of climate change problem and need for adoption of climate smart practices, their adoption was mainly constrained by weak legal and policy framework, financial setbacks, limited climate information and knowledge of climate smart practices. Vardy et al., (2017) finding identified resource limitations, policy and regulatory barriers, market and economic factors, technological and infrastructure constraints, social and behavioral barriers, vulnerability and inequality, global interconnectedness and coordination, environmental degradation and resource scarcity as some factors influencing harnessing

climate change opportunities. Heffernan (2023) identified limited access to funding, technology, and skilled workforce as factors that can hinder efforts to capitalize on climate change opportunities, especially in developing countries and marginalized communities. The findings is in agreement with school of thought that farmers are aware and ready to adopt most effectives climate change opportunities but they are limited by some factors which need to be examined. These form the background of the study in Niger North Senatorial District of Niger State, Nigeria.

Study Area

Niger North Senatorial District, Niger State is located between Latitudes 9°17 00 N and 11°23' 00" North of the equator and Longitudes 3°35'30"-E and 6°13'30" East of the Greenwich meridian. The total land mass of the Senatorial District is 41,265.4 Square Kilometres. It is bounded to the north by Kebbi and Zamfara States, to the east by Kaduna State and Rafi LGA, to the south by Mokwa, Lavun, Gbako and Bosso LGAs and the west by Republic of Benin and Kwara State.

The projected 2023 population of the study area is 2,725,812, Mashegu LGA is the most populated and Agwara is the least [populated].

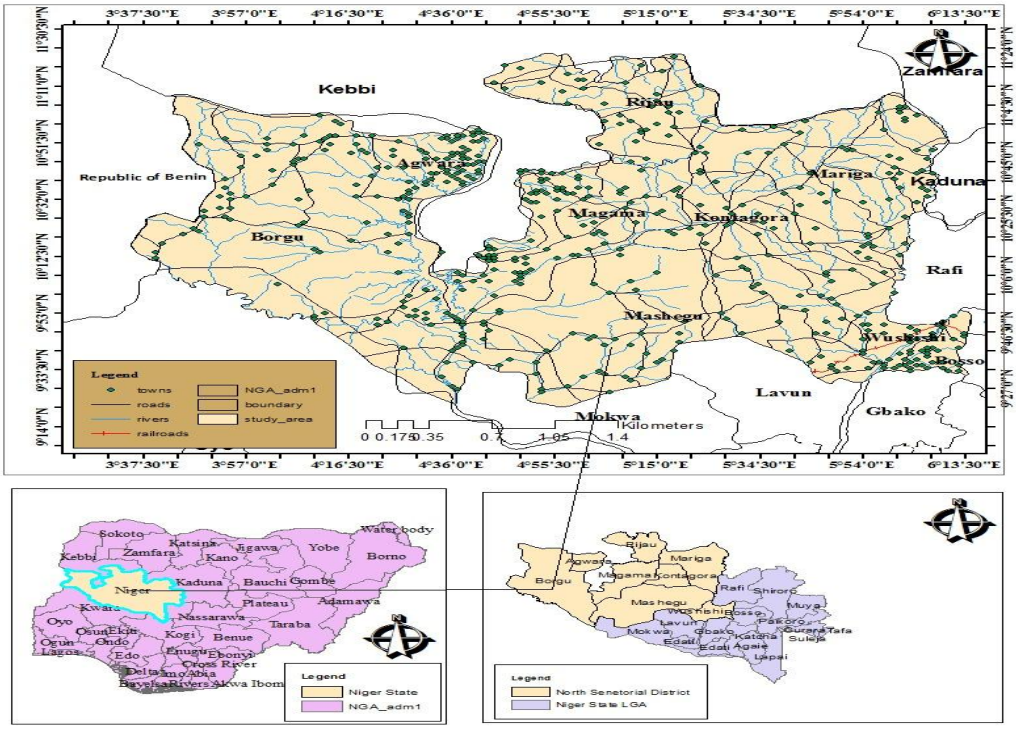

Figure 1.1: Niger North Senatorial District, Niger State.
Source: Niger State Ministry of Land and Housing, 2024.

Materials and Methodology

Types of data

The data required for the study include data on the socio-demographic attributes of the people (age, marital status, education and occupation); climate smart livelihood activities engaged in by the people in the study area; climate change opportunities in the study area; sustainable livelihood activities that can harness the opportunities of the climate change.

Other data include the administrative boundary of the study area, the number of LGA in the study area, the name and number of communities within each LGA, population of each ward and village.

Sources of data

Questionnaire
A structured questionnaire was designed to elicit information on the subject matter from the respondents. The questionnaire was designed in sections. The questionnaire contained both open and closed-ended questions that enhanced the quality of information provided by the respondents.

Observation checklist
Taking advantage of climate change manifestations such as flood, heat, and insect infestation requires some techniques and tools, for instance, Sandbagging, digging trenches to contain flood water for reuse and so on. Therefore, observation was used to acquire data on how it was done and achieved. Observation checklists were used for these.

Key Informants Interview (KII)
The research being a mixed method randomly selected key informants who have successfully taken opportunities of climate change based on professional experience.

Sample size and sampling techniques
Sample size was determined from the 1991 population census data which provided population figures for localities. The aggregated population figure of the area according to the 1991 population census was 1,198,893 with an annual growth rate of 2.60% (World Population Review, 2023). The 1991 Population was projected to 2023 using the formula
$X(t) = Xo \times (1 + r)t$ after calculator.academy/pop.population growth calculator (2023).
Where X(t) is the final population after time t,
Xo = the initial population,
r = the rate of growth and
t = the total time (number of years)
(Xo = 1,235,263, r = 2.60% and t (1991 – 2023) = 32 years). X(t) is therefore 2,725,812 (Population Growth Calculator). Krejcie and Morgan's (1970) Table was used to determine the sample size. According to this technique, for an area with a population range of between 2,500,000 to 10,000,000, the sample size to use is 384 at a 95% confidence level and a 5.0% margin of error. Thus, the sample size for this study was 384. The 384 respondents were selected from the eight selected wards of the four selected LGA proportionate to the population of each ward.
The eight (8) Local Government Council Areas (LGA) of Niger North Senatorial District, Niger State were arranged in alphabetical order and every second LGA was sampled. In this case, Borgu, Magama, Mashegu and Wushishi formed the sampled LGAs. In the second stage, a systematic sampling technique was also used to select every 4th Ward from the four LGAs sampled. In this case, Karabonde, Shaganu in Borgu, Ibelu East, Nasko in Magama, Kaboji, Mashegu in Mashegu, Kanwuri and Maito in Wushishi LGAs formed the sampled Wards.
In the third stage, the purposive sampling technique was used. Respondents who were 45 years and above and must have been residing in the District for at least 30 years were used as units of observation.

The livelihoods in the study area were carefully identified and efforts were made to pick respondents across various livelihood options. The questionnaire was administered with the

help of eight trained research assistants who were drawn from a government agency (NAMDA) and trained by the researcher.

Data Analysis
Both descriptive and inferential statistics were used to analyse data collected based on the research objectives. Descriptive statistics including mean, frequency distribution, percentages, charts and multiple linear regression models were used to analyse and present the results.

RESULTS AND DISCUSSION

Social-demographic Characteristics of Respondents
The personal data of the respondents under consideration include age, level of education, primary occupation and years of livelihood experience.

Respondents' Age [Distribution]
The results indicate that a significant majority of the respondents in Borgu (57.14%), Magama (60.6%), Mashegu (77.49%), Wushishi (66.67%), and the pooled result (72.39%) are above 51 years of age. These age categories have profound implications for engagement in sustainable livelihood activities. This finding is in consonance with Idoma et al., (2017), who reported that a larger proportion of farmers in Agatu LGA of Benue State, Nigeria were still in their active and productive age and easily adopted new farming technology.

Respondents' Level of Education
Most of the respondents, about 63% in Borgu, about 85% in Magama, about 86% in Mashegu, about 67% in Wushishi and about 83% in the pooled result respectively have received some form of formal education ranging from primary to tertiary levels. This suggests a strong foundation for the adoption of sustainable livelihood practices that can harness climate change advantages in the study area. This finding agrees with Ishaya and Abaje (2018), who identified formal education as a way to increase farmers' adaptive capacity to climate change in Jema'a Local Government Area of Kaduna State.

Primary Occupation of Respondents
The primary occupation is the main source of the people's income which influences the adoption of innovation in the study area.

Table 3.1: Primary Occupation of Respondents

Primary occupation	Borgu	Magama	Mashegu	Wushishi	Pooled result
Artisan	4	-	26	-	30
	(11.43)		(9.59)		(7.81)
Civil servant	2	-	4	1	7
	(5.71)		(1.48)	(8.33)	(1.82)
Crop farming	23	48	163	10	244
	(65.71)	(72.73)	(60.15)	(83.33)	(63.54)
Fishing	2	5	23	-	30
	(5.71)	(7.58)	(8.49)		(7.81)
Livestock farming	-	12	28	-	40
		(18.18)	(10.33)		(10.42)
Trading	4	1	27	1	33
	(11.43)	(1.52)	(9.96)	(8.33)	(8.59)
Total	35	66	271	12	384
	(100)	(100)	(100)	(100)	(100)

Note: Figures in parenthesis are percentages
Sources: Field survey (2024)

The findings indicate that a significant majority of respondents in the study area are primarily crop farmers representing about 66% in Borgu, 73% in Magama, 60% in Mashegu, 83% in Wushishi, and 64% in the pooled result respectively. Other occupations undertaken by respondents include livestock farming, artisanship, and trading. The predominance of crop farming as the primary occupation among respondents underscores the critical role of agriculture in the livelihood strategies in the study area.

This reliance on crop farming highlights the vulnerability of these communities to climate change impacts such as altered rainfall patterns, droughts, and extreme weather events. Promoting integrated farming systems that combine crop and livestock farming can improve resource use efficiency and increase resilience in the communities as opined by Adenrele and Sawa (2021).

Livelihood Experience of Respondents

Years of engaging in livelihoods is an indicator of experience and persistence for the sustainability of the livelihood. It also points to being adept at using opportunities that may arise.

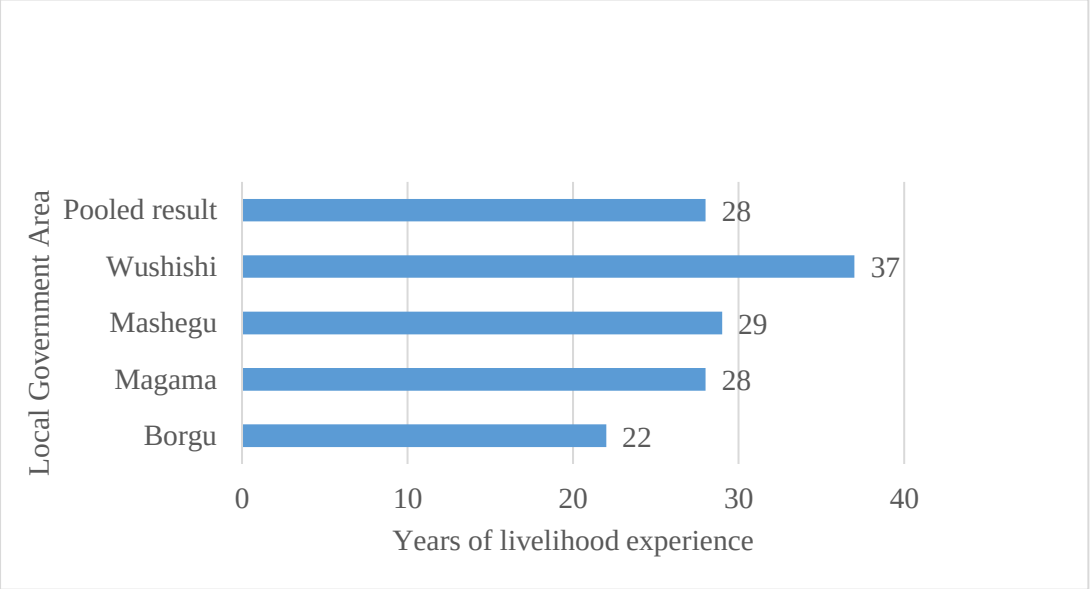

Figure 3.1 Distribution of the Respondents according to Years of Livelihood experience
Sources: Field survey (2024)

Findings show that the average duration of livelihood experience of respondents in the Niger North Senatorial District has 28 years of livelihood experience. The extensive livelihood experience of respondents implies a deep understanding of local agricultural practices and environmental conditions. The result corroborates the finding from Lansigan et al,. (2000), who reported that a long farming experience is an advantage for an increase in farm productivity in the Philippines since it encourages rapid adoption of modern farming innovations.

Types of Threats Posed by Climate Change in the Study Area

Types of threats posed by climate change to respondents' livelihood in the past 30 years data were collected and analysed.

The findings reveal that reduced crop yield and food production is a significant threat, particularly in Magama (56.06%) and Mashegu (51.29%), with 49.22% of respondents across all LGAs, another 83.33% of respondents in Wushishi LGA identified increased flooding and soil erosion, in Borgu LGA 77.14%, 33.59% of respondents across the region identified increased temperatures as a threats, threat of shortage of rainfall and drought was identified particularly in Borgu (62.86%) and Magama (54.55%), respondents in Magama (40.91%) and Mashegu (24.72%) identified rise in pests and diseases directly threatens agricultural productivity The implications for rural households are severe, as water scarcity directly impacts agricultural productivity, reducing crop yields and compromising food security. Livestock, a critical component of rural livelihoods also suffers from inadequate water resources leading to decreased meat and dairy production, pest attacks also lead to potential crop failures, reduced yields, and increased costs for pest control measures. This agrees with Falaki et al., (2023) remarked that the degree of the impact of climate change on crop production will depend upon the magnitude of the climate change and other factors since increasing temperature will also increase the intensity of pests and diseases.

Addressing these challenges requires integrated strategies that not only enhance resilience in agriculture through practices but also integrate policy and practice to mitigate the impacts of climate change on rural livelihoods and foster sustainable development.

Factors influencing Harnessing Opportunities in Climate Change for livelihoods sustainability in the Study Area

The study highlights several key challenges that can hinder harnessing the opportunities in climate change for livelihood sustainability in Niger North Senatorial District. It provides insights into the perceptions of respondents across the four selected LGAs regarding the various challenges.

Large household size as a hindering [factor]

Table 3.2 presents the results of an OLS regression analysis across the selected four LGAs in Niger North Senatorial District, namely Borgu, Magama, Mashegu, and Wushishi, along with the pooled result for the entire study area. The analysis investigates household members above 12 as a factor affecting harnessing opportunities presented by climate change for sustainable livelihoods. The F-ratios across the LGAs (Borgu = 5.74***, Magama = 4.92***, Mashegu = 5.54***, Wushishi = 7.27***) and the pooled result (6.36***) are all significant, indicating that the models are well-fitted and the explanatory variables collectively have a significant impact on the dependent variable in each LGA and across the study area. The positive and significant relationship between household size and the ability to harness climate change opportunities, as evidenced in the result presented across the four LGAs highlights the critical role of household composition in the adoption of opportunities in climate change for sustainability of livelihoods within the study area. The findings reveal that in Borgu household size exhibits a significant positive coefficient of 1.34 at the 5% level. This trend is consistent across Magama and Mashegu with coefficients of 1.26 and 0.96 both significant at the 5% and 1% levels respectively, in Wushishi the positive coefficient of 1.60 remains significant at the 10% level. The pooled result which consolidates data from all four LGAs also reflects a significant positive impact, with a coefficient of 0.87 significant at the 1% level, suggesting that the observed trend is not only localized but pervasive across the entire study area. These findings suggest that larger households by virtue of their greater labour resources possess a higher capacity to engage in diverse livelihood activities which in turn enhances their ability to exploit climate change opportunities. Larger households are likely to have more members available to participate in various income-generating activities, from

agriculture to small-scale enterprises, thereby increasing their capacity to adopt opportunities presented by climate change.

This finding is similar to Ogunrayi et al., (2016). Descriptive Analysis of Rainfall and Temperature Trends over Akure. The econometric technique was used to estimate results and findings show among other variables, household size has a significant effect on the level of adoption of irrigation agriculture in the study area.

Educational attainment and harnessing opportunities in climate change

The results in Table 3.2 show that the relationship between formal education below the secondary school level and the ability to harness climate change opportunities presents a complex and context-dependent dynamic across the LGAs. In Borgu, the positive coefficient of 0.56, though not statistically significant, suggests that lower levels of formal education might have a minimal positive influence on the ability to seize climate-related opportunities. This trend is similarly observed in Magama, where the coefficient of 0.71, a different scenario was observed in Mashegu where the impact of low formal education is significant at the 1% level, with a coefficient of 0.86. This suggests that in Mashegu, lower levels of formal education may actually enhance the ability to harness climate change opportunities.

In Wushishi the relationship remains positive but is not statistically significant (coef. = 0.38), this is similar to findings in Borgu and Magama, lower formal education does not strongly influence the ability to capitalize on climate-related opportunities. However, in the pooled result the effect of low formal education becomes significant at the 10% level (coef. = 0.5). This pooled result suggests that across the study area as a whole, there is a modest but significant positive relationship between lower levels of formal education and the capacity to harness climate change opportunities. This finding implies that in certain contexts, particularly where traditional or experiential knowledge plays a critical role, lower levels of formal education might not hinder and could even enhance adaptive capacity.

These findings did not collaborate with Ishaya and Abaje (2018) findings, where the researchers identified formal education as an important factor for the adoption of innovation and technology in a changing climate where educated individuals are often more open to diversifying their livelihoods, which can reduce dependency on a single income source and increase overall household stability.

Low awareness of climate change opportunities as a hindering factor

The perception of the respondents on awareness of climate change opportunities is presented in Table 3.2

The results indicated that the relationship between awareness of climate change opportunities and the ability to harness these opportunities varies significantly across the LGAs, revealing the complex role that awareness plays in adaptive capacity. In Borgu, the negative and significant coefficient of -1.34 at the 10% level indicates that a lack of awareness significantly impairs the ability of communities to capitalize on climate change opportunities. Similarly, in Wushishi a negative relationship was observed (coef. = -1.97) also significant at the 10% level, underscoring the detrimental impact of low awareness in this LGA as well. The consistency of this negative effect in both Borgu and Wushishi highlights the essential role that awareness plays in enabling communities to respond effectively to the challenges and adoption of opportunities presented by climate change.

Conversely, the positive and significant coefficient of 1.43 in Magama suggests a different dynamic. Despite low awareness households in Magama appear to be utilizing climate change opportunities, possibly due to the presence of alternative factors such as strong community networks, local initiatives, or traditional knowledge systems that compensate for the lack of formal awareness. In Mashegu the effect of low awareness is negligible and not statistically significant, reflecting a neutral relationship where awareness does not appear to play a major role. The pooled results which show a non-significant coefficient of 0.75, further emphasize the variability of this relationship across the study area. These findings suggest that while awareness is crucial in some LGAs, its impact is not uniform and in certain contexts, other factors may mitigate the effects of low awareness. Therefore, enhancing awareness through campaigns and education programmes is important.

Coulson-Thomas and Colin (2017), climate change opportunity and corporate responses. Ahluwalia J. S. (Editor) also opined lack of awareness of certain innovations or technologies can limit the adoption and diffusion of innovative solutions, particularly in remote or underserved areas.

Limited knowledge about using climate change opportunities

The results of the analysis on limited knowledge of climate change opportunities in Table 3.2 reveal varying degrees of limited knowledge about climate change opportunities as a factor influencing harnessing climate change opportunities for sustainable livelihoods across the four LGAs. It shows that the coefficient is negative (-0.64) and significant at the 10% level (t-value = -1.72*) in Borgu, indicating that limited knowledge of climate change opportunities significantly hampers the ability to capitalize on these opportunities. A similar trend was observed in Magama, with a negative coefficient (-0.57) and significance at the 10% level (t-value = -1.71*). This suggests that in Borgu and Magama, a lack of adequate information or understanding of the available climate change opportunities constrains households' adaptive capacity, limiting their ability to develop sustainable livelihoods. Interestingly, in Mashegu the effect is negligible and not statistically significant (coef. = 0.12, t-value = 0.25), indicating that limited knowledge may not be a significant issue in this LGA. Also, in Wushishi, the coefficient is negative (-1.05), but not significant (t-value = -0.69), suggesting that while there might be some impact of limited knowledge, it is not a decisive factor in this LGA. The pooled result across all LGAs further shows an insignificant positive coefficient (0.21, t-value = 0.77), which may reflect the varying impacts of knowledge limitations across different areas.

The significant negative impact of limited knowledge in Borgu and Magama brought to the limelight the need for relevant interventions to improve climate change literacy and information dissemination in these areas. In contrast, the negligible impact in Mashegu and the non-significant result in Wushishi suggest that other factors might be more influential in these areas, however, knowledge is essential for action just as in the case of awareness. Without proper knowledge, even those aware of the opportunities may not know how to take advantage of them, as some are aware but lack knowledge of some technologies involved in climate change opportunities.

Mersha and van Laerhoven, (2019) in their findings on Climate-Resilient fisheries and aquaculture: also opined that the conservation of flood water ensures sustainability of fisheries and aquaculture practices, such as sustainable fish farming, habitat restoration and promotes the conservation of aquatic ecosystems, enhance fish stocks, and provide alternative livelihood opportunities for the communities. This calls for comprehensive training and capacity-building initiatives.

Inadequate income from primary livelihoods ≤ ₦30,000 as a factor hindering harnessing climate change opportunities

Another significant factor influencing harnessing climate change opportunities perceived by the respondents is the low income from their primary livelihood activities. The results presented in Table 3.2 revealed a consistently strong negative relationship between low income from primary livelihood activities (≤ ₦30,000) and the ability to harness climate change opportunities across the selected LGAs studied. In Borgu, a significant negative coefficient of -1.44 with a t-value of -3.02 at the 1% level, indicates that households with low income are severely constrained in their capacity to exploit opportunities presented by climate change. This trend is mirrored in Magama and Wushishi where the coefficients are -1.41 and -1.51 respectively, both highly significant with t-values of -3.13 and -3.17 at the 1% level. These findings suggest that in these LGAs low income from primary livelihood activities acts as a substantial barrier, likely because limited financial resources restrict the ability to invest in opportunities presented by climate change. In contrast, the effect in Mashegu is negative but not statistically significant (coef. = -0.58), suggesting that while low income might still pose challenges, other factors may mitigate its impact on the ability to harness climate change opportunities. However, the pooled result across all LGAs confirms the overall significant negative impact of low income, with a coefficient of -0.96 and a t-value of -3.26 at the 1% level. This underscores the pervasive nature of income constraints across the study area.

Low Income from Other Sources

The analysis also highlights the significant role that income diversification plays in enabling households to harness climate change opportunities across the LGAs in the study area. In Borgu, the positive and significant coefficient of 1.15 at the 10% level suggests that households with income from sources beyond their primary livelihood activities are better equipped to exploit opportunities arising from climate change. This finding is even more pronounced in Magama where the coefficient is 1.40, significant at the 5% level, in Wushishi a significant positive relationship is observed, with a coefficient of 1.89 at the 5% level, reinforcing the notion that income from multiple sources enhances a household's financial stability and adaptive capacity.

In contrast, the relationship in Mashegu, while positive is not statistically significant (coef. = 0.54), suggesting that income diversification may play a less critical role in this LGA, potentially due to other mitigating factors or differing socio-economic conditions. However, the pooled results across all LGAs indicate a significant positive impact of income diversification, with a coefficient of 0.54 significant at the 10% level. This consistent positive relationship across the different LGAs underscores the importance of diversified income sources in taking advantage of opportunities in climate change.

The implications of these findings are that households that rely on multiple income streams are better positioned to invest in climate adaptive measures, reduce vulnerability, and capitalize on new opportunities that arise from climate change.

Heffernan (2023), found that implementing climate change adaptation and mitigation measures often requires substantial financial resources, technological capabilities, and human capital. Limited access to funding, technology, and skilled workforce can hinder efforts to capitalize on climate change opportunities, especially in developing countries and marginalized communities. Therefore, it is necessary to increase income from primary and other livelihoods in order to be able to harness opportunities from climate change.

Table 3.2: Factors Influencing Harnessing the Opportunities in Climate Change in the Study Area

Variables	Borgu		Magama		Masgehu		Wushishi		Pooled result	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Household size above 12	1.34	2.23**	1.26	2.28**	0.96	3.34***	1.60	1.82*	0.87	3.31***
Formal education below secondary school	0.56	0.85	0.71	1.11	0.86	2.77***	0.38	0.52	0.5	1.76*
Low awareness of climate change opportunities	-1.34	-1.84*	1.43	1.97*	0.22	0.34	-1.97	-1.81*	0.75	1.58
Limited knowledge of climate change opportunity	-0.64	-1.72*	-0.57	-1.71*	0.12	0.25	-1.05	-0.69	0.21	0.77
Income from primary livelihood activities ≤ ₦30, 000	-1.44	-3.02***	-1.41	-3.13***	-0.58	-1.51	-1.51	-3.17***	-0.96	-3.26***
Low income from other livelihood activities	1.15	1.69*	1.40	2.17**	0.54	1.38	1.89	2.01**	0.54	1.68*
Weak financial support	-0.93	-1.72*	-0.88	-1.73*	-0.65	-2.15**	-1.70	-2.22***	-0.50	-1.91*
Opportunities too technical to adopt	-1.11	-1.71*	0.95	1.54	0.64	1.60	-3.05	-2.58**	-0.64	-1.98**
Weak policy framework	-1.29	-1.36	-1.17	-1.27	-0.20	-0.40	-0.75	-0.63	-0.11	-0.31
Constant	27.45	3.65***	25.61	3.38***	27.95	8.54***	9.14	0.81	28.84	11.27***
Diagnostic statistics										
F-ratio	5.74***		4.92***		5.54***		7.27***		6.36***	

Note: ***, **, * implies statistical significance at 1%, 5% and 10% levels respectively.

Weak financial support

The results in Table 3.2 reveal a consistently negative and significant relationship between weak financial support and the ability of households to harness climate change opportunities in the study area. In Borgu, a negative coefficient of -0.93, significant at the 10% level, indicates that insufficient financial backing significantly constrains households' capacity to invest in adaptive strategies or technologies that could enable them to capitalize on the opportunities presented by climate change. This trend is similarly observed in Magama with a coefficient of -0.88, also significant at the 10% level. The situation is even more pronounced in Mashegu, where the negative impact is stronger with a coefficient of -0.65, significant at the 5% level, indicating that financial constraints in this LGA are a significant barrier to adaptive capacity. In Wushishi the most severe impact is observed with a highly significant negative coefficient of -1.70 at the 1% level, further emphasizing the critical role of financial resources in enabling households to respond effectively to climate challenges.

The pooled results across all LGAs reinforce these findings with a significant negative coefficient of -0.50 at the 10% level, confirming that weak financial support is a pervasive issue across the study area. These results underscore the importance of financial support as a fundamental enabler of adaptive capacity.

The finding is in line with the study of Duru et al., (2022) that rural women in Ilorin South Local Government Area (LGA) of Kwara State, Nigeria, are impacted by the perils of anthropogenically induced climate change disasters that have impacts on their livelihood.

The study suggests that a collective effort is required to implement proactive measures to improve rural women's resilience to the impact of climate change on their livelihood.

Technical nature of adopting opportunities in climate change

Lastly, the results highlight the vital role that the technical complexity nature of some climate change opportunities such as rainwater harvest and renewable energy as presented in Table 3.1 plays in either facilitating or hindering their adoption across the LGAs in the Niger North Senatorial District. In Borgu, a negative and significant coefficient of -1.11 at the 10% level shows that the technical nature of climate change opportunities presents a substantial barrier to their adoption, effectively limiting the capacity of households to leverage these opportunities for sustainable livelihood enhancement. This same scenario was observed in Wushishi where the impact of technical complexity is even more pronounced, with a coefficient of -3.05 significant at the 5% level. In Magama and Mashegu the coefficients are positive but not statistically significant, suggesting that while technical complexity may not be a significant barrier in these areas, it also does not significantly enhance the ability to harness climate change opportunities. These mixed results across LGAs reflect the varied capacities of different communities to engage with technically complex climate adaptation measures.

The pooled result across all LGAs reveals a significant negative coefficient of -0.64 at the 5% level, reinforcing the overall conclusion that technical complexity poses a substantial challenge to the adoption of climate change opportunities in the study area. This highlights the necessity for interventions aimed at simplifying these technologies or providing adequate training and capacity-building initiatives. Ensuring that climate change opportunities are accessible to all, regardless of their technical complexity, is crucial for enhancing the resilience and adaptive capacity of the communities.

Similarly, Javeed's (2023) study on climate change and sustainable rural livelihoods: constraints and adaptation strategies, highlights the challenges faced by rural communities in adapting to climate change as majority as the community residents opined that the strategies were complex to adapt and emphasises the importance of incorporating indigenous knowledge and sustainable practices into climate change adaptation strategies.

Weak policy framework

The results for weak policy framework present a uniformly negative but mostly non-significant impact across the LGAs, indicating that while a weak policy framework is a concern, its immediate acceptance as a factor influencing harnessing climate change opportunities may vary by location. In Borgu, the coefficient is negative (-1.29) but not statistically significant (t-value = -1.36), suggesting that while weak policies may be detrimental, they do not have a statistically significant impact on the ability to harness climate change opportunities in this LGA. A similar pattern is observed in Magama (coef. = -1.17, t-value = -1.27) and in Magama (coef. = -0.20, t-value = -0.40), where the negative coefficients indicate potential barriers posed by inadequate policies, yet the lack of statistical significance suggests that these barriers may not be the most factor influencing harnessing climate change opportunities. In Wushishi the coefficient is also negative (-0.75) and not significant (t-value = -0.63), aligning with the trends seen in other LGAs. The pooled result reflects a minimal and non-significant negative impact (coef. = -0.11, t-value = -0.31), indicating that across the entire study area, weak policy frameworks are not perceived as a major hindrance to exploiting climate change opportunities.

Generally, non-significant impact of a weak policy framework across the LGAs suggests that while inadequate policies may create an unfavorable environment, they are not the most critical barriers to harnessing climate change opportunities in the Niger North Senatorial District. However, this does not diminish the importance of strong, supportive policies in enabling sustainable livelihoods.

The result of this study is not in total agreement with the findings of Heffernan (2023) Climate Change: Local Challenges and Global Opportunities highlight inconsistent or inadequate or weak policies, regulations, and governance frameworks can impede the adoption and implementation of climate-friendly practices and technologies. Lack of clear guidelines, bureaucratic hurdles, and conflicting priorities among stakeholders may slow down progress in addressing climate change challenges.

Conclusion

The study concludes that climate change poses significant threats to livelihood sustainability in the Niger North Senatorial District of Niger State, Nigeria, with reduced crop yield and food production being the most critical issues identified. Therefore, there is a need to harness climate change opportunities for the sustainability of livelihoods, it is also necessary to look into the factors influencing harnessing climate change opportunities and address the factors.

Based on the findings of this study, the following recommendations are made to address factors influencing harnessing climate change opportunities in Niger North Senatorial District, Niger State, Nigeria:

(i) Local Government Authorities should implement comprehensive policies that will increase harnessing opportunities in climate change in the study area. These policies includes Government and climate change NGOs should support the people with adequate knowledge and funding to utilize technologies that optimize the opportunities in climate change such rain water harvest, damming rain run off-water and use of solar energy for the sustainability of their livelihoods.

(ii) Government and NGOs should encourage and support alternative livelihood activities such as beekeeping, aquaculture, and agroforestry in rural communities to increase people's source of income and enablement to adopt proven technologies that will ensure the sustainability of their livelihoods. This is because these livelihoods are not complex in practice.

(iii) Government and relevant agencies should launch comprehensive information campaigns using local media, social platforms, and community meetings to disseminate accurate information about climate change opportunities.

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