

Assessment of Risk Perception, Level of Awareness and Adaptation Strategies to Climate Change Among Households in the Ancient City of Zaria, Kaduna State

Suleiman, Umar Bambale*, Musa, Inusa, Jimoh, Abdulrauf Kayode & Salahudeen, Hajarat
Department of Geography, Federal University of Education, Zaria, Nigeria

*Corresponding Author's Email & Phone No.: talk2usbambale@gmail.com , +234- 7034568790

Received on: October, 2024

Revised and Accepted on: November, 2024

Published on: December, 2024

ABSTRACT

This paper examined the risk perception, level of awareness and adaptation strategies to climate change among households in the ancient city of Zaria, Kaduna state. The study area has a total population of 261,952 based on 1991 population census which was projected to 707,264 in 2021 using Mehta 2004 method with a growth rate of 2.8%. A total of one hundred and forty-one (141) copies of questionnaire which represents the sample size was purposively administered to both male and female respondents across six (6) wards in Zaria city representing 0.06% of the total population of the study area. This was determined using approximate sample method with 87% response rate (122 copies retrieved). The data collected were analysed and presented in simple tables, and percentages using Microsoft words tool 2016. Findings showed that rise in temperature with mean score of 2.85 was ranked first (1st) among indicators of climate change awareness in the study area. Result also showed that irrigation practice with weighted mean 2.64 was the most accepted adaptation strategy employed in the study area. The paper concludes that households have increased knowledge/awareness of climate change in recent years. Since they have been practicing different adaptation strategies. The paper recommended that bridging gender gaps in knowledge and understanding of climate change need to be encouraged in order to tackle challenges pose by climate change in the study area.

Keywords: Risk Perception, Awareness level, Climate Change, Adaptation, Zaria

1.0 INTRODUCTION

1.1 Introduce the Problem

Climate change is one of the most significant challenges facing human society in the 21st century. Climate change has become one of the most essential concerns in the field of sustainable development, and its impacts can be felt in different parts of the globe (Sintayehu &, Tulu, 2021). The United Nation Development Programme (UNDP, 2020) demonstrated that climate change is a reality and primary environmental threat to sustainable development.

Climate change refers to any change in the state of the climate that can be identified by changes in the average and or the variability of its properties (e.g. temperature, precipitation) that persists for an extended period, typically decades or longer (IPCC,2014).

Climate change is one of the most urgent issues in our time with widespread implication for the earth's ecosystem and human development (Hazo, 2018, Suleiman, 2019). Climate change brings some localized benefit in certain areas, but the overwhelmingly negative especially in the latest developed countries where vulnerability is highest (Abaje, 2016 & Atiku, 2019). Climate change causes several thousands of deaths every year through shifting patterns of diseases, extreme

weather events such as heat-wave and floods, and from the degradation of air quality, food and water supplies and sanitation (Lugard, *et al.*, 2024a). Predictive model indicates that between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year through malnutrition, malaria, diarrhoea and heat stress (Lugard, *et al.*, 2024b). The direct impacts of climate change may result in human injuries, illnesses and deaths related to extreme weather event and changes in weather patterns will exacerbate vector-pathogen relations and increased diseases burden (Suleiman, 2024). Indirect impacts include impaired food security and nutrition as a result of change in crops yield, as well as displacement and loss of live-hoods leading to negative health effect (NIMET 2024). Climate has contributed to the displacement of millions of people by the disruptions of monsoon system and other rainfall regimes, exacerbating droughts of unprecedented severity and duration and sea-level rise resulting to coastal flooding (Perera, et al., 2019) Although the gender equality and women's empowerment are acknowledging pre-requisite for sustainable development issue (UNDP, 2020). Urban flood experienced by people can make them suffer mental disorder, interrupt schooling, loss of lives and properties in northern part of Nigeria (Ideki &Weli, 2019).

1.2 Explore Importance of the Problem

Climate change awareness involved creating knowledge, understanding value, skills and abilities among individuals and social groups towards the issue of climate change for attaining a better quality environment. Climate change experts have repeatedly pointed out that proffering permanent solution to climate change will require climate change awareness and advocacy for its proper understanding (Suleiman, 2020). Hassan, (2018) pointed out that there is need for us to come up with sensitive measures toward addressing climate risks through a strong programme of climate change awareness. This is imperative in the sense that there are some misconceptions and misunderstanding of climate change issues among many people. However, global concern regarding the devastating impacts of climate has emphasized the need for creating awareness and building community capacity for adaptation strategies to mitigate the effect of climate change (Lugard, *et al.*, 2024a).

1.3 Describe Relevant Scholarship

Many researches have been conducted concerning the risks pose by climate change in intensifying global environmental problems. Some of these researches have essentially focused on the misconceptions people hold about climate change issues in terms of causality, consequences and mitigation measures (Suleiman, *et al.*, 2023). These misconceptions according to Abaje, *et al.*, (2015) are probably due to the complexity of the science of climate change, the uncertainties involved and controversies surrounding them. Previous studies on climate change such as (Lugard, *et al.*, 2024 a&b); Hazo, (2018); Suleiman, (2019); Suleiman, 2020); Hassan, (2018); Abaje, *et al.*, (2015) appraised public perception of climate change and its implications without special focus on risk perception, and level awareness at local level. It is in light of the above fact that this research seeks to assess risk perception, level of awareness and adaptation strategies to climate change among households in the ancient city of Zaria, Kaduna state.

1.4 The Study Area

Zaria is located on Latitude 11⁰ 00' and 11⁰ 05' N and Longitude 7⁰ 37' E and 7⁰ 47' E of Green Which Meridian. Zaria Local Government Area covers an area of 300km². The Local Government Area is bounded to the North by Sabon Gari Local Government Area, to the South by Igabi Local Government Area, to the West by Giwa Local Government Area and to the East by Soba Local Government Area (see Figure 1). The climate of Zaria according to Koppen's classification is the A_w type of climate known as tropical continental or savannah type of climate. It has two distinct wet and dry seasons. The wet seasons begins in April and extend to October. The amount of rainfall received ranges between 1000-1500mm per annum. Relative humidity is between 50-70%. The mean average temperature is 28⁰C. The predominant winds in the area are the North East trade wind (Tropical Continental Air Mass) which blows North to South and the south West trade wind (Tropical Maritime Air Mass) which originates from the Atlantic Ocean (Suleiman, 2019). The relief of Zaria area is dominated by high plains, popularly known as the high plains of Hausa land which is between 500 – 600 meters above sea level. On the plains are Inselbergs and conical hills in different parts of Zaria (O.N, 2003). The drainage of Zaria is dominated by three important rivers. River Galma is the major river in the area and a tributary to river Kaduna. River Saye and Kubanni are tributaries to the Galma in addition to numerous streams such as Niima, Kamaca and Fatika. The drainage pattern is dendritic with first and second orders tributaries (Suleiman, 2023). The plain is dominated by tropical ferruginous soil and Hydromorphic / Fadama soil in the Kubanni- Galma lower valley. The main factors controlling soil formation in Zaria area are relief, drainage, climate, and man. The general vegetation classification of the area is Guinea savannah or savannah woodland. The dominant species are: *Locust bean tree*, *Shea butter*, *Baobab*, *Silk cotton*, *Nim* and *Eucalyptus*. The shrubs are *Isobalina spp.* while the grass is the elephant type known as *Gamba and carpet grass* Bello, *et al.*, (2023).

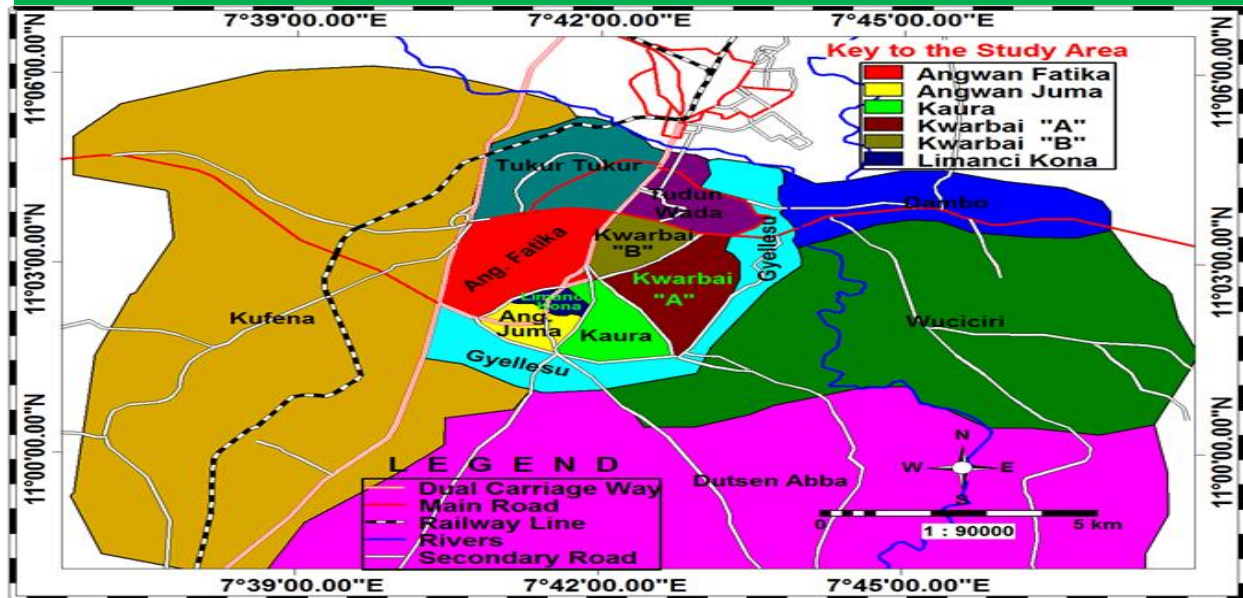


Figure 1: study area (Zaria LGA) showing some selected wards modified from administrative state, 2024.

Map of Kaduna

2.0 MATERIALS AND METHOD

2.1 Material

Materials such as structured questionnaires were used to obtain relevant information for this study. In addition, peer reviewed journals, textbooks, bulletins, reports and other publications were essentially used to achieve the set objectives.

2.2 Methods

The instrument used for this research was validated by experts in the field of climatology. Meanwhile, in testing reliability co-efficient of the instrument used for data collection. The reliability coefficient was estimated to be 0.89 which implied that the instrument was very reliable. Since the reliability co-efficient of the instrument falls between 0.5 and 1. The closer it to 1, the more reliability the instrument, conversely the less it is close to 1, the less reliable the instrument.

2.2.1 Participant (Socio-demographic) Characteristics

Table 1. Participant Socio-demographic Characteristic

Households characteristics		Frequency	Percentages	(%)
Sex status	Male	48		39
	Female	74		61
		122		100
Age (Years)	30-35years	43		35
	36-40	33		27
	41-45	21		17
	≥60	25		21
		122		100
Marital status	Single	27		22
	Married	84		69
	Divorced	6		5
	Widowed	5		4
		122		100
Level of Education				11
	Primary	12		57
	Secondary	70		20
	Tertiary	25		12

	Non formal	15	100
Occupation	Farming	11	9
	House wife	46	37
	Trading	30	25
	Civil service	29	24
	Craft & others	6	5
		122	100
Duration of residency	11-20	21	17
	21-30	51	42
	31-40	30	25
	≥40	20	16
		122	100
Household size	1-5	33	27
	6-10	61	50
	11-15	14	11
	16-20	8	7
	≥20	6	5
	122	100	
Estimated income per annum	≤₦150,000	66	54
	₦150,001-300,000	21	17
	₦300,001-450,000	11	9
	₦450,001-600,000	15	12
	≥₦600,000	9	8
	122	100	

Source : Field Survey, 2024.

2.3 Sampling Procedure

Purposive sampling technique was adopted in administering the questionnaire to the male and female inhabitants of study area. The thirteen (13) wards in the study area were arranged in an alphabetical order and five wards were purposively selected for their high degree of exposure and vulnerability to climate risks in the study area.

2.3.1 Sample Size, Power, and Precision

Based on the projected population of the study area, a total of 141 people represents the sample size for the study. This was determined using approximate sample method. The total of 141 copies of the questionnaire were administered proportional to the population of each selected ward and the response rate of 87% (122 copies of questionnaire retrieved) were used for the analysis.

2.3.2 Measures and Covariates

The collection of data for this research work, involved the use of both primary and secondary sources of data. The primary data involved the used structured questionnaires specially designed to obtain relevant information on the set objectives.

2.3.3 Research Design

Survey design was considered appropriate for this study. In a survey research, data were collected from the population/ its sample and analysed. This is because

survey design is usually interested in some characteristics of the population.

2.3.4 Experimental Manipulations or Interventions

Descriptive statistics such as frequency tables, percentage, were used in analysing and presenting the results. The proportional sample for each selected wards was calculated using the formula below: (1)

$$\frac{\text{Population projected ward selected}}{\text{Total projected population of wards selected}} \times \frac{\text{Sample size}}{1}$$

To assess level of awareness of households, the responses generated on indicators of climate change awareness were analysed using 3-point Likert scale, collapsed into (Low, Moderate and High). Values assigned to these include: 3, 2, and 1 respectively. The rating average is calculated by the formula.

$$\frac{x_1w_1+x_2w_2+x_3w_3\dots x_nw_n}{\text{Total}} \quad (2)$$

Where: w = weight of answer choice; x = response count for answer choice and Total = No of respondents.

The level of each item is determined by the following formula (highest point on Likert scale – Lowest in Likert scale)/the number of levels used was computed as $(3-1) / 3 = 0.67$

To assess the effectiveness of the various adaptation strategies, farmers scored these adaptations in the order

of their effectiveness in mitigating climate change impact in the study area based on 0–3 scale using weighted average index (WAI)

$$WAI = \frac{\sum FiWi}{\sum Fi}$$

(3)

Where: F = frequency of response; W = weight of each score; and i = score (3 = highly effective;

2 = moderately effective; 1 = less effective; 0 = not effective).

weighted average index (WAI) was used to identify the most effective adaptation strategies to climate change in the area. WAI is a scientific tool for comparing entities to judge which of the entity is preferred or has a greater amount of some quantitative property. This study therefore adopted the weighted mean average index (WAI) employed in Jigawa State by Hassan, (2018).

3.0 RESULTS AND DISCUSSION

3.1 Level of Awareness of Climate Change among Households

The level of awareness of people on climate change is presented on Table 2

Table 2 Level of Awareness of People on Climate change

Level of Awareness	High (3)	Moderate (2)	Low (1)	Mean Score	RANK	Decision
Occurrence of drought	67(55%)	39(32%)	16(13%)	2.42	7	High
Drying of rivers	79(65.5%)	29(24%)	14(11 %)	2.53	5	High
Heavy rainfall	85(70%)	26(21%)	21(17%)	2.69	2	High
Strong winds	74(61%)	33(27%)	15(12%)	2.48	6	High
Rise in temperature	95(88%)	26(21%)	11 (9%)	2.85	1	High
Occurrence floods	86(70%)	30(25%)	6(4%)	2.66	3	High
Shortening of rainy season	77(63%)	39(32%)	6(4%)	2.58	4	High
Aggregate mean score				2.60		

Source: Field Survey, 2024.

Table 2 indicated rise in temperature with weighted mean of \bar{x} 2.85 was ranked first (1st) among indicators of climate change awareness by respondents in the study area. Result also indicated that Heavy rainfall with mean score of \bar{x} 2.69 was ranked second 2nd among indicators of climate change awareness in the study area. Occurrence of floods with mean score of \bar{x} 2.52 was ranked third (3rd) among indicators of climate change awareness in the study area. The aggregate mean scores \bar{x} 2.60 showed that the level of awareness of climate change in the study area was generally high. Result further indicated that respondents are aware of climate change in the area. However, this could be attributed to the increased advocacy by electronic media outlets, schools and governmental and non-governmental agencies which sensitize people about the menace of climate change. This result corroborate with the findings of Suleiman 2021 which indicated that the level of awareness of climate change in northern part of Kaduna state in generally high.

3.2 Sources of Information to Respondents on Climate change

The Sources of Information to Respondents on Climate change is presented in Table 3

Table 3: Sources of Information to Respondents on Climate change

Statements	Male	Percentage (%)	Female	Percentage (%)	Total
Electronic Media	21	17.21	49	40.16	70
School/College/University	3	2.46	6	4.92	9
Government Agencies/Information	2	1.64	2	1.64	4
Friends/Relatives	5	4.10	3	2.46	8
Prints media	4	3.28	7	5.74	11
Personal Observation	8	6.56	12	9.83	20

Total	43	79	122
--------------	-----------	-----------	------------

Source: Field Survey, 2024.

Table 3 indicated the various sources of information on climate change by the respondents. Result showed that Male majority 17.21% and female majority 40.16% of the respondents obtain information through electronic media. 1.64% are male while 1.64% are female who obtain information through government agencies. This implies that the respondents may not know the value of extension agent and therefore may respond negatively. On the other hand, electric media such as Radio, and Television other social media platforms were the major sources of information on climate change in the study area. This result is in line with the findings of Suleiman 2021 which indicated that electric media is the major source of information on climate change in northern part of Kaduna state in generally high

3.3 Perception of Climate Change Reality

The Risk Perception of Climate Change Reality is presented in Table 5.

Table 4 Perception of Climate Change Reality

Statements	Male	Percentage (%)	Female	Percentage (%)	Total
Very much real	28	22.95	64	52.45	92
Real	10	8.19	8	6.56	18
Not real	2	1.64	3	2.47	5
No Idea	3	2.46	4	3.28	7
Total	43		79		122

Source: Field Survey, 2024.

Table 4 showed respondents perception on the reality of climate change. Results showed that 22.95% of male and 52.45% of female respondents believed very much that climate change is real. 8.19% of male and 6.56% of female respondents believed that climate change is real while 1.64% of male and 2.47% of female respondents believed that climate change is not real. The remaining 2.46% of male and 3.28% female respondents had no idea about climate change issues in the area.

3.4 Perceived Risk of Climate Change in the Study Area

The Perceived Risk of Climate Change is presented in Table 5

Table 5 Perceived Risk of Climate Change in the Study Area

Perceived Risk	Men						Women						Total
	A	%	D	%	UD	%	A	%	D	%	UD	%	
Decline in forest resource	35	28.69	7	5.74	1	0.82	51	41.80	11	9.02	17	13.93	
Decrease in crop yield	33	27.05	9	7.38	1	0.82	54	44.26	20	16.39	5	4.10	
Rising temperature leads to increase in diseases spread.	38	31.15	5	4.10	0	0.00	52	42.62	25	20.49	2	1.64	
Heavy rainfall/ flooding	19	15.57	12	9.84	12	9.84	47	38.52	26	21.31	6	4.92	
Unemployment	22	18.03	18	14.75	3	2.46	35	28.69	33	27.05	11	9.02	
Rural-urban migration	26	21.31	11	9.02	6	4.92	37	30.33	29	23.77	13	10.65	
Increased poverty	24	19.67	11	9.02	8	6.56	39	31.97	27	22.13	13	10.65	
Shortage of water	32	26.23	9	7.36	2	1.64	67	54.93	8	6.56	4	3.28	
Land degradation	9	7.38	22	18.03	12	9.83	9	7.38	38	31.15	32	26.23	
Total					43					79		122	

Source: Field Survey, 2024.

Table 5 showed that majority (54.93%) of the female agreed that shortage of water was due to climate change, 6.56% disagreed and 3.28% could not decide. This implies that majority of respondents (Females) have stronger perception than the male counterparts on shortage of water as the major climate risk exacerbated by climate change. The reason could be their bitter experience of prolonged hot weather which leads to drying of wells. The unsteady supply of pipeline borne water, leads to shortage of water forcing many women to trek long distance to fetch water for domestic purpose. This results agreed with the findings of Ideki, and Weli, (2019) & Suleiman, et al, (2023) which indicated water shortages was perceived to be a major risk faced by women exacerbated by climate change.

3.5 Adaptation Strategies to Climate Change Employed by Households in the Study Area

The Adaptation Strategies to Climate Change Employed by Households is presented in Table 6

Table 6 Adaptation Strategies to Climate Change Employed by Households in the study area

Adaptation strategies	Highly Effective (3)	Moderately Effective (2)	Less Effective (1)	WAI
Crop rotation	67	40	15	2.43
Mix cropping	59	41	22	2.30
Use of drought resistant/ early maturing variety of crops	75	35	12	2.52
Change of occupation	64	43	15	2.40
Irrigation practice	88	24	10	2.64
Mulching	66	44	12	2.44
Access to loan facilities.	57	29	36	2.17
Planting of trees	78	34	11	2.57
Use of alternative energy source	72	28	22	2.41
Soil conservation	65	33	24	2.25
Sale of assets	69	27	26	2.35
Aggregate weighted mean				2.41

Source: Field Survey, 2024.

Table 6 showed the weighted average index (WAI) for the climate Change adaptation strategies used by the households. Findings of the study revealed that irrigation practice, planting of trees, and use of drought resistant varieties with WAI of 2.64, 2.57 and 2.52 are the major climate change adaptation strategies with high rate of acceptance among the respondents. This result is in line with the findings of Suleiman (2021) & Hassan ,(2018) which indicated that that irrigation practice, planting of trees, use of early and drought resistant varieties of crops are the most effective climate change adaptation options employed by farmers in Jigawa and northern part of Kaduna state. On the other hand, access to loan facilities, soil conservation and mixed cropping were the least accepted adaptation strategies in the study area. The aggregate WAI of 2.41 however indicates that all other adaptation strategies used by respondents were acceptable at various levels. From the foregoing, it is evident that households in the study area are aware of climate change and are practicing different adaptation strategies to mitigate its effects. Therefore, there is need for integrating local adaptation strategies with relevant technology and technical government policies to make it more effective.

3.6 Responsibility of Tackling Climate Change

The Responsibility of Tackling Climate Change is presented in Table 7

Table 7 the Responsibility of Tackling Climate Change

Statements	Male	Percentage (%)	Female	Percentage (%)	Total
International organizations	5	4.10	12	9.84	17
Federal government	19	15.57	51	41.80	70
State governments	9	7.38	3	2.46	12
Local government	3	2.46	3	2.46	6
Community	4	3.28	2	1.64	6
Individuals	3	2.46	8	6.55	11
Total	43		79		122

Source: Field Survey, 2024.

Table 7 showed that 4.10% of male and 9.45% of female respondents believed that international organizations have the responsibility of tackling climate change while 15.57% of male and 41.80% of female believed that Federal Government have the responsibility of tackling climate change. Only 2.46 % each of male and female respondents mentioned local government while 3.28% of male and 1.64% of female respondents indicated

communities. This implies that majority of male and female respondents agreed that federal government has the major responsibility of tackling climate change. The reason could be that Federal Government can provide effective policies and adequate funding to mitigate climate change. Federal government can also provide alternative sources of energy that could be affordable by

local communities. This may reduce the excessive release of gases as a result of burning of firewood.

4.0 Conclusion and Recommendations

Based on the result of the study, it is possible to conclude that the dwellers of ancient city of Zaria are to a large extent aware of climate change. The research also concludes that the level of awareness to climate change in the study area was generally high due to access and utilization of electronic media i.e Radio, Television and other social media platforms which are now the major sources of information on climate change in the study area.

It could be deduced from the findings of this study that majority of respondents believed very much that climate change is real. In the same vein, households are practicing different adaptation strategies to mitigate risks and effects posed by climate change in the area. Finally, respondents agreed that federal government has the major responsibility of tackling climate change.

Based on the aforementioned findings the following recommendations are made:

- i. There is need for increased awareness and understanding of climate change among male and female respondents in the study area.
- ii. Electronic media especially radio and television should be well encouraged to sensitize people about the reality of climate change.
- iii. There is a need to integrate climate change local adaptation strategies with technical government policies to make it more effective.

REFERENCES

Atiku, K. (2019). Effect of Urban Growth on the Pattern of Weather Elements in Urban Zaria. (Unpublished M.Sc. Thesis), Department of Geography, Ahmadu Bello University, Zaria- Nigeria.

Abaje, I. B. (2016). Assessment of Rural Communities Perception, Vulnerability and Adaptation to Climate Change in Kaduna State, Nigeria. Unpublished Ph. D. Thesis, Department of Geography, Ahmadu Bello University, Zaria- Nigeria.

Abaje, B. I., Sawa, B. A., Iguisi, E. O. and Abdulhamed, A. I. (2015). Assessment of Rural Communities' Adaptive Capacity to Climate Change in Kaduna State, Nigeria. *Journal of Environment and Earth Science* www.iiste.org 5, (20): 17-20.

Bello, S. (2023). Analysis of Wood Fuel Utilization in Zaria and Its Environs. A paper presented at 7th Annual Conference and AGM Organized by the Association for Environmental Impact Assessment of Nigeria (AEIAN) Tagged: Impact Assessment:

Climate Resilience, Financing and Environmental Sustainability Held at Nigerian Society of Engineers (NSE), Abuja, Nigeria. Tuesday, 17th-20th October.

Hassan, G. (2018). Assessment of the Level of Adaptation to Droughts among Rural Households in Jigawa State. An Unpublished Ph.D. Thesis Submitted to the Department of Geography Ahmadu Bello University, Zaria.

Hazo, A.I. (2018). Assessment of Rural People's Perception and Adaptation Strategies to Climate Change in Funtua Local Government of Katsina State, Nigeria. (Unpublished Ph.D. Thesis), Department of Geography, Ahmadu Bello University, Zaria- Nigeria.

Ideki, O. and Weli, V.E. (2019). Analysis of Rainfall Variability Using Remote Sensing and GIS in North Central Nigeria. *Atmospheric and Climate Sciences*, 9, 191-201. <https://doi.org/10.4236/acs.2019.92013>

(Intergovernmental Panel on Climate [IPCC], 2014). Summary for Policymakers. In Field, C.B., Barros, V.R., Dokken, D. J., Mach, K. J., Mastrandrea, M.D., Bilir, T.E. and White, L.L. (Eds.). *Climate Change 2014: Impacts, Adaptation, and Vulnerability* (pp. 1-32.). Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Lugard, S. (2024a). Assessment of Response Capacity to Mitigate Flood Risk among Communities in Plateau State., Nigeria. *Journal of Disaster Risk Reduction* © (CDRMD) 2(1): 101- 108.

Lugard, S. (2024b). Assessment of Level of Preparedness to Mitigate the Flood Risk among Communities in Plateau State., Nigeria. *Journal of Disaster Risk Reduction* © (CDRMD) 2(1): 72- 80.

NIMET (2024). 2024 Seasonal Rainfall Prediction. An Unpublished Nigerian Meteorological Agency's Document.

(Online Nigeria [ON], (2003). Nigeria: Physical Setting- Kaduna State. Retrieved January, 30 2003. From www.onlinenigeria.com/link/kaduna_adv.asp?Blurb=295.

Perera, D., (2019). Flood Early Warning Systems: A Review of Benefits, Challenges and Prospects, Unu- Inweh Report Series, 08, available at www.inweh.unu.edu

Suleiman, U. B. (2024). Effect of Climate Change on Livelihood Innovation and Development of Educational Infrastructure in Kano Metropolis,

- Nigeria. A Paper Presented at 4TH Annual Conference Held at Entrepreneur Centre, Faculty of Education Federal University of Keshere, Gombe State, Nigeria from 11th -13th November.
- Suleiman, U. B. et al., (2023). Gender Differential Perception of the Causes and Effects of Climate Change in a Traditional Hausa City of Zaria, Kaduna State, Nigeria. A Paper Presented at 62nd Annual National Conference Organized by the Association of Nigeria Geographers (ANG) Held at Princess Alexander Auditorium and Unity Hall, (PAA) University of Nigeria Nsuka, Enugu State, Nigeria from 7th -11th February.
- Suleiman, U. B (2020). Integrating Global Efforts in Addressing Climate Change with Sustainable Development. A Paper Presented at 12TH Annual National Conference Organized by the School of Secondary Arts and Social Science Education, Federal College of Education Zaria, from 21- 24 July, 2020. Theme: Environmental Challenges, National Security and the Prospects of Sustainable Development Goals in Nigeria.
- Suleiman, U. B. (2020). Assessment of Public Awareness of Temperature and Rainfall Variations in Zaria and its Environs. A Paper Presented At 1ST Annual Conference Organized by the Faculty of Social Sciences, Kogi State University Held at the University Auditorium, Kogi State University, and Ayigba from 11th -13th March, 2020.
- Suleiman, U. B. (2019). Effect of Climate Change on Households and Adaptation Strategies in Northern Senatorial Zone, Kaduna State, Nigeria. An Unpublished Ph.D. Thesis Submitted to the Department of Geography, Ahmadu Bello University, Zaria.
- Sintayehu A. D. &Tulu B. B. (2021). Precipitation and Temperature Trend Analysis by Mann Kendall Test: The Case of Addis Ababa Methodological Station, Addis Ababa, Ethiopia. 4 (4): 517- 518. (United Nations Development Programme [UNDP], 2020). Five Approaches to Build Functional Early Warning Systems. Available at <http://europeandcis.undp.org> Retrieved on 5th January, 2020.