

Original Research Report

Coping Strategies Families Can Adopt to Manage Challenges of Climate Change in Adamawa State, Nigeria

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Abstract: Climate change is one of the most critical environmental challenges confronting human existence in the 21st century. This study investigated the coping strategies that families can adopt to manage challenges of climate change in Ganye, Adamawa State, Nigeria. The descriptive survey research design was adopted for the study. A sample of 384 inhabitants of the area was drawn across the households in Ganye for the study through a multi-stage sampling procedure. A questionnaire was developed by researchers for data collection. The findings of the study revealed that the mean ratings of the items identified as the challenges of climate change faced by respondents in the study area were above a criterion mean of 2.50, which depicts that the identified items were the challenges of climate change faced by the respondents. The values of the standard deviations ranged from 0.37-0.87, which implies that the responses of the respondents were close to each other and to the mean. The mean ratings for the several coping strategies families can adopt in managing the challenges of climate change were above a criterion mean of 2.50, which implies that the items identified were perceived as the coping strategies to manage the challenges of climate change. It was recommended that trees and cover crops should be planted in order to address the challenges posed by climate change in the study area.

Keywords: Challenges, Climate change, Coping strategies, Families, Pollution

1. Introduction

Changes in the climate system otherwise known as climate change are one of humanity's most threatening problems in the 21st century. Hence, there is global attention to climate change. According to the Intergovernmental Panel on Climate Change (IPCC, 2013), climate change is any significant alteration in the state of the climate that can be recognized by changes in the mean or the changeability of its properties. In other words, it is the change in climate over a long period of time. It encompasses changes in one or more climate variables such as wind, precipitation, temperature and sunshine. This change is not only due to natural variability but also as a result of anthropogenic activities. Climatic change has also been defined as any identifiable variability in the state of climate's properties, that often lasts for decades or longer (Ogbuabor & Egwuchukwu, 2017). It is also viewed as the shift in climate patterns that is mainly caused by natural processes and human activities (Haider, 2019). According to the authors, natural processes (biogeographical) and human activities (anthropogenic) are the two main causes of climate change.

Natural factors such as oscillation of temperature, dust and aerosols gotten from periodic volcanic eruptions emits greenhouse gases such as carbon dioxide, methane, Sulphur dioxide and nitrogen dioxide into the atmosphere. Human activities such as burning coal and fossil fuels, industrial air pollution, gas flaring, cutting down and burning forests, burning oil in cars and power plants also add greenhouse gases to the atmosphere (Hilton et al., 2012). These greenhouse gases trap solar radiation in the atmosphere and is absorbed and reemitted in all directions by greenhouse gases molecules and cloud. This results in the warming of the earth's surface (United Nations Framework Convention on Climate Change, UNFCCC 2019).

The impact of climate change is felt worldwide, both on the eco-system of developed and developing nations though with varying degrees of effect. In the developed nations, the effects of climate change have been perceived to be less severe due to the following advantages; agricultural mechanization, high adaptation methods, capital status/affluence and high expertise (Adeyeri, Ishola, & Okogbue, 2017). The availability and accessibility of these advantages have enabled the developed nations such as Germany and United States of America to limit the negative effects of climate change. In the developing countries, for instance in Africa, climate change and global warming are adduced to have serious effect in many of the countries as over 250 million people are exposed to increased water stress and adverse weather conditions. In Nigeria, just like other African and developing countries, climate change poses a serious threat to the lives of individuals and families, long-term development, poverty reduction, and achievement of the Millennium Development Goals (MDGs). The negative effects of climate change are already being felt, with more frequent changes in climate effects like floods, droughts, and heat waves (Chidi & Ominigbo, 2010). Climate change have also heightened the threat to food security, insufficient water resource availability, degeneration in natural resource productivity, diminished biodiversity, decline in human health viability, increasing land degradation, increasing desertification, and coastal zone recession are among the major concerns for Africa and Nigeria in particular (Onwutuebe, 2019; Shiru et al., 2018; Onah et al., 2016). Similarly, Ikelegbe (2016) noted that the impact of climate change is more devastating in developing countries, particularly those in Africa, due to their low adaptation or coping experiences. Usman and Dije (2013) also observed that the erratic patterns of weather elements in Nigeria accounts for many environmental and agricultural problems experienced in the country. In essence, climate change has negative impact on the natural environment and all ramifications of human life.

Nigeria is particularly susceptible to the effects of climate change in many aspects which are but not limited to the following; its systems of agriculture, soils, energy needs, economic organization,

geographic location, weather and climate, population and settlement, vegetation cover, high level of temperature, poor and low national income level, absence of early warning system, poor and low adaptation capacity (Akinbobola, Adedokun, & Nwosa, 2015). As noted by Ogbuabor and Egwuchukwu (2017), droughts higher temperatures, and desertification are all consequences of climate change as a result, many farm land are lost, agricultural productivity is reduced, and crop yields are affected. Furthermore, as observed by some researchers, climate change-related unpredictability in rainfall, heat stress, and drought can negatively impact the food production system and lead to food shortages (Abdulkadir et al., 2017; Elum et al., 2017). In another observation, Ebele and Emodi (2016) pointed out that increased salinity and shrinking rivers are also threatening the viability of inland fisheries, ponds. For instance, the authors noted that the north's high vulnerability to climate change poses a serious threat to the country's food security. The increased air pollution; disease and food- and water-borne illness (such as: typhoid fever, cholera among others) and increased cases of meningitis are also linked to higher temperatures resulting from climate change (Abdussalam, et al., 2014). These foregoing assertions suggest that climate change has devastating effects and as such poses a serious threat to human life. Thus, the devastating impact of climate change to human existence cannot be overstated. In order to reduce people's vulnerability to the effects of climate change, there is therefore a need for individuals and families in Nigeria to adopt a variety of coping strategies in managing the associated challenges of climate change. Coping strategies in this sense are the various control measures that can be adapted by people in mitigating and addressing the negative effects of climate change to human life.

1.1. Statement of Problem

Climate is now changing so fast, with widespread of harmful effects on people, plants, animals, aquatic organisms and microbes. Adamawa State, Nigeria is now hotter and drier and rainy seasons are now unpredictable. This has manifested itself in various ways, including rising temperatures, droughts, heavy precipitation, flood and rising sea levels which have destroyed farmlands, school buildings and homes and has accelerated damage on plants and animal's species and aquatic organisms in the State. This has become a serious concern and threat to lives of many families. Despite this, there appears to be paucity of empirical evidence on coping strategies families can adopt to manage challenges of climate change. This prompted the question of what coping strategies families can adopt to manage challenges of climate change. Thus, the problem of this study therefore is to investigate the coping strategies families can adopt to manage challenges of climate change in Ganye Adamawa State, Nigeria.

1.2. Purpose of the Study

Specifically, the study ascertained the:

- (a) challenges posed by climate change to families in Ganye, Adamawa State
- (b) coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State

1.3. Research Questions

- (a) What are the challenges posed by climate change to families in Ganye, Adamawa State?
- (b) What are the coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State?

1.4. Hypotheses

- (a) There is no significant difference between the mean responses of male and female respondents on challenges posed by climate change to families in Ganye, Adamawa State.

- (b) There is no significant difference between the mean responses of male and female respondents on coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State.

2. Materials and Methods

2.1. Design for the study

The descriptive survey was adopted for the study.

2.1.1. Ethics approval of research

The ethical approval of the research was approved by Department of Home Economics and Hospitality Management Education research review committee, University of Nigeria Nsukka.

2.2. Area of the study

The study was carried out in Ganye local government area in the southern part of Adamawa state, Nigeria. It is located within latitude 11⁰ North and longitude 9⁰ East of the equator and has a landmass of 1,463.8km with a population 216,990(NPC, 2006). The study area is bounded in the North by Jada and mayo-Belwa local government area, in the south by Toungo local government, in the west by Taraba state and in the east by the republic of Cameroun. The study area experiences two (2) distinct seasons, the rainy and dry seasons. The wet season starts from April to October, and long dry season last from November to March. The minimum monthly rainfall is 2.7mm and maximum of 15.2mm with a total rainfall of 1100mm-1600mm per annum (Adebayo,1999). The area is typical of the state and west African savanna climate. Temperature is high throughout the year because of the incoming radiation. The maximum temperature of the study area is 40⁰c particularly in April, while minimum temperature can be as low as 18⁰ Celsius between December and January, with the mean monthly temperature of about 27.8 (Adebayo,1999). The dominant tribe in the study area is the chamba, others are Fulani, Mumuye, Hausa and Vere. The people are predominantly farmers with more than 75% of its work force population engaged in Agriculture, with items of cultivation such as yam, maize, guinea-corn, rice, sugar cane, beans, cassava, groundnuts, rearing of small and large ruminant livestock's (Kardu, 2015).

2.3. Population and sample

The population of the study consisted of Ganye residents. A sample of 384 inhabitants were drawn across Ganye for the study, through multi-stage and random sampling procedure.

2.4. Instrument for data collection and study procedure

The instrument for data collection was a questionnaire, titled "Questionnaire on Coping Strategies for Families in Managing the Challenges of Climate Change" developed by the researchers. The questionnaire had two sections, A and B. Section A elicited data on the demographic factors of the respondents such as gender, level of education and location. Section B of the instrument consisted of 30 items arranged in two clusters (I & II). Cluster I contained 15 items which elicited data on the challenges of climate change to families while cluster II contained 15 items that elicited data on coping strategies families can adopt to manage the challenges of climate change. The respondents were requested to express their level of agreement or otherwise to each of the items modeled on a four (4) point scale with response options and numerical values or points of 4, 3, 2, and 1 respectively such as Strongly Agree (SA) = 4, Agree, (A), =3, Disagree (D), 2 and Strongly Disagree (SD) = 1.

The instrument was validated by three experts; one each from the fields of Environmental Geography, Measurement & Evaluation, and Sociology Departments, Univasty of Nigeria Nsukka.

The experts validated the instrument in line with the research purpose, questions and the hypothesis that guided the study. The instrument was trial-tested on 30 respondents drawn from Jada Local Government Area of Adamawa State who were not used for the actual study. Data gathered from the trial-test were analyzed using Cronbach Alpha method of estimating reliability, and the index obtained was 0.89 which showed that the instrument was very reliable for the study.

2.5. Data collection techniques

The researchers made use of three research assistants in the study area. The research assistants were told what to do and how to administer and retrieve the questionnaire from the respondents at the spot, while the researchers supervised the administration and retrieval of the questionnaire process. A total of 384 copies of the questionnaires were administered, out of which 367 (95.57%) was correctly completed and retrieved from the respondents for analysis in December 2021.

2.6. Data analysis techniques

Data collected were analyzed using mean, standard deviation to answer the research questions while t-test statistics was used to test the hypothesis at 0.05 level of significant at relevant degree of freedom with the use of statistical package for social sciences (SPSS, version 20). The mean score of the level of agreement was calculated by adding the four responses to obtain 10, which was further divided by four to obtain 2.5. The 2.5 was regarded as the mean cut off point that was used to determine the level of agreement or otherwise to the coping strategies. The following scale was used to determine the level of agreement or otherwise: Strongly disagreed = less than 2.50 Strongly agreed = equal or above 2.50.

3. Results and Discussion

Research Question One: What are the challenges posed by climate change to families in Ganye, Adamawa State?

Table 1: Mean and Standard Deviation on Respondents responses on the challenges posed by climate change to families in Ganye, Adamawa State

SN	Items	\bar{X}	SD	D
	Climate change has posed the following challenges to families:			
1.	Increasing cases of floods	3.05	0.41	A
2.	Serious droughts	3.91	0.45	A
3.	Increasing intensity of sun/heat waves.	3.63	0.47	A
4.	Heightened threat to food security	2.98	0.65	A
5.	Insufficient/shortage of water	3.44	0.87	A
6.	Increasing land degradation	3.11	0.74	A
7.	Increasing desertification	2.87	0.37	A
8.	Low level of agricultural productivity	3.88	0.51	A
9.	High level of temperature	3.22	0.50	A
10.	Unpredictability in weather condition and rainfall	3.94	0.45	A
11.	Shrinking of rivers	2.97	0.76	A
12.	Increased air pollution	2.99	0.76	A
13.	Increasing cases of water-borne illness (such as: typhoid fever, cholera among others)	2.86	0.50	A
14.	Increased cases of meningitis due to higher temperatures	2.85	0.76	A

15	High cost of family health maintenance	2.78	0.53	A
Grand mean		3.08	0.58	A

Note: \bar{X} = Mean, SD = Standard Deviation, D = Decision, A= Agreed.

Result in Table 1 shows that the mean ratings for all the items 15 were above a criterion mean of 2.50, which depicts that all the items are the challenges of climate change faced by families in Ganye, Adamawa State. The values of the standard deviations ranged from 0.37-0.87, which implies that the responses of the respondents were close to each other and to the mean. The grand mean was also above the criterion mean. This justifies that all the items in the table are the challenges posed by climate change to most families in Ganye, Adamawa State.

Hypothesis One

Table 2: ANOVA statistical test

	Sum of Square	Df	Mean Square	F-cal	F-tab	p-value	Level of Sig.	Remarks
Between Groups	1.340	2	0.670	.597	0.560	3.00	0.05	NS
Within Groups	257.125	364	1.153					
Total	258.465	366						

Data presented in Table 2 showed that challenges posed by climate change to families had P-value of 3.00 and was greater than 0.05 at degree of freedom 2 and 364. This indicated that there was no significant difference between the mean responses of male and female respondents on challenges posed by climate change to families in Ganye, Adamawa State. Therefore, the null Hypothesis was accepted.

Research Question Two: What are the coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State?

Table 3: Mean and Standard Deviation on Respondents responses on coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State

SN	Items	\bar{X}	SD	D
	To cope with climate change, families can;			
1.	build a fence to prevent increased flooding into the compound	2.95	0.36	A
2.	wear light clothes during hot weather to reduce heat	3.04	0.36	A
3.	turn on fan when the bed/setting room is hot	3.21	0.42	A
4.	plant flowers in the compound to absorb carbon dioxide in the atmosphere	2.87	0.69	A
5.	use energy efficient bulb in the house to reduce heat	3.14	0.64	A
6.	using air condition system to reduce heat-waves	3.11	0.90	A
7.	plant trees to cool the environment	2.69	0.55	A
8.	use solar system of energy to prevent burning of fossil fuel	3.08	0.41	A
9.	do regular sanitation to reduce diseases associated with climate change	3.04	0.76	A
10.	wear thick clothes to reduce cold when there is extremely cold weather	3.19	0.49	A
11.	close the windows during whirlwind	3.52	0.51	A
12.	plant cover crops/carpet grasses in the compound to prevent soil erosion	2.98	0.66	A
13.	use umbrella during intense sunshine to reduce heat from the sun	2.79	0.47	A
14.	avoid bush burning	3.56	0.47	A
15.	proper disposal of waste/refuse	3.33	0.58	A

Grand mean

3.10 0.55 A

Note: \bar{X} = Mean, SD = Standard Deviation, D = Decision, A= Agreed.

Result in Table 3 indicates that the mean ratings for all the items (1-15) were above a criterion mean of 2.50, which implies that all the items are perceived as the coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State. The standard deviation values ranged from 0.36-0.90, which can be interpreted that the responses of the respondents were not far from each other and from the mean. The grand mean was also above the criterion mean, which implies that the coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State.

Hypothesis Two

Table 4: ANOVA statistical test

	Sum of Square	df	Mean Square	F-cal	F-tab	p-value	Level of Sig.	Remarks
Between Groups	1.245	2	0.561	.0025	0.06	3.00	0.05	NS
Within Groups	256.125	364	1.125					
Total	257.37	366						

Data presented in Table 4 showed that coping strategies families can adopt to manage the challenges of climate change had P-value of 3.00 and was greater than 0.05 at degree of freedom 2 and 364. This indicated that there was significant difference between the mean responses of male and female respondents on coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State. Therefore, the null Hypothesis was rejected.

The essence of this study was to investigate the coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State. The study thus found that climate change has posed several challenges to many families in the area. These include increasing cases of floods, Serious droughts, increasing intensity of sun/heat waves, intensified threat to food security, unpredictability in weather condition and rainfall, increasing cases of water-borne illness (such as: typhoid fever, cholera among others). The findings add credence to Chidi and Ominigbo (2010) who observed that climate is a threat to food security, insufficient water resource availability, degeneration in natural resource productivity, decline in human health viability, increasing land degradation, increasing desertification. Usman and Dije (2013) stated that the erratic patterns of weather elements in Nigeria accounts for many environmental and agricultural problems in the country. The implication is that climate change negatively affects almost every aspect of human existence. The finding also revealed that there was no significant difference between the mean responses of male and female respondents on challenges posed by climate change to families in Ganye, Adamawa State.

However, the study has revealed some of the coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State. They include building a fence to prevent increased flooding into the compound, wearing light clothes during hot weather to reduce heat, planting of flowers in the compound to absorb carbon dioxide in the atmosphere, using energy efficient bulb in the house to reduce heat, planting of trees to cool the environment, engaging in regular sanitation to reduce diseases associated with climate change, wearing thick clothes to reduce

cold when there is extremely cold weather, use solar system of energy to prevent burning of fossil fuel, planting of cover crops/carpet grasses in the compound to prevent soil erosion, proper disposal of waste/refuse, and avoidance of bush burning, among others. These findings are in line with Okoroh, Olaolu, and Igbokwe (2016) who suggested that to mitigate the challenges of climate change, there is need for individuals to engage in certain actions such as planting of trees, flowering plants, preference for solar energy than fossil foil burning, among others. Likewise, the finding agrees with Abdulkadir et al. (2017) that avoidance of bush burning and fossil foils, among others, as strategies for controlling the negative effects of climate change. Thus, various families can adopt such strategies in managing the effects of climate change in Ganye, Adamawa State. The findings also revealed that there was significant difference between the mean responses of male and female respondents on coping strategies families can adopt to manage the challenges of climate change in Ganye, Adamawa State. The study was limited to Ganye local Government area of Adamawa state. Thus, similar studies should be conducted in various Local Government of the State where the study had not been done in order to find a robust solution to coping strategies families can adopt to manage the effect of climate change.

4. Conclusion

Developing countries, most especially in Africa, must brace up to the realities of climate change. They must invest heavily on adaptation strategies for mitigating the impact of climate change. Thus, there is a need for families in Nigeria, particularly, in Ganye, Adamawa State to adopt several coping strategies to manage the challenges of climate change. Such strategies if adopted by families can reduce the effect of climate change on human existence. Based on the findings, it was therefore recommended that families in Ganye, Adamawa State should build fence around their compounds to prevent increased flooding, planting of flowers, cover crops/carpet grasses in the compound to prevent soil erosion and absorb carbon dioxide in the atmosphere, using energy efficient bulb in the house to reduce heat, planting of trees to cool the environment, engaging in regular sanitation to reduce diseases associated with climate change, wearing thick clothes during summer to reduce cold and wearing light clothes during winter season to reduce heat, use solar system of energy to prevent burning of fossil fuel, proper disposal of waste/refuse, and avoidance of bush burning, among others. The Federal and State Governments should consider policies that will encourage planting of trees and sensitize various families on waste management and the use of weather friendly source of energy in order to prevent burning of fossil fuel among others in so as to cope with climate change in the study area.

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Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

This research was conceived by Angelina Emmanuel, the second author carried out the data analyses while the third author took part in the distribution of the questionnaire to respondents. The final draft was approved by all authors

Data availability Statement

The original contributions presented in the study are included in the article. Further inquiries can be directed to the corresponding author.

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