



ABSTRACT

This study is to look at climate change as a trigger to seasonal variation effects in Lake Chad region, Borno state north-east Nigeria. The objectives were to: examine whether climate change is a trigger to seasonal variation in the Lake Chad region Borno state Nigeria, , measure the effects of climate change on seasonal variation in the study area, use some weather parameters to see the relationship with increasing latitude; The data used in this study were generated from primary; the primary source include the administration of questionnaires to 252 respondents, to assessed the effects of climate change on seasonal variation in

CLIMATE CHANGE AS A TRIGGER TO SEASONAL VARIATION EFFECTS IN LAKE CHAD REGION BORNO STATE NORTH-EAST NIGERIA

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Introduction

Seasonal variation

According Inter Governmental Panel on Climate Change, Climate change is the most dangerous environmental hazard in the history that faced mankind (IPCC 2014). The acidity of the ocean will continue to increase due to the anthropogenic emissions of carbon dioxide, which will have devastating effects on various marine biota (Doney, et al. 2009). Climate change will also lead to the thermally expansion of ocean waters, as well as lead to the melting of glaciers, which both will contribute highly to sea level rise (Meehl, et al. 2012). In addition, climate change can of course increase the frequency of hurricanes, as well as worsen their intensity (Mudd, et al. 2014). It has also the potential to eradicate wildlife populations in a not small way, causing the sixth mass extinction in the earth's history (Bellard, et al. 2012). Furthermore, apart from the environment, it has serious impacts on the general societal life. First, climate change will



the study area, Journal articles, Conference proceedings and papers, Books, Maps and other relevant sources were all consulted to have related information's on the effects of climate change on seasonal variation in Lake Chad region, Borno State north-east Nigeria; Few Possible recommendations were made for future studies.

hinder economic growth and decrease global productivity (Moyer, et al. 2014). In some part of the world, climate change will alter and impair yields of crop and reduce food production (IPCC 2014). Climate change will also increase heat-related mortality and morbidity, and as well incidences of infectious diseases (Patz, et al. 2005). Despite the looming threats of climate change, the mitigation of climate change has been unevenly developed.

Aim and Objectives of the study

The aim of this study is to look at climate change as a trigger to seasonal variation effects in Lake Chad region, Borno state north-east Nigeria. The specific objectives are to:

- i. Examine whether climate change is a trigger to seasonal variation in the Lake Chad region Borno state Nigeria.
- ii. Measure the effects of climate change on seasonal variation in the study area.
- iii. Use some weather parameters to see the relationship with increasing latitude.

Study Area

Borno state lays in the north eastern corner of Nigeria between latitudes 11.00 and 13.45 east. It occupies an area of 69.435 Sq km sharing border with three states, Adamawa to the South, Gombe to the South Westland Yobe to the West as well as three countries, namely, Republic of Niger, Chad and Cameroon to the North, North-East and East respectively. (Waziri, 2009).

According to National Population Commission Borno state has a total population of 4, 151, 103 people, with annual growth rate of 2.8% per annum (NPC, 2006).

Maiduguri Metropolis is situated in a semi-arid climate zone. It has basically two seasons: dry and wet seasons. These are further distinguished by the local population into: Binøm (cool dry season), harmattan season from December to February; Bey, (hot dry season), from March to late May; Nøngøli, raining season from June to September and Biila, humid dry transitional period between September and November (Waziri, 2009). According to (Wakil *et al* 2009) empirical findings have shown that rainfall is dwindling in Maiduguri both in volume and number of rainy days since the 1970s. The raining season never exceeds four months in the area, with an annual rainfall mean of 577mm. The rainfall type is usually convectional which is mostly in the afternoon hours (Iloeje, 2009). Rain fall is usually heavy and within a short duration with some variations within a small distance. Temperatures generally range between 29.4°C and 35°C. There is a sudden rise in temperature during the day around April, May and June, occasionally exceeding 40°C, and high terrestrial radiation in the night. With these weather conditions coupled with the low humidity (40% to 60% relative humidity), evaporation is always high and the environment can only support the growth of a scanty vegetation.



The economy of the state is anchored on natural resources such as clay, salt, nitron, limestone and kaolin. Iron ore and uranium and micas petroleum is prospected intensively on the shore of the Lake Chad in the state. There are only few industries in the state. These are flour mills, shoe factory, ginnery, dairy products, and corn milling just to mention a few (Waziri, 2009). Different kinds of land uses can be identified: such as settlements, agricultural, road, forestry, but the dominant type is the agricultural land use. Majority of the people in the area are peasant farmers although they may be engaged in other activities.

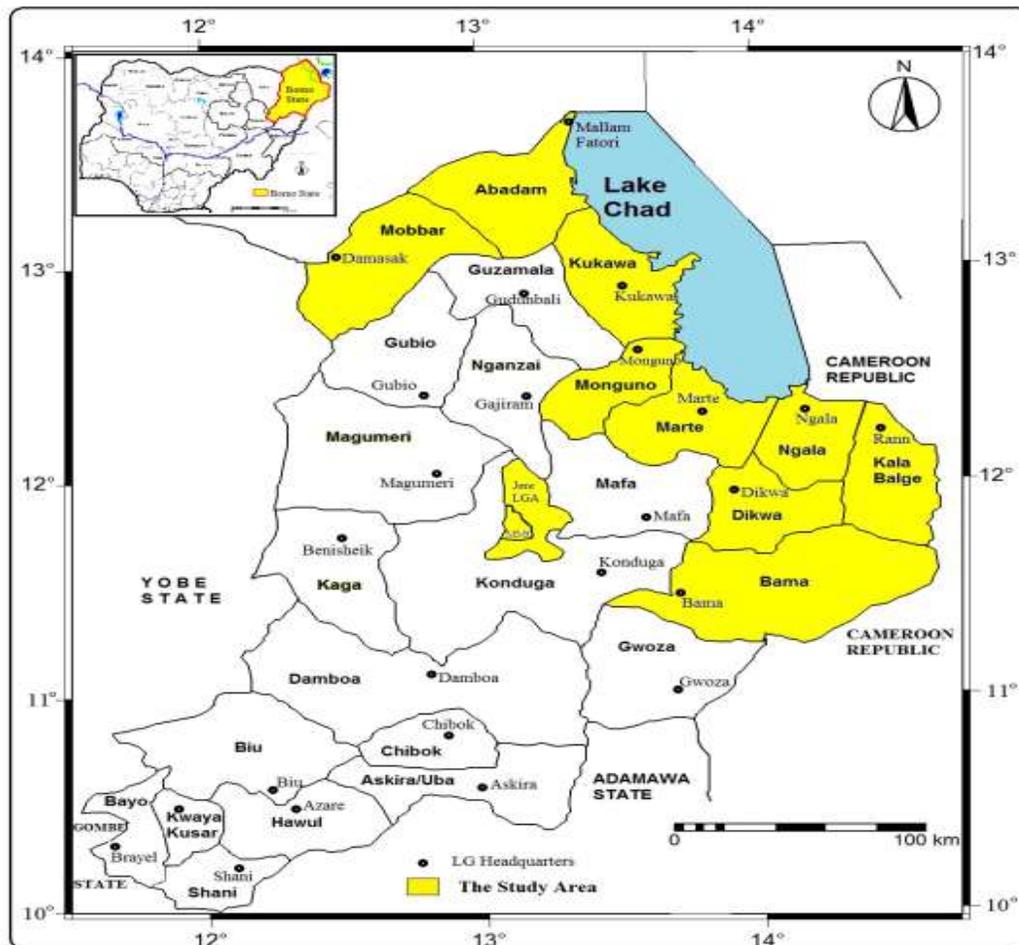


Fig: 1 BORNO STATE SHOWING SAMPLE SETTLEMENTS AND STUDY AREA THAT CONSTITUTED THE FORMER (MEGA LAKE CHAD)

Source: GEONETCast Unit, Department of Geography, University of Maiduguri, 2018

Lake Chad Physical Information

Lake Chad basin is historically a large shallow endorheic lake in Africa, which has varied in size over the countries. According to the Global Resource Information Database of the United Nations Environmental Programme, it shrinks by as much as 95% from about 1963 to 1998, but the 2007



image shows significant improvement over previous years. Lake Chad is economically important, providing water to more than 68 million people living in the four countries surrounding it on the edge of the Sahara Desert. It is the largest lake in the Chad Basin (J. Allman, 2015). i- Surface Area: 521.24 square kilometre, miles (1,350 kilometres square) ii- Depth: 361” (11 m) iii- Surface Elevation: 938 feet (286 m) iv- Shore Length: 404 miles (650 km)

v- Mean Depth: 4 ‘11”
(1.50 m) vi- Inflow:
Chari River

Methodology

The data used in this study were generated from secondary source only; the secondary data sourced from Meteorology station, Journal articles, Conference proceedings and papers, Books, Photographs and other relevant sources were all consulted to have related information’s on the variation in evaporation rate as evidences of climate change in some communities of former Mega Chad, Borno State North East Nigeria

Results and Discussions of Findings

Climate Change Effects on Seasonal Variations

Seasonal variation of the surface temperature change appears to be broadly consistent considering some findings made by scientist in the past with some weather parameters using a coupled atmosphere-ocean-land model. However, usually the warming that leads to variation increases as the latitude increase also. 19% of the respondents revealed that climate change has a lot of effects which include making life very difficult because of the different changes associated with it. While, 13% of the respondents revealed that the effects of climate change led to economic crises in the study area, while 17% of the respondents were of the view that it causes economic crises. This validates the views of the majority which says it makes life very difficult. This could either be economic difficulty or shortage of natural resources like water as indicated in table 1.1.

Table 1.1 Effects on Seasonal Variations

	Frequency	Percentage
It Makes Life Very Difficult	48	19
It Leads to Economic Crises	32	13
It Causes Security Challenges	42	17
It Leads to Poor Harvest	34	13
It Causes the Drying of Water Bodies	96	38
Total	252	100.0

The result of the chi-square reveals A Pearson chi-square value of 63.761 at 12 degree of freedom (df) was significant at 0.05 level of significance, that is, $P < 0.05$. Thus, climate change does have significant effect on the seasonal variations as it is clearly indicated in table 1.1 above.



Table 1.2 Chi-Square Test

	Value	df Asymp.	Sig. (2- sided)
Pearson Chi-Square	210.815	4	.000
Likelihood Ratio	198.004	4	.000
Linear-by-Linear Association	145.834	1	.000
No of Valid Cases 252			

a. 1 cell (10.0%) have expected count less than 5. The minimum expected count is 3.67.

Conclusion

Climate change will continue to have effects on the general environment of different communities located in the Lake Chad region Borno state north-east Nigeria. Change in climate is a serious trigger to seasonal variation effects in the larger extent and the entire people living along the shores of the lake. It is quite imperative that residents of the area should learn to practice best local adaptation strategies to curtail effects of changes and fluctuations associated to seasonal variation due to climate change, and some impacts that resulted in various other environmental problems like drying of river bodies, desertification, deforestation, drying up of wetlands, flooding, erosion, outbreak of diseases and other several risks and hazards associated with climate change. Furthermore, this change will result in various environmental issues that could bring severe impacts on communities of the Lake Chad region Borno state north-east Nigeria.

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