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## **Perception of Climate Variability, Its Anthropogenic Implications and Socio-Economic Development in the West African Sub-Regional States of Nigeria and Niger Republic**

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### **Abstract**

Increasing temperature and decreasing rainfall contribute to climate variability which has become a global phenomenon leading to frequent drought, desertification, desert encroachment, loss of biodiversity as its common features. This paper is a comparative analysis of the anthropogenic implications of climate variability on the socio-economic development in the West African states of Nigeria and Niger republic. Specifically, it attempts to ascertain the influence of climate variability on food security, health status and social cohesion. To achieve this, a sample of four hundred respondents was taken from the target populations. Questionnaires consisting of multiple-choice questions were used to draw responses from the two countries. The study employed the descriptive statistical method for data analysis. The study found that there is significant positive relationship between climate variability and food security, health and social cohesion among the population. In line with this finding, the study recommends the need to build and developed cohesive societies by means of complementary, coherent and systematic implementation of local public intervention programmes for climate variability.

### **Keywords**

Perception, Climate change, Climate variability, Socio-economic Development, West African sub-regional states.

### **Introduction**

Climate variability has become a global issue manifesting in variations of climate parameters including cloud cover, precipitation, temperature ranges, sea levels and vapour pressure (MOEPRN, 2003:43). According to the Ministry of Environment of the Federal Republic of Nigeria, the variations in climate parameters affect different sectors of the economy such as agriculture, health, water resources, energy, etc. (MOEPRN, 2003). The main cause of climate variability has been attributed to mainly anthropogenic (human) activities. For example, the increased industrialization in developed nations has led to the introduction of large quantities of Greenhouse gases (GHGs), including carbon (iv.) oxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) into the atmosphere (Odjugo, 2010:14).

In different studies by Stott, et al (2004), Huber and Knutti (2014) and others, human factors were identified to have significant contributions global warming and Greenhouse gases emissions. In the words of Stott, et al (2004), human factors has very significant influence on the changes in local temperatures,

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leading to changes in atmospheric humidity, drought, arctic ice decline, extreme heat events, ocean, heat and salinity changes, and a number of other regional climate impacts.

Meanwhile, the increasing temperature and decreasing rainfall (attribute of climate variability) are known to have led to frequent drought and desertification. The Sahara desert for instance is observed to be expanding to all directions trying to engulf the Sahellian region of Africa with annual expansion of 1 – 10km (Odjugo & Ikhuoria, 2003; Yaqub, 2007:95). Some parts of Northern Nigeria are under severe threat of desert encroachment with sand dunes, as common features of desertification becoming much more in states like Borno, Sokoto, Jigawa and Katsina (Odjugo & Ikhuoria, 2003:11), burying large expanse of arable lands, thus reducing viable agricultural land and crop production (Yaqub, 2007). This in reaction has prompted massive emigration and resettlement of people to areas less threatened by desertification. Such emigration gives rise to social effects like loss of dignity and social value (Yuguda, 2000). It often results in increasing spate of communal clashes among migrating groups (mostly herders) and host groups (who in many occasions are farmers) and such clashes have resulted in the death of many people in the Northern state of Nigeria (see Yuguda, 2002; Yaqub, 2007; Nwanegbo, Ikyase and Umara, 2017; Nwanegbo, Umara & Babagana, 2017). Akonga, (2001) also observe that most of the destitute that emigrated as a result of drought and desertification usually move to nearby urban areas to beg for alms thereby compounding the already tense urbanization problems and compounding the problems of insecurity in Nigeria (Nwanegbo, Ikyase and Umara, 2017).

Similar situation is experienced in other Sahellian region of Africa. For instance, Niger Republic climate is equally characterized by high variability especially in term of rainfall and has over the past forty years equally experienced seven episodes of droughts whose effect on agro- production, food security and socio- economic life have been disastrous (Bonfiglioli, 2010:75). Other climate related hazards experienced in Niger Republic include floods, sandstorms and locust invasions, drought, etc. (Bonfiglioli, 2010:75).

As this situation prevails in this region, the record of development has eminently dwindled. In the record of UNDP (2006), of the twenty five (25) countries in Africa that faced food emergencies in 2003, ten (10) are currently experiencing civil strife and four are emerging from conflict. Most disturbing is the sporadic nature of the few development indices in the region (UNDP, 2006), as the socio-economic development measured with indicators, such as GDP, life expectancy, literacy and levels of employment being affected. Other less-tangible factors of socio-economic development such as personal dignity, freedom of association, personal safety and freedom from fear of physical harm, and the extent of participation in civil society (Nwanegbo, Umara & Babagana, 2017) are also extensively reduced.

Indeed, there really could be dual relationship between socio-economic development and climate variability. While climate variability influences key natural and human living conditions and by that also, the basics for social and economic development, socio-economic development goals on the other hand, are threatened by climate variability, with the heaviest impacts on poor countries and poor people. Yet climate variability appear not to be controllable unless growth in both rich and poor countries becomes less greenhouse-gas-intensive.

Taking from the state of development loses in the Sahelian region of Africa even in the face of abundant natural resources in the countries like Nigeria and Niger one is inclined to seek to further find out the

level of relationship between the climate variability and the obvious socio-economic development challenges in the Sahelian region, using Nigeria and Niger as major points of analysis.

### **Conceptual and Theoretical Discourses**

Atmospheric resources offer a variety of opportunities for sustainable development. But air pollution such as soot, dust, Greenhouse Gases (G H G), Chlorofluorocarbons (CFCs) and heavy metals effect quality of air and threaten the goods and services provided by the atmosphere. These pollutions contribute to climate variability (IPCC2001). Climate variability can be described as the collapse of the atmospheric systems processes and pattern which represent massive environmental challenges to maintaining a habitable earth. Climate variability manifests themselves in global warming and extreme weather events such as floods, drought, heat waves and typhoons. These phenomena affect land and marine product systems from which livelihoods are derived and also destroy infrastructure and other life support system (IPCC2001). All the gases that make up the atmosphere such as nitrogen, oxygen, carbon dioxide, methane, nitrous oxide, and water vapour exist in proportion. Most of these gases allow solar radiation to penetrate, but many radioactivity active ones in particular, carbon dioxide (CO<sub>2</sub>), water vapour (H<sub>2</sub>O), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) trap long wave radiation emitted from the earth's surface, and act like a thermal blanket similar to the glass roof of a greenhouse (greenhouse effect) (IPCC, 2001).

Generally, the idea of socio-economic development is to find ways to improve the standard of living within the area while also making sure the local economy is healthy and capable of sustaining the population present in the area. Such development can be implicated by the effect of the climate variability in many ways. Climate variability threatens livelihoods along Africa's coasts. It affects farmers, fishermen, hunters, and cattle-rearing. People lose their sources of livelihoods following the impacts of climate variability. The condition further predispose them to hunger, sicknesses, resource over-exploitation and other social vices such as conflicts and militancy.

Agriculture is the backbone of most African economies accounting for as much as 40% of the total export earnings and employing 60-90% of the total labour force in Sub-Saharan Africa (SSA) (Spore, 2008). Over 50% of household food needs and an equivalent share of income emanate from agriculture. The bulk of agricultural systems is climate dependent, with for example most of sub-Sahara relying primarily on rain-fed agriculture. Climate variability hence intensifies food insecurity as productivity decreases and prices go up in countries already suffering this insecurity. Hunger victims have been on the increase mainly as a result of extreme weather events. The current situation in Niger is not isolated. The ability to diversify is limited by a variety of factors including the global trade system. Projected losses in cereal production potential in SSA will be about 33% by 2060. Fish production will be negatively affected by sea level rise and coral bleaching. Some countries have significant agricultural products from coastal zones which are threatened by sea level rise and increasing temperatures. These include Kenya (mangoes, cashew nuts, and coconuts); Benin (coconuts and palm oil); Guinea (rice) and Nigeria where coastal agricultural land accounts for about 75% of total. Though the research is inconclusive it is expected that off-shore oil production will be negatively impacted by rise in sea level.

In Nigeria/Niger, the traditional and predominant method of clearing farm land is through bush burning. In addition, the use of firewood as cooking energy source has recently gained prominence, because of the high cost and non-availability of other cleaner sources such as natural gas. These activities increase

the concentrations of greenhouse gases (GHGs) in the atmosphere trapping heat and causing global warming, climate variability and sea level rise (Medugu, 2009).

Further, there is the problem of deforestation. Currently, forest covers approximately 400 million ha (almost 17 percent of land area). The current annual deforestation rate is, however, 0.7 percent and the decline in forest area is expected to continue. Garba, (2006) noted that one of the major causes of poverty is destruction of natural resources, leading to environmental degradation, high temperature, drought and consequently reduced productivity. Nigeria's forest is being depleted because of rising population, migration, land hunger, poverty and starvation (Akah, 2010).

Climate variability is having a multitude of immediate and long-term impacts on water resources in African countries. These include flooding, drought, sea-level rise in estuaries, drying up of rivers, poor water quality in surface and groundwater systems, precipitation and water vapour pattern distortions, and snow and land ice mal-distribution. These effects when compounded together have devastating impacts on ecosystems and communities, ranging from economic and social impacts to health and food insecurity, all of which threaten the continued existence of agriculture in the regions of Africa e.g. Nigeria/Niger.

Human and natural activities affect virtually all sections of the water cycle, often with additive effects. Over time, human activities such as forest clearing, afforestation, agriculture, etc., have disturbing influences on the water cycle including evaporate - transpiration, flow regimes, groundwater table and sea level. Also, human activities influence cloud formation via the emission of aerosols and their gaseous precursors (Krüger & Graßl, 2002). Principal threats to water resources for humans include water pollution (the contamination of surface water and groundwater reservoirs with chemicals and microorganisms); water scarcity (the change of run-off regimes and the change – mostly lowering – of the groundwater table); and most importantly, global climate variability with consequences such as redistribution of precipitation, rising sea levels, change in the CO<sub>2</sub> absorption of the oceans and increases in extreme precipitation events (WBGU, 2004; Stolberg *et al.*, 2003; Palmer & Räisänen, 2002).

In addition, agriculture and crop production in Nigerian depends to a very large extent on rainfall and therefore its successes or failure is determined by the weather condition. The other measure that has been employed to overcome sole dependent on whether is irrigation are there are three generally used methods of the developing the irrigation in Nigeria today. They are; first the public irrigation schemes (that is the formal irrigation systems under government control). Second, the farmer-owned and operated irrigation schemes (informal irrigation). Third, residual flood plains Fadama irrigation scheme. Even with these three known and used processes in Nigeria, the country is still very far behind other developing nations of the world, especially countries in Asia and South America in irrigation development (see Madu, *et al.*, 2010). For instance, as Ogedengbe (2002) earlier reported, it was is only 0.9 million of the 73 million hectares of cultivatable areas out of the 98 million hectares of land space in Nigeria that was under irrigation. Currently, as Nnodim (2021) explained, that out of the total of 3.4 million hectares of land in use in Nigeria that need irrigation, only 88.950 hectares have access to irrigation leaving millions of hectares of farms to depend majorly on rainfall for crop production. This makes storage of water for agricultural purposes very problematic and agricultural activities seasonal and non-sustainable. With climate variability therefore, reduction in volume of rainfall, drought, sand dune encroachment, the opportunities for agricultural production is reduced deepening food insecurity.

Climate variability is predicted to deepen peoples on poverty both directly and indirectly. The direct impacts include; the loss of life, livelihoods, assets, infrastructure, etc. from climate extreme events. For example, following Hurricane Mitch in 1998, 165,000 people in Honduras fell below the poverty line. The poorest lost 18% of their assets; there was a 29% loss of crops and 20% of the hospitals and education centres were affected (World Bank, 2002). On the other hand, the indirect effects are predicated on economic growth. Continuing climate variability variation is predicted to alter the sectoral origins of growth, including the ability of the poor to engage in the non-farm sector, as well as increase inequality, and therefore to reduce the elasticity of growth (ERM, 2002). A key milestone in defining the poverty impacts of climate variability is the Third Assessment Report of the IPCC in 2001.

For a better understanding of the regional divisions in Nigeria, a discussion of the greater North-South divide is very necessary. First, there came a strong presence of Islam in the North part of Nigeria starting from as early as in the 11th century BC and thereby making the North a strong base of Islam in Nigeria. On the other hand, the Christian missionaries made their early interactions with the South in the mid-19th century and established the Christian faith strongly in the South leaving (as a matter of colonial policy) the North until late and without the much vigour with which they pursued the expansion in the south. Some other policies of the colonialists further laid the foundation for North-South regional divisions in infrastructure, religion, educational systems, gender norms, and a variety of other factors. The differences in geographic peculiarities also played significant role in establishing the North-South divide in Nigeria. While the North has arid climate with proximity to the Sahara Desert thereby making it more vulnerable to the effects of climate variability, the oil industry in the Niger Delta furthers violence in the area which again results in environmental damage in that section of the South. In the areas of economy, the North displays a disproportionately higher percentage of peasant households than the South. The combination of extensive poverty, food insecurity, poor health, poor infrastructure, and low levels of education in that region has in the opinion of scholars resulted in livelihoods less easily adaptable to change (Asadurian et al. 2006:407-455; Adejuwon 2008). Indeed in 2007, C. C. Soludo (2007), (the then Governor of the Central Bank of Nigeria) in an address noted that all of the 10 states with the highest incidences of poverty in Nigeria were from northern regions; four were from the North West, four from the North East, and two from the North-Central region (Waziri & Nwanegbo, 2018). Additionally, Kano, Kaduna, and Sokoto, all states in the North West, are home to 1/3 of Nigeria's poor (Adegbola 2008). While approximately 64 percent of Nigeria's total poverty as at that time was recorded to the northern regions (representing around 53 percent of the country's population), the South East and South West with lesser population exhibit relatively better household well-being (see Araar & Timothy 2006). Given the higher total fertility rate in the Northern part of Nigeria and the apparent association between household size, low educational attainment, and poverty (Soludo 2007; Adejobi et al. 2008; Measure DHS 2004), the implication of climatic condition to that arid part of the nation will be better appreciated as well the consequence of the regional poverty differentials on national peace.

In clear terms, with the risk for increased drought growing along the Sahel region, particularly along the Sahara region with the expected effects of global warming (Adejuwon 2008), northern part of Nigeria is particularly susceptible to drought. And with pervasive illiteracy and high dependence on agriculture, the population in the north will have difficulties to adapt to the expected effects of climate variability in the future (Mberu 2007; Adejuwon 2008; Africa Investment Publishing 2009) meaning that more rural-urban migration is imminent.

Meanwhile, the Intergovernmental Panel on Climate variability (IPCC) had earlier predicted that the Sahel region, in which Nigeria/Niger lies, will be among the world's worst affected areas by climate variability. Patz et al. (2005) estimate that climate variability has already increased malaria (with 5,000 deaths), diarrhoea (5,000 associated with another diarrhoea), and malnutrition (with yet another 8,000) mortality and morbidity in West Africa attributable to climate variability in 2000. For West Africa, Patz et al. calculate a total of 626,000 disability-adjusted life years (DALYs) lost to these diseases as a result of climate variability instance is malaria. Malaria is endemic in Nigeria, with the country's cases accounting for a quarter of those in the WHO African Region and a high population of death and infirmities arising there from occur among women (Nwanegbo & Odigbo, 2012).

Health is closely linked to poverty, because poverty precludes most people from access to health care facilities. The aspects of health that will be exacerbated by climate variability include; increased cases of cataracts (eye disease) in the northern parts of Nigeria due to low cloud cover and greater intensity of solar radiation; increased cases of malaria and typhoid due to increased rainfall and temperature in certain parts of the country; and increased cases of water-borne diseases such as cholera and dysentery due to urban flooding, and improper disposal of wastes (WHO, 2005).

The effects of gradual climate variability and extreme weather events in the recent past have undermined progress in the alleviation of poverty and food insecurity, while also having a negative effect on overall development efforts. Economic sectors that largely depend on weather conditions – either directly or indirectly – most notably agriculture and fisheries are increasingly subject to the impacts of climate variability (IPCC, 2012). Moreover, the depletion of natural resources, as a result of increased environmental and demographic pressures, tends to aggravate the severity of climate variability impacts. All in all, there are increasing concerns about the rising threats to current income and consumption patterns of households and individuals that earn their livelihoods from these sectors (Foresight, 2011; IPCC, 2012).

Climate variability, or global weather patterns, or global warming can be described as the biggest environmental issue of our time. It is global in its causes but its consequences are far more reaching in developing countries, particularly Nigeria. It is a topical issue worldwide because of its attendant problems that are threatening the sustenance of man and his environment. These are particularly becoming more severe in the under-developed and developing countries (Small & Nicholis, 2003). Climate variability has become the new reality of our time. It brings with it changes in weather patterns that can have serious repercussions for human beings, upsetting seasonal cycles, harming ecosystems and water supply, affecting agriculture and food production, causing sea-levels to rise. Climate variability has a cumulative effect on natural resources and the balance of nature. Its effects are already visible in Nigeria.

Nigeria, as a developing nation is particularly sensitive to the effects of climate variability. A large part of the economy of the country depends on natural resources, which are particularly vulnerable to climate variability. When those resources are affected, communities are implicated. Disease, loss of livelihoods and settlements can force entire communities into relocation or complete extinction and even refugee status. As critical as the effect of climate variability is, it is not clear whether Nigerians are aware of what climate variability is or its effects. Perhaps the biggest obstacle is the lack of awareness and knowledge as Olorunfemi (2010) had put it. Nigerians need to be educated and informed about climate variability

and how it can change our lives drastically. Lack of information (awareness) and knowledge (education) about climate variability also means that many Nigerians are reluctant to accept the reality of climate variability. Also, there is a lack of public policy, government preparedness and commitment to promoting climate variability adaptation strategies in the country.

Over 89% of energy consumption in Niger comes from the household sector, with most individuals burning wood and biomass remnants. This not only causes health problems but aids in the release of carbon dioxide into the atmosphere, increasing the levels of dangerous greenhouse gases. In order to mitigate the effects of this, modern fuels such as LPGs should be made more readily available to all Nigerians (IPCC, 2009).

In Niger, more impact of climate variability is going to be strongly felt in the coming decades, bringing with it desertification, increased droughts and increased flooding. The impact can be seen already as with the case of the 2009/10 drought and flooding. Measures need to be put in place immediately to help alleviate the problems associated with climate variability and to ensure that we ourselves are not contributing to the problem (IPCC, 2009).

### **Climate of Study Area and methods of Study**

The work uses descriptive research design. It concentrates on the effect of the changed climatic condition on the two countries using case situations of selected areas from the two countries.

Borno State is one of the warmest regions in Nigeria with an average daily high temperature of 35 degree centigrade. With a yearly average of 35% with very warm climate but has only few tropical and humid month it is a yearlong warm or hot. The state is characterized by distinct Rainy and dry season. The two seasons occur in April-October and November – March. The rainfall variation is over 100 percent. Rainy season lasts for less than eighty days. Droughts are endemic and rainfall tends to have been in decline since 1960s (Department of Meteorological Services, 1992).

Niger Republic is one of the hottest countries in the world, has three basic climatic zones: the Saharan desert in the north, the Sahel to the south of the desert, and the Sudan in the southwest corner. The intense heat of the Saharan zone often causes the scant rainfall to evaporate before it hits the ground; at Kablewa, annual rainfall is only 2 cm (0.79 in). On the average, rainfall in the Chetimari is limited to a maximum of 25 cm (10 in) annually, and most of it comes during a single two-month period. At Kankandi, annual rainfall averages 16.5 cm (6.5 in), but yearly totals often vary greatly. The rainy season is from May through October, with most rain in July and August. The average maximum daily temperature fluctuates from 31° C (88° F) in August to 41° C (106° F) in April. Nights are cool (below 20° C /68° F) from November to February.

Though the condition is considered to be of effect on the whole population of all the citizens of Nigeria and Niger, the study population is seven hundred and fourteen thousand, four hundred and eighty-eight (714.488.00) drawn from four Local Government in Borno state of Nigeria (Mobbar, Abadam, Kukawa & Guzamala) with total population of 431.826 (Census, 2006) and three Local Government from diffa state of Niger Republic (Kablewa, Chetimari & Kankandi) with total population of 282.662.

For the purpose of the study, multi stage sampling technique was used to select the respondents. The stratified sampling technique was first used to divide the sample into various regions and local areas

(strata), while purposive sampling technique was used to select respondent based on the knowledge of the subject matter. In other to determine the sample size, the researcher used the Taro Yamane formula with 0.05% level of significance to arrive at 399.7 (approximated to 400 respondents). 400 questionnaires were therefore transcribed, translated (where appropriate) and administered to the selected sample.

**Table 1: Sampling Frame**

Country	Locality	Population	Sample Size
<b>Nigeria</b>	Mobbar	101,822	57
	Abadam	107,956	60
	Kukawa	114,324	64
	Guzamala	107,724	61
	<b>Total</b>	<b>431,826</b>	<b>242</b>
<b>Niger Republic</b>	Kankandi	94,220	53
	Kablewa	90,490	50
	Chetimari	97,952	55
	<b>Total</b>	<b>282,662</b>	<b>158</b>
<b>Grand Total</b>		<b>714,488</b>	<b>400</b>

Descriptive statistical methods were employed in analyzing the data collected. This involves the use of simple percentage and tables in the summarization of the data collected from the responses to questionnaires administered.

### **Presentation of Results and Discussion**

This section present data collected from respondents in the selected locality of Nigeria and Niger Republic. The results were presented in frequency distribution table and percentage. This section is divided into two, the first involve the presentation of data on the characteristic of the respondents according to Age, marital status, educational qualification and occupation and effects of climate variability on food security, health and social cohesion, while the second part is the discussion of the findings.

**Table 2: Characteristics of the respondents**

S/N	Items	Frequency (F)	Percentages (%)
<b>Age Distribution</b>			



1	16 – 22	37	10.5
2	23 – 29	98	27.75
3	30 – 36	79	22.25
4	37 – 43	28	8
5	44 – 50	32	9
6	51 – 57	66	18.75
7	58 and above	13	3.75
	<b>Total</b>	<b>353</b>	<b>100%</b>
<b>Marital Status</b>			
1	Single	178	50.5
2	Married	127	36
3	Divorced	13	3.5
4	Window(s)	35	10
		<b>353</b>	<b>100%</b>
<b>Educational Qualification</b>			
1	Non-Formal Education	24	8
2	First School leaving certificate	93	26.25
3	Senior Secondary School certificate	128	36
4	Diploma/NCE	62	17.25
5	HND/B.Sc./BA	34	9.25
6	M.Sc./ PhD	12	3.25
		<b>353</b>	<b>100</b>
<b>Occupation</b>			
1	Civil servant GL 07-13	117	33.25
2	Farmer	64	18
3	Traders	137	38.75

4	Drivers	35	10
		<b>353</b>	<b>100</b>

Source: Questionnaire Response, 2017

A descriptive statistic of the sample revealed that analysis of the respondents show that representatives of all active age groups in the population were captured. Same goes with the marital status of the respondents which show that single (50.5%), married persons (36%) and divorced/widow/er (3.5% and 10% respectively) were covered. The respondents are highly educated and occupationally, the respondents had fair representations of the concerned and conscious population.

### The effect of climatic variability on food security, Health and Social Cohesion in Nigeria and Niger

This sub-section presents the result of questionnaire administered and returned by the respondents on food security, health and Social Cohesion in Nigeria and Niger.

**Table 3: Effect of climate variability on Food Security**

Items	Nigeria						Niger					
	SA %	A %	U %	D %	SD %	Total (%)	SA %	A %	U %	D %	SD %	Total %
The effect of climate variability noticed obvious by increase desertification in the area and causes low yields in production and also affect food security	102	63	27	18	5	215	38	50	16	29	5	138
	47 %	29 %	13 %	8%	3%	100%	28 %	36 %	12 %	21 %	3%	100%
With the climate variability, there is an increase in the non-arable land in our area	65	75	10	35	30	215	50	50	8	20	10	138
	30 %	35 %	5%	16 %	14 %	100%	36 %	36 %	6%	14 %	8%	100%
There are no more grazing field for the livestock and animal rearing	3	7	10	75	120	215	1	3	9	53	72	138
	1% %	3% %	5% %	36 %	56 %	100%	1% %	2% %	6% %	39 %	52 %	100%
People migrate out to farm and graze in other places	119	60	10	12	14	215	71	10	11	20	26	138
	55 %	27 %	5% %	6% %	7% %	100%	52 %	7% %	8% %	14 %	19 %	100%

because they wish to, not as a result of climate variability.												
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Source: Field Survey 2017

Table 4.2 discussed the climate variability on food security in Nigeria and Niger. The table shows that, 102 respondents representing 47% from Nigeria strongly agreed that the effect of climate variability notice obvious by increase in the desertification in the area and causes low yields in food production, 63 respondents representing 29% agreed, 27 respondents representing 13% were undecided while 18 respondents representing 8% disagreed and 5 respondents representing 3% strongly disagreed. On contrast 38 respondents representing 28% from Niger Republic strongly agreed that by increase in the desertification in the area and causes low yields in food production, 50 respondents representing 36% only agreed, 16 respondents representing 12% were undecided, while 29 respondents representing 21% disagreed and 5 respondents representing 3% strongly disagreed. This implies that increase in the desertification in the area causes low yields in food production as represented by majority view from both Nigeria and Niger.

In determining whether climate variability has led to increase in non-arable land in both Nigeria and Niger, the table shows that 65 respondents representing 30% in Nigeria strongly agreed, 75 respondents representing 35% only agreed and 10 respondents representing 5% were undecided while, 35 respondent representing 16% disagreed and 30 respondent representing 14% strongly disagreed. In comparison, 50 respondents representing 36% from Niger republic strongly agreed that climate variability has led to increase in non-arable land, 50 respondents representing 36% agreed, and 8 respondents representing 6% were undecided while 20 respondents representing 14% disagreed and 10 respondents representing 8% strongly disagreed. This indicates that majority of the respondents from both Nigeria and Niger affirms that climate variability has led to increase in non-arable land.

As to whether there is no more grazing field for the livestock, the table shows that 3 respondents representing 1% in Nigeria strongly agreed, 7 respondents representing 3% agreed while 10 respondents representing 5% were undecided whereas 75 respondents representing 35% disagreed and 120 respondents representing 56% strongly disagreed. On the other hand, 1 respondent representing 1% from Niger republic strongly agreed that there is no more grazing field for the livestock as a result of climate variability, 3 respondents representing 2% only agreed and 9 respondents representing 6% were undecided while 53 respondents representing 39% disagreed and 72 respondents representing 52% strongly disagreed. This shows that majority of respondent disagreed to the saying that there is no more grazing field for the livestock from both Nigeria and Niger.

On the statement whether people migrate out of farm and graze in other places, the table shows that 119 respondents representing 55% from Nigeria strongly agreed, 60 respondents representing 27% only agreed and 10 respondents representing 5% were undecided whereas 12 respondents representing 6% disagreed and 14 respondents representing 7% strongly disagreed with the statement. In contrast to responses from Niger Republic, 71 respondents representing 52% strongly agree that people migrate out of farm and graze in other places as a result of climate variability, 10 respondents representing 7% only agreed and 11 respondents representing 8% were undecided while 20 respondents representing 14%

disagreed and 26 respondents representing 19% strongly disagreed with the statement. This shows that majority of respondent agreed to the saying that people migrate out of farm and graze in other places from both Nigeria and Niger.

**Table 4: The Effect of climatic variability on Health**

Items	Nigeria						Niger					
	SA %	A %	U %	D %	SD %	Total (%)	SA %	A %	U %	D %	SD %	Total (%)
Climatic variability is the main causes of prevalence of human diseases such as malaria's epidemic.	100	103	5	3	4	215	73	55	7	3	0	138
	47 %	48 %	2%	1%	2%	100%	53 %	40 %	5%	2%	0%	100%
The effect of rising temperature precipitation has cause mortality rates in livestock.	95	80	5	20	15	215	70	40	4	10	14	138
	44 %	37 %	2%	10 %	7%	100%	51 %	29 %	3%	7%	10 %	100%
Peoples relocate out from the places because of the heat stress and drought.	103	94	3	12	3	215	80	30	7	18	3	138
	48 %	44 %	1%	6%	1%	100%	58 %	22 %	5%	13 %	2%	100%
Harsh weather condition causes animal malnutrition	128	40	30	15	2	215	60	26	23	21	8	138
	60 %	19 %	14 %	6%	1%	100%	43 %	19 %	17 %	15 %	6%	100%

Source: Field Survey 2017

Table 4.3 discussed the effect of climate variability on Health in Nigeria and Niger. The table shows that, 100 respondents representing 47% from Nigeria strongly agreed that the climate variability is the main cause of the prevalence of human diseases such as malaria epidemic, 103 respondents representing 48% agreed, 5 respondents representing 2% were undecided while 3 respondents representing 1% disagreed and 4 respondents representing 2% strongly disagreed. On contrast 73 respondents representing 53% from Niger Republic strongly agreed that climate variability is the main cause of the prevalence of human diseases such as malaria epidemic, 55 respondents representing 40% only agreed, 7 respondents representing 5% were undecided, while 3 respondents representing 2% disagreed and no respondents was strongly disagreed. This implies that climate variability is the main cause of the prevalence of human diseases such as malaria epidemic, as represented by majority view from both Nigeria and Niger.

In determining whether raising temperature precipitation has caused mortality rate in livestock in both Nigeria and Niger, the table shows that 95 respondents representing 44% in Nigeria strongly agreed, 80 respondents representing 37% only agreed and 5 respondents representing 2% were undecided while, 20

respondent representing 10% disagreed and 15 respondent representing 7% strongly disagreed. In comparison, 70 respondents representing 51% from Niger republic strongly agreed that raising temperature precipitation has caused mortality rate in livestock, 40 respondents representing 29% agreed, and 4 respondents representing 3% were undecided while 10 respondents representing 7% disagreed and 14 respondents representing 10% strongly disagreed. This indicates that majority of the respondents from both Nigeria and Niger affirms that raising temperature precipitation has caused mortality rate in livestock.

As to whether people relocate from their dwelling because of the heat stress and draught, the table shows that 103 respondents representing 48% in Nigeria strongly agreed, 94 respondents representing 44% agreed while 3 respondents representing 1% were undecided whereas 12 respondents representing 6% disagreed and 3 respondents representing 1% strongly disagreed. On the other hand, 80 respondent representing 58% from Niger republic strongly agreed that people relocate from their dwelling because of the heat stress and draught, 30 respondents representing 22% only agreed and 7 respondents representing 5% were undecided while 18 respondents representing 13% disagreed and 3 respondents representing 2% strongly disagreed. This show that majority of respondent agreed that people relocate from their dwelling because of the heat stress and draught in both Nigeria and Niger.

On the statement whether harsh weather condition causes animal malnutrition, the table shows that 128 respondents representing 60% from Nigeria strongly agreed, 40 respondents representing 19% only agreed and 30 respondents representing 14% were undecided whereas 15 respondents representing 6% disagreed and 2 respondents representing 1% strongly disagreed with the statement. In contrast to responses from Niger Republic, 60 respondents representing 43% strongly agree that harsh weather condition causes animal malnutrition, 26 respondents representing 19% only agreed and 23 respondents representing 17% were undecided while 21 respondents representing 15% disagreed and 8 respondents representing 6% strongly disagreed with the statement. By implication, climate variability has led to harsh weather condition causes animal malnutrition in both Nigeria and Niger Republic.

**Table 5: The Effect of Climate variability on Social Cohesion**

Items	Nigeria						Niger					
	SA %	A %	U %	D %	SD %	Total (%)	SA %	A %	U %	D %	SD %	Total (%)
The effect of climate variability is worst felt by the poor masses	122	60	5	20	8	215	60	47	5	14	12	138
	57 %	28 %	2%	9%	4%	100%	43 %	34%	4%	10 %	9%	100%
Damages caused by climatic hazard increase susceptibility of the poor masses	133	50	7	11	14	215	50	55	7	10	16	138
	62 %	23 %	3%	5%	7%	100%	36 %	40%	5%	7%	12 %	100%

Climatic hazard decrease in the ability of the less privileged to cope and recover from their damage	115	60	7	28	5	215	60	58	3	12	5	138
	53%	28%	3%	13%	2%	100%	43%	42%	2%	9%	4%	100%
There is cooperation and solidarity among local social groups in eradicating greenhouse emission	130	60	10	10	5	215	70	53	4	6	5	138
	60%	28%	5%	5%	2%	100%	51%	38%	3%	4%	4%	100%

Source: Field Survey 2017

Table 4.4 discussed the climate variability on social cohesion in Nigeria and Niger. The table shows that, 122 respondents representing 57% from Nigeria strongly agreed that the effect of climate variability is worst felt by the poor masses, 60 respondents representing 28% agreed, 5 respondents representing 2% were undecided while 20 respondents representing 9% disagreed and 8 respondents representing 4% strongly disagreed. On contrast 60 respondents representing 43% from Niger Republic strongly agreed that the effect of climate variability is worst felt by the poor masses, 47 respondents representing 34% only agreed, 5 respondents representing 4% were undecided, while 14 respondents representing 10% disagreed and 12 respondents representing 9% strongly disagreed. This implies that the effect of climate variability is worst felt by the poor masses, as represented by majority view from both Nigeria and Niger.

In determining whether damages caused by climatic hazard increase susceptibility of the poor masses, the table shows that 133 respondents representing 62% in Nigeria strongly agreed, 50 respondents representing 23% only agreed and 7 respondents representing 3% were undecided while, 11 respondent representing 5% disagreed and 14 respondent representing 7% strongly disagreed. In comparison, 50 respondents representing 36% from Niger republic strongly agreed that damages caused by climatic hazard increase susceptibility of the poor masses, 55 respondents representing 40% agreed, and 7 respondents representing 5% were undecided while 10 respondents representing 7% disagreed and 16 respondents representing 12% strongly disagreed. This indicates that majority of the respondents from both Nigeria and Niger affirms that damages caused by climatic hazard increase susceptibility of the poor masses.

As to whether climatic hazard decrease in the ability of the less privileged to cope and recover from their damage, the table shows that 115 respondents representing 53% in Nigeria strongly agreed, 60 respondents representing 28% agreed while 7 respondents representing 3% were undecided whereas 28 respondents representing 13% disagreed and 5 respondents representing 2% strongly disagreed. On the other hand, 60 respondent representing 43% from Niger republic strongly agreed that climatic hazard decrease in the ability of the less privileged to cope and recover from their damage, 58 respondents representing 42% only agreed and 3 respondents representing 2% were undecided while 12 respondents representing 9% disagreed and 5 respondents representing 4% strongly disagreed. This shows that majority of respondent disagreed to the saying that climatic hazard decrease in the ability of the less privileged to cope and recover from their damage from both Nigeria and Niger.

On the statement whether there is cooperation and solidarity among local social groups in eradicating greenhouse emission, the table shows that 130 respondents representing 60% from Nigeria strongly agreed, 60 respondents representing 28% only agreed and 10 respondents representing 5% were undecided whereas 10 respondents representing 5% disagreed and 5 respondents representing 2% strongly disagreed with the statement. In contrast to responses from Niger Republic, 70 respondents representing 51% strongly agree that there is cooperation and solidarity among local social groups in eradicating greenhouse emission, 53 respondents representing 38% only agreed and 4 respondents representing 3% were undecided while 6 respondents representing 4% disagreed and 5 respondents representing 4% strongly disagreed with the statement. By implication, there is cooperation and solidarity among local social groups in eradicating greenhouse emission, in both Nigeria and Niger republic.

### **Discussion of Findings**

The research is aimed as assessing the climate variability and socio-economic development in the West Africa, a comparative analysis of Nigeria and Niger Republic. In this regard, the research objectives and questions were carefully formulated to address issues on effect of climate variability on food security, health, and social cohesion. In order to achieve the desired objectives of the research, frequency distribution tables are used with a view to determining the level of differences.

The study finding revealed that climate variability has increased the desertification of both Nigeria and Niger thereby causing low yields in food production, non-arable land has continually been on the increase consequent upon this, no more grazing field for the livestock, hence people migrate out of their farm and graze in other places. To corroborate this finding, The UN development Report reported that one in four household in Sub-Saharan African cannot access adequate food. Also Romer (1986) has succinctly observed that about 800million people are without enough food to eat on a regular basis and the figure remain stubbornly high throughout the world. More than 60% of the world's undernourished people live in Asia while 25% live in Africa. Same is echoed by the earlier reports of Nwanegbo (2012), further given credence to finding and the Ministry of Agriculture's estimate that 65% population of Nigerians are food insecure due to the constrained of poor infrastructure, drought etc.

The study also revealed that climate variability is the main cause of the prevalence of human diseases such as malaria epidemic, in both Nigeria and Niger. Studies have shown that Nigeria is already in the thick of climatic variability. According to Ekpoh and Bassey (2016) with climate variability, the scale of climate-health problem has expanded from micro level to macro or global level, and the impacts are intense and they either concerns direct impact (heat stress, heat waves, cold, and frost bite) or indirect impacts like health problem that arise as a collateral consequences from climate variability impact on our ecological and economic system; thus, the raising temperature precipitation which caused mortality rate in livestock and sometime human. For this reason too, people had to relocate from their dwelling because of the heat stress and draught in both Nigeria and Niger. The harsh weather condition causes animal malnutrition.

The study further explained that the effect of climate variability is worst felt by the poor masses than any other social groups. This was aptly put by Baussan (2015) that the low income households are more likely to be affected by extreme weather. This is because majority of counties that experienced multiple extreme weather events over the past years were homes to a majority of middle and lower income household. This is owing of the fact that it increases their susceptibility to damages cause by climatic hazard and decreases

their ability to cope and recover. In 2008, Hurricane Ike destroyed nearly 70 percent of the structures on Galveston Island, Texas, including more than 500 low income housing units, nearly five years later, only 40 public housing units had been rebuilt (Baussan, 2015). The other population badly hit by the situation are the women who in most situations according to Nwanegbo & Odigbo (2012) bear the brunt of social dislocation and family disorganisation.

### **Conclusion**

This study has addressed the issue of climate variability and Food security, health and social cohesion. It has shown that climate variability is real in both Nigeria and Niger and should be taken seriously in all sectors of the economy, especially the health sector. The study is of the opinion that if we can mitigate climate variability, then the negative impacts on health, food security and social cohesion would have been averted. Therefore, addressing the problem of climate variability will entail a fundamental shift away from the manner in which we have been doing things in the past, to ways that will dramatically reduce emissions of carbon dioxide and other greenhouse gases. In this way, we will not only protect our health, food and our environment against the adverse effects of climate variability, but will further guarantee a better and secure future for our children and generations yet unborn. The increasing frequency of climate variability-related disasters in Nigeria and Niger Republic, especially floods, droughts, heat stress and their associated health impacts demand that strategic plans be made to contain the menace. Our actions today will determine what we will have tomorrow.

Following the above, the study recommends among others;

- i. The need to build and developed cohesive societies by means of complementary, coherent and systematic implementation of local public intervention programme for climate variability. The governmental action which Nwanegbo (2007) explains as having very strong potential for achieving sustainable governance and development in the polity.
- ii. The health sector should undertake vulnerability assessments in order to identify areas or regions that may easily succumb to climate variability impacts, for appropriate capacity building and resource allocation. This will ensure that appropriate attention is given to events as they occur.
- iii. It will be helpful to widen the climate variability Actors' space by ensuring that government actors collaborate with non-government actors (NGOs, Civil Societies and Community based Organization) in the development of adaptation policies and strategies. For instance, early warning signs put forward by meteorological Agencies should be coupled into plans of action. Thus there should be greater synergy between weather scientist and medical experts.
- iv. Effective economic empowerment of the public, particularly the down trodden, to enhance their ability to cope with the impact of climatic variability. In this respect, budgetary allocation to climate variability activities should be improved.

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