

**USING INDIGENOUS KNOWLEDGE TO ADDRESSING CLIMATE CHANGE IN THE NIGERIAN SECTOR OF THE LAKE CHAD BASIN**

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**ABSTRACT**

*The problem of changing or declining sizes of the Lake Chad has, so far, been attributed to two key things: climate change and anthropogenesis as a result of High reliance of various irrigations projects on the lake (Ayuba and Dami, 2011). While climate change is blamed for the dwindling rainfalls hence recharge of the Lake, anthropogenesis is related to land use change from mainly farming activities and overgrazing leading to creation of arid-like conditions. The aim of this paper is, therefore, to establish how traditional or the so-called indigenous knowledge of the local populations have helped them lived through this changing climate; in other words how has the indigenous knowledge, defined as knowledge of the environment gathered by communities through years of interaction. The paper shows the vulnerabilities the indigenous people are exposed to as a result of high dependency of their livelihood on the natural environment. The Indigenous people have been challenged with the adverse impacts of climate for long period of time and have developed a wide array of coping strategies, and their traditional knowledge and practice provides an important basis for facing the even greater challenges of climate change, among the strategies they adapt to the effect of changing climate are Diversification of livelihood and Migrating.*

**INTRODUCTION**

Climate change is considered the most pressing environmental problem facing the globe today. It is affecting patterns of life and general living conditions of people around the world; the availability of water, food production, weather conditions, health, cultures, economic well-being and recreation among others. Millions of people, especially in the desert prone frontline states of the Northern Nigeria where Lake Chad is located will be confined to perpetual poverty and perilous living conditions due to food and water shortages, and extreme change in weather pattern as a result of global warming. Lake Chad is Africa's fourth largest lake, the largest in Western and Central Africa. Its basin constitutes an important freshwater source shared by Cameroon, the Central African Republic (CAR), Chad, Niger, Nigeria and Sudan. The Lake is fed mainly by the Chari River, which flows northward from the highlands of CAR through the Southern Chad, supplying approximately 95% of the Lake's recharge; the remaining 5% is accounted for by Komadugu-Yobe River, River Ebeiji and River Yedzaram, which in recent times dried up completely before reaching the Lake Chad. A recent study by Jauro (2007) has indicated considerable reduction in the depth of lake with the maximum depth averaged 1.5m and its surface area reduced to less than 200km<sup>2</sup> from about 25000Km<sup>2</sup> in the last thirty years. This is indeed a huge reduction considering that in the 1600s the lake was at full capacity after it rebounded from a

completely dried up basin in the late 1400s. Like any other natural water body, the study attributed the balance of the Lake on interactions between rainfall, groundwater recharge and surface evaporation; this balance has however been significantly affected by the persistent decline in rainfall over the whole of the basin in the last 30 years, with the mean rainfall isohyets shifting by more than 185 km southwards. Close to 20 million people rely on lake-based economic activities; this is expected to increase to 35 million by the year 2020 (LCBC, 2000). The lake, its floodplains, and surrounding wetlands support recessional agriculture, pastoralism, forest regeneration, fish breeding and production and limited tourism. The basin has also been identified as supporting biodiversity of global significance during periods of migration. Almost all aforementioned activities are related to water levels in the Lake. The pastoralists will move in their cattle at low water levels in search of green pastures. The fishermen, on the other hand, hope to find rich fishing grounds in the deep waters of lake especially at the beginning of the farming season in January/February when there is more rainfall increasing the surface area of the Lake. The Lake region also hosts a considerable number of seasonal migrants from neighboring regions who work as farm laborers, farm their own plots or engage in their own suitable trades.

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This paper is has two main sections. The first section establishes the vulnerability of Nigeria, in particular the Lake region, to climate change, providing evidence on the threats of livelihoods, the possible implications and the link between adapting to climate change and indigenous knowledge. The penultimate section discusses how the aforementioned populations, the indigenous people, that have lived many generations around the Lake are coping with the changing climate as a result of their extensive knowledge of the said environment.



Fig. 1. Shows the Location of the lake chad basin: Source: LCBC (2000)

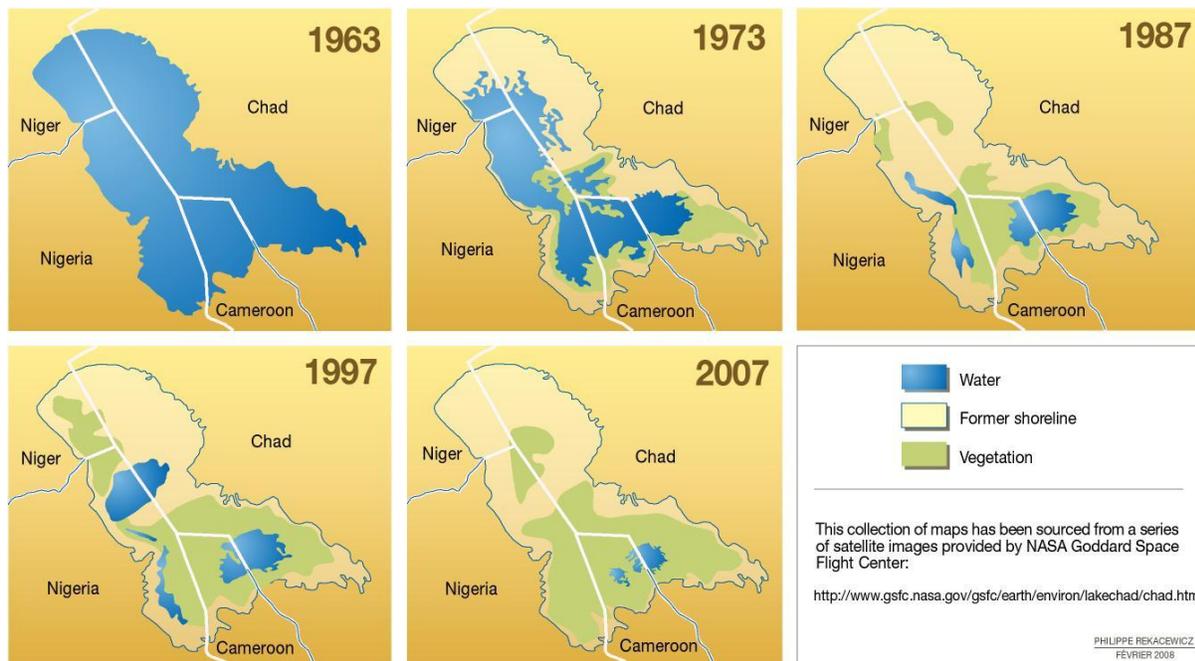


Fig. 2. Shows How The Lake Chad Basin has been shrinking: Source:UNEP (2008)

### **VULNERABILITY TO CLIMATE CHANGE IN NIGERIA**

Vulnerability as defined by IPCC (2007) as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. The developing world is generally confirmed to be the region most vulnerable to climate change and sub-Saharan Africa is perhaps the worst region to be

affected in the developing world due to the very high levels of poverty. Their vulnerability is largely a result of their livelihoods being dependent on the natural environment in agriculture, fisheries and hunting to mention just a few; the population of the developing world is estimated to be more than 65% dependent on agriculture or related activities. The vulnerability levels in developing countries is particularly made acute because of the heavy reliance of their populations on the climate-sensitive sectors of as agriculture and fisheries, very low GDPs, hence high poverty levels as mentioned earlier, low levels of education and limited human, institutional, economic, technical and financial capacity Preston et al. (2007).

The situation of the developing world is analogous to the situation in Nigeria. The country is the Africa's number one producer of crude oil and world's number 8; this notwithstanding, the country is still however a net importer of oil and poverty levels are extremely high particular among the rural populations including the local populations around the Lake Chad. The percentage of the Nigerian population classified as extremely poor that is living under poverty line is estimated at 65% to 70% that is about *105million people*; and the levels are even believed to be higher among the rural populations (Okolo, 2010). According to BNCCC (2011), Nigeria is one of the countries highly vulnerable to climate change as a result of the huge dependence of its economy and individual livelihoods on rain-fed agriculture, serious fluctuations, especially decline, in which can lead to catastrophic implications.

In perspective, vulnerability of the Northern part of the country is highly related to accelerated desertification in most of the States in the northern region. It has been estimated that between 50% and 75% of Bauchi, Borno, Gombe, Jigawa, Kano, Katsina, Kebbi, Sokoto, Yobe, and Zamfara States, all in the North, are being affected by desertification (FGN, 1998). These States, with a population of about 27 million people account for about 38 % of the country's total land area. In these areas, population pressure resulting in over grazing and over exploitation of marginal lands has aggravated desertification and drought. Entire villages and major access roads have been buried under sand dunes in the extreme northern parts of Katsina, Sokoto, Jigawa, Yobe and Borno States where the Lake Chad is located. In the south of the country, especially along the coastal communities, vulnerability to climate change is highly related to exposure of the coast lines to the treats of accelerated sea level rise and increased storm surge risk which could impact the coastal communities. It has been shown that the extreme southern states of Lagos, Cross Rivers, River and Akwa Ibom are been affected by flooding hence serious implications on both local and national economies especially those activities related to fisheries. Essentially, the fact that the economy of Nigeria is vulnerable to climate change makes the entire population vulnerable and already effects are being felt by the population that are attributable to the changing climate. For example, the shorter rainy seasons, at most two months compared to about four months previously, is affecting the amount of water available for cattle and the quality of the grazing fields in pastoralist communities of northern Nigeria while in southern part of the country, coastal communities are at the risk of flooding due to storm surge and heavy rainfall events. Residents in these communities cope with impact such as property damage, temporary homelessness and spread diseases such as malaria and diarrhea. According to a studies carried out by Daniel et al. (2009), rural households on three livelihoods groups of the Sahelian zone of northern Nigeria namely the farmers, herders and fishers are all vulnerable to drought and water scarcity and the poorest households amongst these

groups are projected to be most vulnerable. The disparity in vulnerability is also identified between rural and urban households. The rural households are deemed more vulnerable because of their low asset base that exposes them to the high risk of impact from climate stress and limits their resilience and capacity to adapt. The land holdings and other resource assets of the rural communities are small in amount and degraded in quality leaving a slim margin between basic needs in good years and suffering severe deprivation in poor years in this water scarce region. Apart from the natural factors, vulnerability to climate change in Nigeria is also attributed to the perception, and awareness, of climate change. In a recent undated survey carried out by the British Council in partnership with the British World Service Trust, it was revealed that an average Nigerian is not aware of climate change despite its impact on their day-to-day activities. Some see climate change as a natural phenomenon that is simply destined by God to happen. The study further revealed little or no attention is being paid to alarming change in weather pattern such as excessive flooding experienced in different parts of Nigeria in 2008, increased aridity and intense desert encroachment witnessed in northern Nigeria in the past decade or the dwindling flow of Niger Basin and other major waterways, corroborating poor agricultural yield, communal clashes over natural resources management and siltation of the river basin. In a recent report carried by NAN (News Agency of Nigeria) on the need for the federal government to intensify awareness campaign on climate change, professor Emmanuel Oladipo of the climate change research unit in Ahmadu Bello University Zaria charged the government for providing fund for creating awareness at national state and community level on the effects of climate change, he describe it as a unique problem capable of adversely affecting national development and stress the need for government to take appropriate adaptation measure to address the menace

The situation in the Lake Chad Region State of Borno at north-eastern border with Cameroun is not different from the discussions above with respect to rural populations. The Lake sector of Nigeria is in Borno State whose estimated population of 4 million (NPC, 2006) is almost entirely dependent on the Lake in one way or the other; they are either part of the indigenous farming and fishing populations or depend on supplies related to the Lake for their livelihoods and micro-economic activities. As mentioned earlier, the dominant socio-economic activity around the Lake is rain-fed agriculture in upland crop cultivation especially maize, groundnut, cassava, miller and sorghum; horticulture by women, mainly for income generation, is also an expanding activity. The other dominant activities are fishing and fisheries related activities and animal husbandry. The population in agriculture has even increased over the years as the water levels declined forcing a number of the fishermen to abandon their trade, at least as an economic venture, into farming (Eric et al., 2006). Apparently, Nigeria's response to the impact of climate change must therefore address such topics as natural resource management, with a strong focus on agriculture, including animal husbandry. Improving the infrastructure situation, particularly in the coastal regions of the south, especially in the areas of health, energy and transportation need to take centre stage too. According to the IPCC report, there is high confidence that the impacts of climate change on freshwater systems and their management are mainly due to the observed and projected increases in temperature, sea level and precipitation variability. Increase in Global temperature would lead to increase in the rate of evaporation and disruption in the Hydrological cycle. Africa is already a continent under pressure from climate stresses and is highly vulnerable to the impacts of climate

change. Many areas in Africa are recognized as having climates that are among the most variable in the world on seasonal and decadal time scales. Floods and droughts can occur in the same area within months of each other. These events can lead to famine and widespread disruption of socio-economic well-being. Studies indicate that one third of African people already live in drought- prone areas and 220 million are exposed to drought each year (UNFCC, 2007).

It has been well established that there is clear link between indigenous knowledge and climate change, been that it is the knowledge been used for thousands of years by the indigenous people and passed from one generation to another. Indigenous people live close to the resources, observe activities and are the first to identify any change and adapt to them. They are more linked to the climate; their source of live and livelihood entirely depend on the climate. In all their observations using various traditional methods in understanding very well change in time and season through indicators, such as appearance of certain Birds, Mating of certain animals or the flowering of certain plants which are all important signals in identifying change in the climate.

### **ADAPTING TO CLIMATE CHANGE IN THE LAKE CHAD REGION OF NIGERIA THROUGH INDIGENOUS KNOWLEDGE**

The IPCC (2007) has painted a dire picture of the future of as a result of the Earth's changing climate. The report projected that by 2020, between 75 million and 250 million people are projected to be exposed to increased water stress due to climate change; that this water stress coupled with increased demand, this will adversely affect livelihoods and exacerbate water-related problems. Agricultural production, including access to food, in many African countries and regions is also projected to be severely compromised by climate variability and change. The area suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease. In some countries, yields from rain-fed agriculture could be reduced by up to 50% further creating food insecurity, exacerbate malnutrition, among others, on the continent.

The developing world is severely affected by the impact of climate change even though they contribute very insignificant amount of greenhouse gasses – the drying of lakes and rivers are among the most serious of these climatic impacts. The vulnerability of Nigeria to the impacts of climate change has been detailed earlier, with almost all sectors of the economy and the natural environment, particularly agriculture, water resources, forestry, health and settlement. According to a document by BNRCC (2011) agricultural production has decreased in the Sahelian and Savannah regions of Nigeria as a result of high temperatures leading to high evaporation rates and reduced soil moisture hence lowering of the ground water table and the shrinking of the surface water, especially in the extreme north of the country where Lake Chad is; the water stress or shortage problem has also seen tremendous reductions in livestock populations in the north. The story is different in the south of country. Increased rainfall intensity has been observed in the region, especially along the coastline that has led to, among others, flooding and intensive soil erosion that has potential of reduced agricultural production. Overall however, albeit the increased intensity in the south, rainfall in Nigeria has, over the years, been erratic particularly in the Sahelian north that has not only further created the problem of

confusing the farmers over the start of the planting seasons but also crop failure as the rains become less sufficient for the lives of the crops. Extreme events are also occurrences in; while drought and occasional heat waves are the main ones in the north, the south experiences intensive rainfall and coastal storms accompanied by serious flooding and related damages.

Apparently, adaptation to climate change has become an issue for Nigeria. The IPCC (2001) described adaptation to climate change as adjustment in natural or human systems in response to actual or expected climatic stimuli and their effects which moderates harm or exploits beneficial opportunities. Others like Smith and Lenhart (1996) and Fankhauser, (1996) describe it as an important component of climatic change impact and vulnerability assessment and as one of the policy options in response to climatic change impacts. Adaptation to climatic change is therefore critical and of concern in developing countries, particularly in Africa where vulnerability is high because ability to adapt is low (Hassan and Nhemachena 2008). Adaptation strategies are expected to be various and in most cases combined as may be required by geography and the problem at hand. At the agriculturally dependent rural communities, strategies could include the adoption of efficient environmental resources management practices such as the planting of early maturing crops, adoption of hardy varieties of crops and selective keeping of livestock in areas where rainfall declined; they also include the use of technological products that enable the individual to function in the new condition. Generally, as pointed out by UNFCC, (2007) farmers in Africa use different adaptive practices in addressing climate change effects ranging from the use of variety of agricultural techniques such as intercropping and crop diversification on the same plots with different resistant capacities to enable sustainable food production and deal with extreme events. The idea of growing different varieties of crops on same piece of land has also been accredited by both Benhin (2006) and Hassan and Nkemechena (2008) as an appropriate adaptation strategy in avoiding failure.

With respect to the subject area of the application of indigenous knowledge in adapting to climate change in the Lake Chad region of Nigeria, studies by Ayuba (2009), Eric (2006) and Nyong (2007) have described various means through which the indigenous communities of the region have always managed to sustain their indigenous livelihoods, especially under unfavorable climatic conditions; means that are a largely a result of accumulation of the knowledge of their environment and in some cases 'borrowed' from communities with similar existence. The key strategies identified by these studies are briefly described below. As will be seen, while most of the measures are related to the production and livelihood systems of the area, a number of the measures also depend on the socio-economic systems as well in managing climate risk. The order of description does not bear any significance.

- **Intensification of farming:** associated with rapid sowing of the principal crops at the onset of the rains with intensive application of manure. It also involves good soil management practices like application of organic manure, animal kraaling on farmlands, application of ash and mulching.
- **Liquidating assets:** this is usually a last resort option when others have failed. The communities will liquidate or exchange assets in order to acquire basic necessities.

- **Intercropping:** the most common of this activity is the combined cultivation of millet (tolerant to drought and fast-maturing) and guinea corn, which is resistant to key pests like grasshoppers and able to use late rain and residual soil moisture.
- **Maintenance of soil cover:** the farmers would plant cover crops or practice crop rotations and minimum tillage to ensure the land stays covered for a long period of the year to avoid reduced soil fertility particularly during heavy winds.
- **Migrant fishing:** the fishermen will move as the waters in the lake recede to the deeper regions, where the fish would as well migrate to from the shallow waters.
- **Less mechanization:** under very dry conditions the farmers will use more of the traditional long-handled hoes to plough of the fields instead of heavy machinery like tractors that could further destroy the soil under such conditions.
- **Water harvesting:** the farmers would collect rain water from the rooftops or dig ponds to collect water that is used for both household chores and livestock watering.
- **Local irrigation:** the communities dig shallow wells in women's vegetable gardens during the dry season, when the lake has receded for the watering of vegetables. The most common method is the shaduf, a technology borrowed from Egypt, where water is drawn from the well on a manually operated rope on a horizontal support 8 to 10feet above the mouth of the well.
- **Deferred grazing:** the farmers would put off livestock from certain pastures to allow grass to fully grow and mature, while they continue feeding on other pastures; it is sort of a shifting cultivation practice.
- **Transhumance:** this is also an extreme activity during low water levels when the cattle herders move long distances, usually south to areas of greener pasture.
- **Agroforestry and community woodlots:** substantial regeneration of lost forests are happening in the region having known the positive effects of forests on rainfall; the community managed woodlots are also ensuring forests are sustainably harvested for fuel wood and other forest products like wild fruits that have high economic value to the communities.
- **Traditional weather forecasting:** the communities have learned certain animals and birds behavior and cries to tell the coming of rains or even the length of the season from the migratory behavior of some animals. Wind patterns and observation of certain plant species are also among the techniques.
- **Local fish breeding:** the fishermen construct channels from the lake to sizeable ponds for the breeding of particular fish species. When the ponds are full to a certain level, the channels are blocked to ensure the water does not flow back to the lake. The ponds are monitored to maturity of the fish before they are harvested.
- **Rural-urban migration:** this is common among the youthful population and occurs mainly during the off-cropping season. The youth move to the big cities to engage in petty trading and other income earning activities; they go back home in time for the cropping season.
- **Livestock herd's diversification:** the herders would have mixture of different varieties of livestock in the same herd for example sheep, goats and cattle together to strengthen the hardiness of the herd.

Suffice it to say that while most of the above adaptation strategies have worked and helped the communities through numerous hard times, their effectiveness is however being threatened by the increasing population of the region accompanied by high poverty and illiteracy levels. Under such conditions, where people have limited options, the chances of risky ventures become a norm (UNDP, 2002). For example, communities may deliberately choose to inhabit hazard-prone zones if they believe this will reduce to the effects other potential hazards, especially food shortages; for example settling on

flood plains where the soils are fertile for cropping and horticulture. The adaptation options are further affected as the causal processes of risk become increasingly global, which limits the options available to local communities. This growing complexity of risk, due to both economic globalizations as well as to global climate change, greatly reduces the predictability and increases the uncertainties of climate related disaster events in the Lake Chad Basin and similar regions in the developing world. The dearth of information concerning climate change forecasting (on seasonal and long-term climate changes) increases the failure associated with the adoption of new technologies and adaptation measures.

Some of the specific options mentioned above have also had their own problems; the key one was the border dispute between Cameroun and Nigeria in the early late 1990s to early 2000s that emanated from the large scale migration of Nigerian fishermen to the Cameroun side of the lake in pursuit of the deep waters. The ensuing furor led to the intervention of the International Court of Justice hence the resolution of the problem in 2002 through the repatriation of the Nigerians, which further created another problem in that the repatriated communities were moved farther away from the lake and therefore the loss of an indigenous livelihood. The story is not however all about doom with respect to the receding Lake Chad. The exposed spaces have released up to about 500hectares of land that have proven very useful agricultural land; these recessional lands and polder depressions between dunes grow maize, rice, wheat and vegetables. In a traditional polder one crop a year is grown as the lake water recedes.

In a related study carried out by (Enete et al., 2011) shows that the biggest effect of climate change in the south eastern region of Nigeria is reduced farm yield and income, drying up of streams/rivers, reduction in storage quality of crops, loss of pastureland/vegetation and destruction of wildlife ecosystem. Some of the local coping strategies adopted by the farmers with a relatively high profitability index include multiple/intercropping, agro-forestry/afforestation, mulching, purchase/harvest of water for irrigation and use of resistant varieties. The major factors identified to be driving farmers' investment in adaptation practices were age, level of formal education and level of awareness of climate change issues. The major factors constraining them from adapting to climate change were poverty; farmland scarcity and inadequate access to more efficient inputs, Lack of information and poor skills, land tenure and labour constraints.

## **CONCLUSION**

The extent of climate change incidence is on the increase in northern Nigeria. This was shown by the vagaries of climate conditions as reflected by uncertainties in onset of farming seasons, extremities of weather conditions and increase in Farming problems. The paper shows the vulnerabilities the indigenous people are exposed to as a result of high dependency of their livelihood on the natural environment. The Indigenous people have been challenged with the adverse impacts of climate for long period of time and have developed a wide array of coping strategies, and their traditional knowledge and practice provides an important basis for facing the even greater challenges of climate change, among the strategies they adapt to the effect of changing climate are Diversification of livelihood and Migrating.

**REFERENCES**

Ayuba, H. K., 2009. The Application of Climate Adaptation Systems and Improvement of Predictability Systems in the Lake Chad Basin. World Water Week, Stockholm, August 16-22, 2009

Ayuba ,H. K. and Dami, A. 2011. Environmental Science, An Introductory Text. Apani Publications, Kaduna, Nigeria.

BBC Trust Survey on climate Change awareness in Nigeria.[Online] Available at <http://www.youtube.com/watch?v=VkAMR-ncwZM>

Benhin, J.K.A. 2006. Climate change and South African agriculture: Impacts and adaptation options. CEEPA Discussion paper No. 21. CEEPA, University of Pretoria, South Africa.

BNRCC 2011. National Adaptation strategy and Plan of Action. Nigeria.

Daniel, D. D.,Anthony, O. N.,Adebowale, A. A. 2009. Past Present and Future Adaptation by Rural households of Northern Nigeria In: Neil, I., James, A., Vincent, B., Lan, B., Jyoti, K. and Rodel, L. ed. 2009. Climate Change and Adaptation. Earthscan London.

Editha, P. (2001) Common quarrels – Individual solutions; Coping with Conflicts in the Lake Chad area of Nigeria. In Proceedings of the International Symposium 1999, Frankfurt Main 2001.

Enete et al., 2011. Indigenous Agricultural Adaptation to Climate Change: Study of Southeast Nigeria. African Technology Policy Studies Network Research Paper No. 6.

Eric,O.O., Lekan, O. and Johnson, A.O. 2006. Lake Chad: Experience and Lessons Learned Brief. Nairobi Kenya.

Fankhauser, S. 1996. The potential costs of climate change adaptation. In: Smith, J.B., Bhatt, N., Menzhulin, G., Benieff, M., Budyko, M., Campos, M. Jallow, B. and Rijsbeevman, F (eds.), Adapting to Climate change: An International perspective. Springer, New York, USA.

Hassan, R. and Nhemachena, C., 2008 Determinants of African farmers' strategies for adapting to climate change: Multinomial choice analysis. CEEPA Discussion paper No. 21. CEEPA, University of Pretoria, South Africa.

IPCC, 2001, Climate Change 2001: Impacts, Adaptations and Vulnerabilities. Contribution of Working Group II to the Third Assessment Report of the IPCC. New York; Cambridge University Press.

IPCC, 2007, Climate Change 2007: Impacts, Adaptation and Vulnerability. The Working Group II Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report. Cambridge University Press, Cambridge.

Jauro, A.B. 2007, Socio-economic Issues and Conflict Resolution in water Resource use. A paper delivered at the Regional Roundtable on Sustainable Development in the Lake Chad Basin held at the University of Maiduguri, Maiduguri. 20<sup>th</sup> – 22<sup>nd</sup> February 2007.

LCBC, 2000, The Lake Chad Basin Vision for 2025. Second World Water Forum.

Federal Government of Nigeria, 1998. Combating Desertification and mitigating the effects Droughts in Nigeria. [Online] Available at [http://boellnigeria.org/downloads/NASPA\\_PDF](http://boellnigeria.org/downloads/NASPA_PDF).

NPC, 2006. Population Data in Nigeria. [Online] available at <http://www.population.gov.ng>. Access on 7 January 2011.

Nyong, A., Adesina, F. and Elasha, B. O., 2007 The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel Received: 8 May 2006 [Online] Available at <http://ies.lbl.gov/iespubs/8nyong.pdf>

Okolo, P., 2011. Nigeria's Poverty Ratio Rises to 70% of Population: Daily trust Online, [online] 18 Jan 2011. Available at <http://www.bloomberg.com/news/2011-01-18/nigeria-s-poverty-ratio-rises-to-70-of-population-trust-says.html>.

Oladipo, E.,2011. Intensify awareness campaign on Climate Change: Daily trust online , [Online] Available at [http://dailytrust.com.ng/index.php?option=com\\_content&view=article&id=151174:fg-urged-to-intensify-awareness-campaign-on-climate-change&catid=1:news&item=2](http://dailytrust.com.ng/index.php?option=com_content&view=article&id=151174:fg-urged-to-intensify-awareness-campaign-on-climate-change&catid=1:news&item=2).

Preston, B.L., T.M. Smith, C. Brooke et al. 2007. Mapping Climate Change Vulnerability in the SCCG region. A Report for the SCCG and the Australian Greenhouse Office. CSIRO Marine and Atmospheric Research, Aspen dale, VIC, Australia.

Smith, J. B. and S. Lenhont, 1996. Climate change adaptation policy options. Climate Research 6.

UNDP, 2002. Expert Group Meeting Integrating Disaster Reduction with Adaptation to Climate Change, Havana.

UNEP 2008. Lake Chad: Almost Gone, Vital water Graphics. [Online] Available at <http://smbhome.uscs.susx.ac.uk/mn261/Desktop/Lake Chad almost gone - Vital Water Graphics.htm>.

UNEP n.d. Indigenous Knowledge in Africa. [Online] Available at <http://www.unep.org/ik>

UNFCCC, 2007. Climate change: impacts, vulnerabilities and adaptation in developing countries.

