



# **Technological Challenges of Climate Change Adaptation in Nigeria: Insights from Enugu State**

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**Emeka Celestine Nzeh**  
**Ogugua Rita Eboh**





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**Emeka Celestine Nzeh**

African Institute for Applied Economics,  
Enugu State, Nigeria

**Ogugua Rita Eboh**

Centre for Entrepreneurship and  
Development Research,  
University of Nigeria, Nsukka



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## Introduction

Climate change has become our new reality. It brings with it changes in weather patterns that can have serious repercussions for all of us, upsetting seasonal cycles, harming ecosystems and water supply, affecting agricultural farming systems and food production, causing sea-levels to rise. Climate Change can lead to floods, landslides, drought and famine. As the weather becomes fiercer and storms increase in frequency and intensity, serious socio-economic consequences may result. Malnutrition and disease become common occurrences. Climate change has a cumulative effect on natural resources, agriculture and the balance of nature. Its effects are already visible in Enugu state and Nigeria in general.

## Why Bother About Climate Change?

Farmers grow a variety of food crops in Enugu state, Nigeria, and all are dependent on rainfall. In the rainfall abundant areas, rain-fed crops are planted, whereas in the drier parts of the country, crops that can tolerate less water are cultivated. Food production on the whole, however, has not kept pace with population increase in Nigeria's and specifically in Enugu state. Climate Change can seriously affect agricultural production, hence food security. Enugu State, at present, is not food secure, and is therefore highly vulnerable to the effects of climate change.

Land degradation reduces the quality and productivity of land. Many factors can lead to land degradation, and climate change is one of the underlying causes. This results in water and wind erosion of land at different degrees in different parts of the state, drought and the creation of deserts, acid and salt accumulation, depletion of minerals, and heavy-metal contamination. Also, in Nigeria all forms of land degradation occur in different scales and no part of the country is safe from it. The low-lying nature of Nigeria's 800 km coastline makes it prone to coastal erosion and flooding, all of which are climate change-induced forms of land degradation. In the Sahelian zone of Nigeria's north, the most pronounced climate change-related forms of land degradation are wind erosion and related sand dune formation, drought and desertification. Sheet erosion—which results in the complete removal of arable land—is Nigeria's biggest threat to agriculture, especially in the sandy soil regions of south-eastern Nigeria which encompasses Enugu state.

Prevailing climate is critical in controlling the ecosystem structure. Forests provide important goods and services, which include food, non-timber forest products, timber, and firewood, the natural regulation of biochemical cycles, genetic resources, soil and water conservation, carbon reservoirs, recreation, cultural and spiritual values. Forests play a key role in the functioning of the biosphere and indirectly affect the provision of many other goods and services. Changes in climatic and atmospheric composition have led to the diminishing of forests in Enugu state and Nigeria at-large. The upper limits of the tropical rainforest are already receding. Given the sensitive nature of the forest ecosystems, forest resources have become highly vulnerable to even slight changes in climate systems. Changes in temperature, precipitation and water cycle dynamics, therefore, can lead to remarkable forest-cover loss in the state.

## Consequences of climate change on agriculture and livelihoods

Climate change affects agricultural farming systems in Enugu state in a number of ways. Extreme weather events such as thunderstorms, heavy winds, and floods devastate farmlands and can lead to crop failure. Pests and crop diseases migrate in response to climate variations and potentially pose a threat to livestock. Food security is vulnerable to extreme weather events such as drought and floods. When the Sahelian zone of the country suffered drought in the 1970's and 1980's, harvest failure was remarkable throughout the region. Close to one million livestock were lost, affecting meat and dairy supply throughout the country. Flood hazards in both the north and south of the country consistently posed a danger to farmlands and hence, to food security. Food security is dependant on rainfall and rainfall amount, and is affected by the age-long ability of farmers to predict when to plant their crops thereby resulting to changes in their farming systems. Unpredictable changes in the onset of rains in the last three to 10 years have led to situations where crops planted with the arrival of early rains get smothered in the soil by an unexpected dry spell that can follow early planting. That crop smothering, and the late arrival of rains due to climate variability, results in harvest failures in ecosystems that rely on rain-fed agriculture.

The proliferation of pests and crop diseases (again originating with climate change) can hinder storage when the need arises because of temperature



increases. The pests, in turn, attack crops and animals. The current warming trend hinders livestock production and reproduction by reducing animal weight gain and dairy production. As well, livestock are usually subjected to long treks to find water and grass in the more southerly areas of the country during the dry seasons. Warming trends also affect the growth of/farming systems of grain crops such as maize, guinea corn, and rice, and makes storage of root crops and vegetables difficult. Indicators of land degradation due to climate change are already apparent in Nigeria especially in communities of Enugu state. Deforestation, characterized by the quickly disappearing forest cover, is one symptom made worse by human poor land use systems. Changes in temperature, rainfall and water cycle dynamics can induce other problems. Scorched and retreating forests, reduced soil productivity in some places due to the removal of soil nutrients by massive soil erosion and flooding, farmlands devastated by heavy rainfall-induced soil erosion, as in the southeastern ecozone, are but a few. Changes in climatic conditions in Enugu state also modify tree growth and development, reducing the availability of non-timber forest products such as spicy vegetables and mushrooms. Climate change equally increases the incidence of pests and diseases that attack and decimate forest trees. It can lead to species extinction in the various ecozones of Nigeria and Enugu state; for example, the Iroko and oil bean in the southeast; various mahogany species in southwest; the baobab and the locust bean in the northwest; gum arabic in the northeast; and the list goes on!!!.

## Uncontrolled human activities aggravate climate change

Human activities are known to drive both land degradation and climate change. Deforestation, for example is a well-known factor causing land degradation by erosion. Also contributing to the problem are population pressures (urban populations are growing and contributing to environmental degradation and pollution), failure to implement appropriate technologies (the burning of fossil fuels and firewood is prevalent), poverty, and local land-use policies.

Humankind is guilty of decreasing forest density, pollution of environment and degradation of land resources that results to food storage. While changes in climate conditions affect agricultural and forest productivity overall, illegal

logging in Enugu state Nigeria has exacerbated the decline in both density and floristic richness of the forests. With the progressive and rapid disappearance of the most popular indigenous timber species, attention has now shifted to virtually every other tree species to meet the rising demand for wood.

## What is possible in climate change adaptation in Enugu state?

Agricultural production could be increased by doubling the crop areas or by investing in agriculture management and indigenous technology. Producing/uses of more drought-resistant crops is one of the recent indigenous technology that has helped farmers in Enugu to adapt to recent climate changes in the state. This would help, as would better management of water resource, more efficient food storage systems, improved processing methods and better pest management thereby give better yield of the crops. Farmers learn (and can be encouraged) to exercise discretion in planting with the arrival of the earliest rains in the season. Water reservoirs are being constructed in dry areas. Mixed farming practices are also being introduced.

## What is the present situation of climate change adaptation?

Individuals and communities in Enugu state have adapted behaviours or policies geared at restoring and conserving the environment. Increased self-reliance, avoiding unregulated forest exploitation, planting appropriate tree species, protecting water sheds, using agroforestry and organic farming techniques and maintaining adequate food supplies lessen the vulnerability of the food supply sector are some of the recent adaptive measures by different farming communities in the state. Also maintaining water levels so that fish can spawn, planting drought-resistant crops, draining wetlands for rice cultivation, and reforming land tenure and land management policies in some communities are the recent mechanisms in place.

At some local communities, erecting contour bunds around farmlands as a safeguard against soil erosion and flooding; using organic manure instead of the more preferred chemical fertilizers; establishing wood lots with fast-maturing

plant species that yield domestic fuel wood for community members; reducing bush-burning; using disease-resistant, quick-maturing crop and plant species (cassava sticks, fruits and nuts); properly preserving seeds and plant seedlings to ensure healthy germination in the succeeding farming season; also helps to mitigate the affects of climate change. Furthermore, limiting access to eroded and erosion-prone areas, and initiating and stringently enforcing anti-erosion laws which act as human deterrents has been put in place in some communities.

Other adaptation measures include: adopting new farming approaches (such as mushroom farming and planting more fruit tree orchards), using improved varieties; identifying and conserving threatened and endangered species of plants and animals and raising public awareness on the importance of biodiversity in different communities.

But, perhaps the most effective method of staving off the negative effects of climate change is educating the public on the menace of land erosion and the public's role in tackling the problem, and educating Nigerians/Enugu State communities overall on how climate change will affect all of human activity. The key indigenous technologies adopted by farmers in Enugu to combat climate change in the area are change in planting date, change in cropping patterns, change in harvesting date of crops, change in planting distance, introduction of new breeds of crop(s), changes in the storage mechanism and change in the processing techniques. Others are use of mixed farming/cropping, agroforestry, and lastly tunguya farming techniques among others.

## How to reduce/eliminate the gaps?

Perhaps the biggest obstacle is lack of awareness and knowledge. The people of Enugu State and Nigerians in general need to be more educated and better informed about climate change. They should also be made aware of climate change and its adverse effects on their livelihoods especially in the absence of adequate adaptation measures.

Effecting change is difficult, and that is probably the main reason for not taking action. Taboo and tradition may keep some people and communities from making the necessary changes to the way they do things in Enugu State. Some local farmers, for example, believe that fertilizer defiles the ground. Industries

have been manufacturing fertilizers using environmentally-unfriendly methods for many years, but changing to new methods can seem to be impractical and more costly. These new methods may not be common knowledge, either. The existing land tenure and management systems, and current government policies, are not complimentary to adaptation strategies.

There is also a heavy dependence on agricultural and forest resources in Enugu state especially in local communities, and a dependence on environmentally-unfriendly energy sources. Lack of universal public awareness and education prohibit the state from adapting to climate change. There is a dearth of public policies that target adaptation, and those that do exist are inadequate.

## The need for collaboration between science and practice

There are hundreds of reasons to be concerned. Increased poverty, unplanned urbanization, deforestation, over-cultivation of grasslands and agricultural lands, loss of flora and fauna the list is endless. In a nutshell, all economic activity is affected by climate change, as is quality of life. It is obvious that unless we concern ourselves now, it will be too late to help Enugu state society take preventative measures and we will end up being ill-equipped to deal with our new reality. The scientific community must be involved in studying climate change and forecasting weather, and then transmitting this information to all sectors of the society, industry and economy so that these sectors can adapt and be ready to meet a very different future than the present. The Enugu State government, especially, should adopt strategies and policies that will encourage improved farming practices and agricultural methods, and that will protect our cherished agricultural activities which is the mainstay of our economy.

**This Policy Brief is drawn from the larger ongoing report of a study on TECHNOLOGICAL AND FARMING SYSTEMS ADAPTATION TO CLIMATE CHANGE IN FARMING COMMUNITIES OF ENUGU STATE, NIGERIA which is aimed at finding out the current indigenous technologies in-use to combat climate change challenges in Enugu state, Nigeria. The study was commissioned by ATPS Nairobi, Kenya. The views expressed in this Policy Brief are those of the authors and not necessarily representative of ATPS or the Institutions which the authors represent.**





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Contact the Executive Director at  
The Chancery, 3rd Floor, Valley Rd.  
P O Box 10081, 00100-Nairobi, Kenya  
Tel: (254 020) 2714092, 2714168,  
2714498, 2723800  
Fax: (254 020) 2714028

<http://www.atpsnet.org>

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