

# Documenting Indigenous Knowledge of Climate Change, Coping and Mitigation Mechanisms: The Case of the Niger-Delta, Nigeria

Onwuemele Andrew

Nigerian Institute of Social and Economic Research (NISER), Oyo Road, Ojo Ibadan, Oyo State Nigeria

## Abstract

The IPCC Fifth Assessment Report (2013) confirms that the global climate is already changing with implications for ecosystems and human livelihoods. The report indicates that communities who live in marginal lands and whose livelihoods are highly dependent on natural resources are among those highly vulnerable to climate change. In the Niger-Delta region of Nigeria where the study is based, environmental and climatic changes are not new to the indigenous people due to the fragile nature of their environment. The region is characterized by perennial flooding, high temperatures, salt water intrusion and sea level rise and the magnitude and intensity of which have been on the increase in recent time. Studies have shown that local communities in the region have successfully achieved some level of sustainable livelihoods in the face of these changing environmental and climate conditions using indigenous knowledge. However, indigenous knowledge systems have been neglected in climate change policy formulation and implementation in Nigeria. Indigenous people, who have survived over long periods to many kinds of environmental changes, including climate change have valuable lessons to offer about successful and unsuccessful adaptations which could be vital in the context of climate change. Also, integrating knowledge of the beneficiaries of a given programme is necessary, if such programmes are to find support amongst the targeted population. Despite bearing the brunt of climate change impacts, local communities are hardly involved in decision making and policy formulation. This deliberate exclusion has stymied adaptation and mitigation projects from achieving their goals in this respect. This paper explores and documents this indigenous knowledge in the Niger-Delta region of Nigeria. Both quantitative and qualitative data were collected for the study. Data collected were analysed using Statistical Packages of the Social science (SPSS) while the FGD were content analysed. The results reveal relevant indigenous knowledge of climate change and plethora of viable traditional coping and mitigation strategies of climate change impacts. The paper calls for active participation of local communities in the formulation of climate change adaptation and mitigation policies at the state and national levels.

**Keywords:** Indigenous Knowledge, Climate Change, Coping, Mitigation, Niger-Delta, Nigeria

## 1. Introduction

The term indigenous knowledge has been defined as “knowledge and know-how that is accumulated over generations and guides human societies in their innumerable interactions with their surrounding environment (Mafongoya, and Ajayi (2017). Indigenous knowledge is strongly tied to local culture and specific to community. Over the years, indigenous population acquire local knowledge of their environment on a wide array of phenomenon ranging from environmental, biophysical, economic and social issues to spiritual knowledge which are pass on from parents to offspring and from generation to generation. This knowledge is applied when necessary in addressing the gamut of challenges in their day to day living and survival. With respect to climate change threats, the application of indigenous knowledge in addressing the emerging challenges to their lives and livelihoods is embedded in climate change adaptation and coping mechanisms (Twigg, 2004).

The Intergovernmental Panel on Climate Change (IPCC) (2007) defines “Climate change as a change in the state of the climate that can be identified by changes in the mean and or the variability of its properties that persists for an extended period typically decades or longer”. In the last couple of decades, changes in climatic condition have attracted wide attention from governments and other international development agencies. These attentions draw mainly from the predicted impact of climate change on indices of development including health, food security, security of lives and property, among others. Evidence of climate change manifest in various forms ranging from increasing temperature, increasing evapo-transpiration, decreasing rainfall amount in the continental interiors, increasing rainfall in the coastal areas, increasing disruption in climatic patterns and increasing frequencies and intensities of extreme weather events (Chidumayo, Okali, Kowero, & Larwanou, 2011; Boon & Ahenkan's, 2012; Dube, Moyo, & Nyathi, 2016). These evidences are already manifesting in both the developed and the developing countries of the world. In Nigeria, evidences of climate change are manifested in the form of flooding in both the south and northern part of Nigeria, drought and desertification in the northern part of Nigeria, sea level rise and flooding in coastal communities in the Niger-Delta region of Nigeria (Onwuemele, 2013).

Climatic changes due to increase in greenhouse gas (GHG) emissions through human activities have contributed warming of the earth's surface with severe consequences for poor communities. Over the years, all effort towards addressing the problem of global warming have centred on first, mitigation and later adaptation

due to the realization that mitigation and adaptation can yield better results if both strategies were accepted (Nyong *et al*, 2007). Evidence from literature also points to the fact that communities who live in marginal lands and whose livelihoods are highly dependent on natural resources are among those highly vulnerable to climate change (IPCC, 2007). Many African countries are characterised by low institutional capacity, low incomes and greater reliance on climate sensitive sectors like agriculture. Thus, climate change impacts pose one of the greatest challenges to development effort in countries of Africa.

In the Niger-Delta region of Nigeria where the study is based, environmental and climatic changes are not new to the indigenous people due to the fragile nature of their environment. The Niger Delta is located in the Atlantic Coast of southern Nigeria. It is the second largest delta in the world with a coastline spanning about 450 kilometers (Awosika, 1995). The Niger Delta is highly susceptible to adverse environmental changes occasioned by climate change because of its location in the coast. The region is characterized by perennial flooding, high temperature, salt water intrusion and sea level rise and the magnitude and intensity of which have been on the increase in recent time. The region is also faced with myriads of environmental problems resulting from oil exploration and exploitation activities (Uyigue and Agho, 2007). Studies have shown that local communities in the region had successfully achieved some level of sustainable livelihoods in the face of these changing environmental and climatic conditions using indigenous knowledge (Awosika, 1992; Awosika, 1995; Onwumele and Olorunfemi, 2010).

However, indigenous knowledge systems have for a long time been neglected in climate change policy formulation and implementation in the region. Indigenous people, who have survived over long periods to many kinds of environmental changes, including climate change, have valuable lessons to offer about successful and unsuccessful adaptations which could be vital in the formulation of climate change adaptation policies (Macchi, 2008). Despite bearing the brunt of climate change impacts and other environmental hazards, indigenous people in the region are hardly involved in decision making and policy formulation. This deliberate exclusion has stymied climate change adaptation and mitigation projects from achieving their goals in the region (Modikela *et al*, 2018). This explains why Greinier (1998) noted that ignoring local circumstances, local technologies and local knowledge systems amounts to waste of huge amounts of time and resources. If climate change adaptation and mitigation policies are to be successful and sustainable in the region, integrating indigenous knowledge of local communities becomes a *sine qua non*.

In addition, while there have been many studies on indigenous knowledge in agriculture, forestry, biodiversity and soils, little or no studies has been carried out on indigenous knowledge of climate change (Vedwan, 2006). In addition, this valuable indigenous knowledge stands the chance of extinction if no proper documentation such as this is carried out in the Niger-Delta region. This scenario is exacerbated by the contemporary globalization which is eroding indigenous values in many parts of Africa (Amare, 2018). Hence, this study attempts to document indigenous knowledge of climate change, coping and mitigation mechanisms in the Niger-Delta region of Nigeria. It is based on the above premised that the following research questions were raised: what are the available indigenous people knowledge of climate change in the Niger-Delta region of Nigeria? Does climate change negatively impact of the livelihood of ingenuous people? How do indigenous people cope and mitigate changing climatic conditions in the Niger-Delta region? What policy measures are relevant in the integration of indigenous coping and mitigation strategy in the design and implementation of climate adaptation strategies in Nigeria? The goal of the paper is to identify and documents indigenous knowledge of climate change, their coping and mitigation mechanisms in the Niger-Delta region of Nigeria.

## 2. Materials and Method

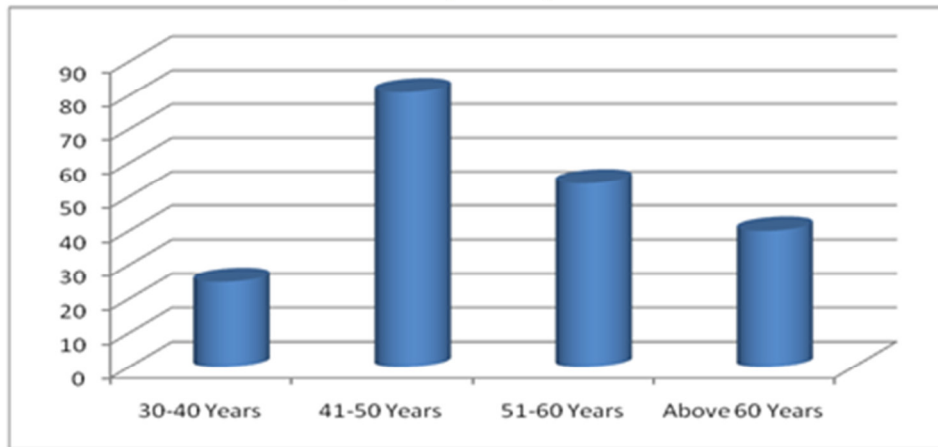
The paper utilized the case study design and covers two states (Delta and Ondo states) out of the nine states in the Niger-Delta region. Both quantitative and qualitative data were collected for the study. The major instruments of data collection were the questionnaire and Focus Group Discussion (FGD) with indigenous people in the two states. Five notable local communities each adversely affected by climate change were purposively selected from the two states. They include Ayetoro, Awoye, Molutehim, Arogbo, and Igbekebo for Ondo state and Aviara, Uzere, Umeh, Ehrowa and Ewokpalo communities in Delta state. A total of two hundred questionnaires were randomly distributed to two hundred households. Also, two FGDs each were conducted in the two states. The paper also relied on existing literature or documentation on the area to complement the information elicited during the field work. Such information were obtained from relevant government institutions institutions in the area. The household questionnaire were analysed using Statistical Packages of the Social science (SPSS) while the FGD were content analysed.

## 3. Results and Discussions

Of the total 200 indigenous people who served as the respondents for the study, the majority (58.1%) were males. Also 64.2% of them are between the ages of 40-55 years old. The high percentage of the elderly was deliberate to tap from their wealth of experience in the changing climatic conditions and coping mechanisms in their

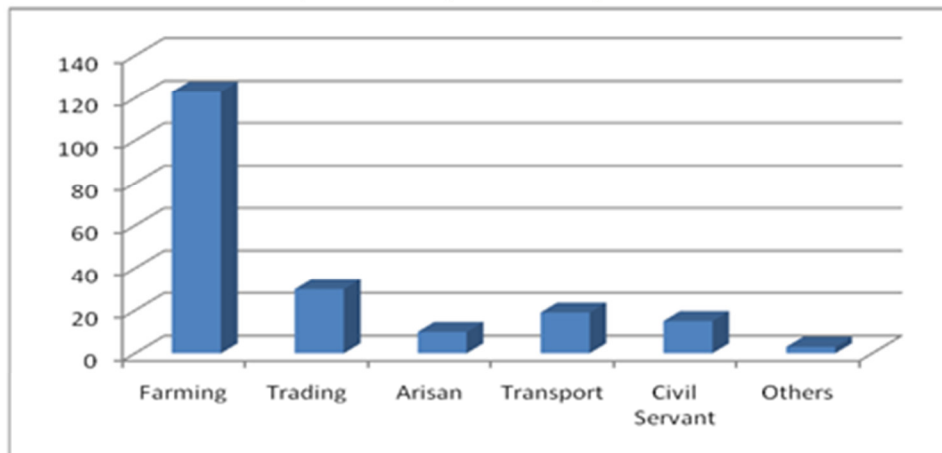
respective communities. Expectedly, 73.8% of the respondents are engaged in the agricultural sector. Also, more than half (51.7%) of the respondents had secondary education as their highest level of educational qualification.

**Figure 1: Age of Respondents**



*Source: Fieldwork, 2018*

**Figure 2: Occupation of Respondents**

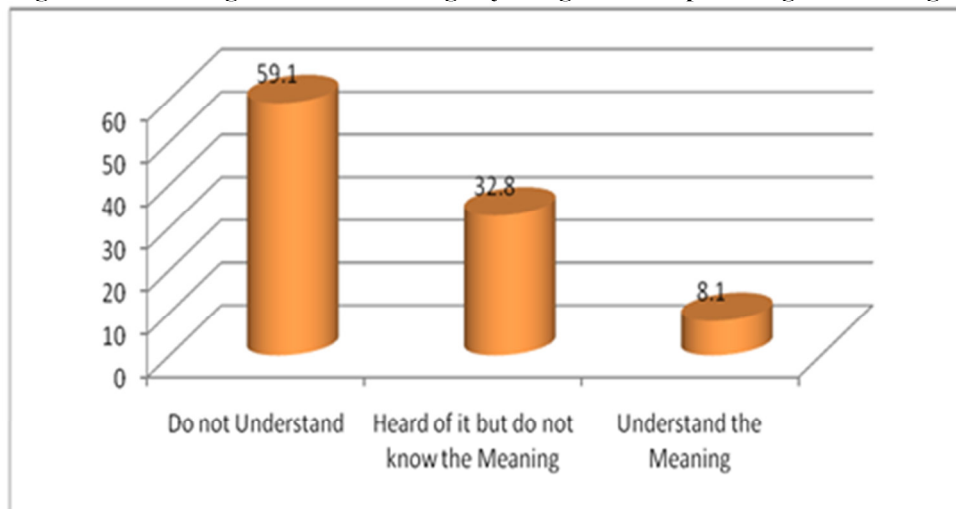


*Source: Fieldwork, 2018*

### **3.1. Climate Change Knowledge by Indigenous People in the Niger-Delta Region**

Analysis of data revealed that the respondents do not understand the term climate change. About 59.1% of the respondents stated that they do not understand the term climate change. Another 32.8% maintained that they have had of the term climate change but they neither understand the meaning nor its impact while 8.1% of the respondents understand the term climate change. This situation may be attributed to the low educational attainments of the respondents in the region.

**Figure 3: Knowledge of Climate Change by Indigenous People in Niger-Delta Region**



Source: Fieldwork, 2018

In spite of this deficiency, the respondents showed high knowledge of changes in climatic elements. Result indicates that 91.4% of the respondents agreed that the climatic elements such rainfall and temperature are changing while only 8.6% stated otherwise. About 64.5% of the respondents observed that rainfall intensity and duration is increasing in the region in the past decades. Also, 45.3% of the respondents indicated that there is no clearly defined rainy or dry season in the last fifteen years in the region. The respondents further indicated that there is an increasing trend in daily temperature during the dry season which is accompanied by high flooding during the rainy season.

One major observation from the FGD discussants is the disappearance of the August Break and Harmattan season in the region. The Harmattan is a dry and dusty trade wind caused by North east winds that blow from across the Sahara Desert into the northern part of Nigeria. The effects of the Harmattan include drought, low humidity and cold temperature across regions in Nigeria. The August Break is a short dry period experienced in August for 3-4 weeks in Nigeria. The discussants noted that the harmattan usually starts in November and ends in February yearly but this phenomenon has changed in the past decades. The discussant maintained that the disappearance of the August Break and Harmattan seasons are major evidences of changing climatic conditions in the region.

### 3.2 Impacts of Climate Change on Indigenous People in the Niger-Delta Region

Results indicate that climate change is impacting negatively on the indigenous people. About 57.8% of the respondents maintained that climate change is negatively affecting their livelihood activities, 31.9% stated that no impact is being felt while only 10.8% of the respondents stated that they don't know. The FGD discussants were unanimous in stating that agricultural activities such as farming and fishing which are the most important livelihood activities of the people are most affected.

*"The perennial flooding destroys our food crops creating major food security challenges for households. Flooding and sea level rise also destroy our fish ponds (Women FGD)"*.

However, a cross tabulation of age of respondents and knowledge of impacts of climate change shows that older respondents have deeper knowledge than the younger respondents. More than 70.5% of the respondents aged 50 above indicated that climate change is affecting them negatively. Other studies in the region reveal that settlements, social infrastructure and some oil wells in the region have been uprooted by coastal erosion and flooding and have been reported to pose more serious problem for the economic activities in the Niger Delta especially natural sectors such as farming and fisheries (Awosika, 1995; Uyigue and Agho, 2007, Onwuemele and Olorunfemi, 2010).

Apart from the impact on livelihood activities, the FGD discussants stated

*"it poses major threat to their lives and property. Our houses are usually submerged during the rainy season destroying their houses and property"* (Women FGD).

They equally stated that salt water intrusion due to sea level rise pollute their water sources making access to portable water difficult in their respective communities. This in most cases has resulted in the outbreak of diseases especially during the rainy season. In the light of these impacts on the indigenous people, the paper further sought to determine the coping strategies of the indigenous people in the Niger-Delta Region.

### 3.3. Climate Change Coping Strategies among Indigenous People in the Niger-Delta Region

The preceding sections show that the indigenous people of the Niger-Delta are very vulnerable to climate change. To survive, the indigenous people have devised various coping strategies in their respective communities based on their experiences over the years. It is recognised that environmental knowledge and resilience to climate change lie within societies and cultures (Mitchell and Tanner, 2006). Thus, an understanding of how communities cope with climate change is important in developing regional and national climate change adaptation strategies. In this section, we highlighted the different ways indigenous people have been coping with changes in climatic conditions in the Niger-Delta region. Table 1.1 shows the percentage distribution of coping strategies of indigenous people to climatic changes in the region

**Table 1.1: Coping Strategies of Indigenous People to Climate Change.**

S/N	Coping Strategies	No of Households	%
1	Livelihood diversification	106	53.0
2	Planting date adjustments	188	94.0
3	Planting of fast maturing species	145	72.5
4	Relocation out of flooded areas	55	27.5
5	Rain water harvesting	125	62.5
6	Creation of embankments round buildings	71	35.5
7	Digging of holes to retain some of the flood water	89	44.5
8	Sand filling of flood prone areas	95	47.5
9	Construction of drainage channels	84	42.0
10	Clearance of drainage channel	81	40.5
11	Community rain control system	88	44.0
12	Use of pedestrian bridge	96	48.0
13	Aquaculture	67	33.5
14	Mixed farming	176	88.0
15	mulching	112	56.0
16	Bush fallowing	189	94.5
17	Use of organic and inorganic fertilizers	170	85.0

Source: Author, 2018

Table 1.1 shows that the respondents adopt multiple coping strategies. It shows that more than half (53.0%) of the respondents practiced livelihood diversification as a coping strategy for climate change. The respondents who before now were mainly engaged in crop farming and fishing are now engaged in other activities such as trading for women and Okada riding (transporting using motor bike) for men to supplement dwindling income from the farm sector occasioned by changing climatic conditions. This scenario portends danger for food security in Nigeria as an estimated 50% of the fish consumed in Nigeria come from the Niger Delta (Uyigwe and Agho, 2007).

Another coping strategy practised by the indigenous people as shown in Table 1.1 is adjustment in planting dates. 94.0% of the respondents have adopted this strategy. The changing climate has created uncertainty in the rainfall pattern in the Niger-Delta region. This problem is compounded by the fact that rain-fed agriculture is mainly practiced in the region. Due to the uncertainties in predicting the rain, farmers now delay their time of planting. After the first or second rain, they watch the rain for a while to ensure that the rain fall regularly enough before planting to prevent their crops from being killed when rain is delayed.

Fast maturing species of crops such as maize, okra and cassava have also been adopted by the indigenous people as a coping strategy. 72.5% of the respondents have already adopted this strategy. This is mainly used to check the effect of flooding on their crops. This ensures that the crops are harvested before the onset of the flood. Many indigenous people in the study area also relocate to other areas that are not affected by flood. Other affected persons live in their houses for few months of the year during the dry season, after which they relocate during the rainy season and come back when the dry season begins.

The parlance “water everywhere but none to drink” is manifested in all parts of the study area due to salt water intrusion and pollution of the water bodies. Potable water supply to indigenous people in the region has been a major problem due to salt water intrusion. The indigenous people therefore depend on rain harvesting to store water for domestic uses. About 62.5% of the respondents obtained their domestic water supply through rain harvesting.

Creation of embankments round buildings and digging of deep pit or holes very close to houses are also used by indigenous people as a coping strategy against flooding. 33.5% and 44.5% of indigenous people apply these coping strategies. While the embankments prevent the flood water from entering their houses, the pits or holes help to retain some of the flood water around their houses. The focus group discussants also identified another important function of the pit or holes. They noted that as the sea level rises, it pushes excess water

together with some fishes into the holes or pit. These fishes remained there and mature and they are harvested on a yearly basis and providing food and income to the people.

In addition, about 47.5% and 42.0% of the indigenous people also adopt sand filing of flood prone area and construction of drainage channels respectively while 40.5% practiced clearing of drainage channels to facilitate free flow of water. Another important coping strategy used by the indigenous people in the study area is the community rain control system. This control system is owned by the community. It is used once in a while in the event of extreme weather event such as drought or excessive rainfall in their community. The focus group discussants also stated:

*“there are some individuals in their community that have the spiritual power to control either excessive rainfall or drought and ... both the community control system and the individual owned systems have worked in many instances (Women FGD)”.*

Other coping strategies are use of pedestrian bridges (48.0%), aquaculture (33.5%), mixed farming (88.0%), mulching (56.0%), bush fallowing (94.5%) and use of organic and inorganic fertilizers (85.0%). The FGD discussants argued that these strategies have been used by their fore fathers to withstand extreme weather phenomenon and pass on them and are therefore indigenous to them. What is obvious from the preceding section is the fact that indigenous people have been practicing different coping measures for extreme weather events in order to survive in their fragile environment before the advent of climate change as a global environmental problem. This scenario has serious policy implication for climate change adaptation policy formulation in Nigeria.

#### 4. Conclusions and Policy Implications

The findings indicated that the indigenous people do not understand the term climate change and the science behind it. However, they are very much aware of the changing climatic conditions especially the unpredictability of rainfall and rising temperature over the years in their environment. The findings equally demonstrated that the phenomenon of climate change is impacting negatively on the livelihoods of indigenous people in their respective communities. It also revealed that they have over the years devised various coping strategies to mitigate these impacts. From the findings, it is evidently clear that climate change is not new to the indigenous people in the Niger-Delta region. It is important therefore to identify and recognised them as major stakeholders in climate change adaptation and policy development in Nigeria.

Given the avalanches of indigenous coping and mitigation mechanisms, this paper calls for active participation of indigenous people in the design and formulation of climate change adaptation and mitigation policies at the state and national levels. It also recommends the integration of these indigenous coping and mitigation mechanism with the western scientific knowledge in the design and implementation of climate change adaptation and mitigation strategies in the region. The poor knowledge of the science of climate change by the indigenous people constitutes a major threat to adopting relevant climate change mitigation and conservation practices. It is therefore important for relevant agencies of government to educate the indigenous people on the science of climate change and the anthropogenic factors contributing to it.

#### References

- Amare, Z (2018). Indigenous knowledge of rural communities for combating climate change impacts in west central Ethiopia. *Journal of Agricultural Extension*. 22. 181. 10.4314/jae.v22i1.16.
- Awosika LF, French CT, Nicholas RT, Ibe C.E (1992). The Impact of Sea Level Rise on the Coastline of Nigeria. In: J O’Callahan (Ed.): *Global Climate and the Rising Challenges of the Sea*. Proceedings of the IPCC Workshop at Mongarine Island, Venezuela 9- 13 March, 1992.
- Awosika, L. F. (1995). Impacts of Global Climate Change and Sea Level Rise on Coastal Resources and Energy Development in Nigeria. In: Umolu, J. C. (ed). *Global Climate Change: Impact on Energy Development*. DAMTECH Nigeria Limited, Nigeria.
- Boon, E., & Ahenkan, A. (2012). Assessing Climate Change Impacts on Ecosystem Services and Livelihoods in Ghana: Case Study of Communities around Sui Forest Reserve. *Ecosystem & Ecography*, 1–8
- Chidumayo, E., Okali, D., Kowero, G., & Larwanou, M. (2011). Climate change and African forest and wildlife resources. Nairobi: *African Forest Forum*, Nairobi, Kenya
- Dube, T., Moyo, P., & Nyathi, D. (2016). The Impact of Climate Change on Agro-Ecological Based Livelihoods in Africa: A Review. *Journal of Sustainable Development*, 9(1), 256–267
- Greinier, L. (1998). Working with Indigenous Knowledge: A Guide for Researchers. Ottawa: International Development Centre. <http://www.idrc.ca/books/847>.
- Intergovernmental Panel on Climate Change IPCC (2007). Climate Change 2007: Synthesis Report. Summary for policymakers, available at : [http:// www. Ipcc-wg1- ucar.edu/wg1/w1-report.htm](http://www.Ipcc-wg1-ucar.edu/wg1/w1-report.htm), (Accessed 26 October 2018) pp. 1-22.
- Macchi, M. (2008). Indigenous and Traditional Peoples and Climate Change, Issues Paper, IUCN.

- Mafongoya, P.L. and Ajayi, O.C. (editors), 2017, *Indigenous Knowledge Systems and Climate Change Management in Africa*, CTA, Wageningen, The Netherlands, 316pp.
- Modikela Nkoana, Elvis & Verbruggen, Aviel & Hugé, Jean. (2018). *Climate Change Adaptation Tools at the Community Level: An Integrated Literature Review*. Sustainability. 10. 796. 10.3390/su10030796.
- Nyong, A., F. Adesina, and B. O. Elasha. (2007). The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies in Global Change* 12: 787-97
- Onwuemele, A. And Olorunfemi, F.B (2010). *Climate Change Perceptions and Adaptation Strategies among Rural Farmers in Coastal Communities in Delta State*. *Ife Research Publication in Geography*, Vol. 9, No. 1, pp.12-20.
- Onwuemele, A. (2013): *Determinants of Rural Household Capacity to Participate in the Rural Non-Farm Livelihood Activities in the Niger-Delta, Nigeria: A Study of Isoko Land*. *Benin Journal of Social Sciences*, vol.21 No. 1, 316-327, Benin City
- Twiggs, J (2004). *Good Practice Review. Disaster Risk Reduction: Mitigation and Preparedness in Development and Emergency Programming*. Overseas Development Institute, 111 Westminster Bridge Road, London, UK
- Uyigüe, E. and Agho, M. (2007). *Coping with Climate Change and Environmental Degradation in Niger Delta of Southern Nigeria*. A publication of the Community Research and Development Centre, Benin City, Nigeria.
- Vedwan, N (2006). *Culture, Climate and the Environment: Local Knowledge and Perception of Climate Change among Apple growers in North western India*. *J. Ecol Anthropol* 10:5–18.