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Impact of Climate Change on the Livelihood Patterns of Rural Dwellers in Cross River State, Nigeria

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Abstract

The purpose of this paper is to assess the impact of climate change phenomenon on the socio-economic activities of the rural dwellers of Cross River State, Nigeria. A descriptive survey methodology was adopted in the study. The methodology provided an opportunity to explain the concept of climate change and its impact on livelihood patterns. A survey on livelihood patterns of rural dwellers was conducted. A questionnaire on socio-cultural and economic activities of rural dwellers for the past five years was used in data collection. Data on climate change and its impact was collected using secondary source of data and observed climate extremities such as on and off set rainfall, prolonged drought and other climate variability. The impact of climate variability was analyzed using lots of means of livelihood by the rural dwellers. The study established that climate change has impacted on the livelihood patterns of rural dwellers. It is suggested that mitigation and coping strategies such as mulching, planting of cover crops, tree planting, home garden and hedgerow planting should be adopted in the affected rural areas in order to promote sustainable development.
Key words: Climate change, socio-economic activities, livelihood patterns and rural dwellers.

Introduction

Globally, the world is besieged by the problem of weather variation or climate change which has virtually affected every facets of human existence. Due to man's action and inaction, man has been hunted in recent past by his relationship with his environment, which has severally been viewed from the negative interaction with his environment and its resources. Climate change has in recent times posed the greatest challenge to the socio-economic development of nations. The impacts of climate change phenomena have a lot of implications on the survival of man. The impacts and implications of climate change pursued world leaders to converge at Copenhagen in December 7 – 8, 2009 to discuss the menace of climate change. The global concern in climate change was justified by the fact that climate change affects every aspect of human life. The impacts have no boundaries. Although climate change has become a global concern, some areas are more vulnerable to its impacts than others. The rural areas especially of the developing world tend to be more vulnerable to the impacts of climate change. Hence, the socio-economic lives of the rural areas are seriously affected by the phenomena.

The impacts of climate change have not spared the livelihood patterns of rural dwellers. This is premised on the fact that the climate of a place has overwhelming influence on the socio-cultural life of the people. The rural economy is totally dependent on nature (climate) and as such any prolonged change in climate would adversely affect the economy. Unfortunately, the fragile

economy of rural areas is dependent on agriculture, fishing, hunting and animal rearing. These economic activities respond sharply to climate variability. The effect of this response could be devastating on the livelihood of the rural dwellers.

Concept of Climate Change

Climate change phenomenon is no longer a new concept. It has been vividly discussed and explained in different forums. To understand the concept of climate change, one may first understand the term climate. Eneji, Williams, Ekpo and Isa, (2017) saw climate as the regular weather condition of an area over a prolonged time. The same dictionary refers to weather as the state of the atmosphere at a particular time. The state of the atmosphere of a place is described in terms of weather elements such as sunshine, rainfall, winds, temperature etc. The state of the atmosphere and in-fact the regular weather condition of many places seem to be departing from the regular pattern. It is this observed change in the weather pattern that is referred to as climate change.

The United Nations Framework Convention on Climate Change (UNFCC) explained climate change as a change which is attributed directly or indirectly to human activities that alter the composition of the global atmosphere and which are in addition to natural climate variability observed over comparable time period. The Department for International Development (DFID), (2009) simply explained climate change as a change in contemporary climate. It is a change in the statistical distribution of weather events over a period of time, that ranges from within a period of 35 years. In other words, climate change is a long term change in the average weather condition of a place (Allison, 2009; Ettah, 2011). The change becomes apparent as changes occur in annual, seasoned, or monthly temperature, rainfall, winds, and other climate elements. The prolonged changes in the weather elements create impacts on the environments. These impacts are known as impacts of climate change.

The observed change in climate is attributed to global warming. Global warming according to Columbia Encyclopedia is the gradual increase of the temperatures of the earth's lower atmosphere as a result of the increase in greenhouse gases caused by human activities and natural processes. The changes in natural patterns have great impact on human activities and natural processes. The impacts of change in climate can be appreciated from the point of view of Adelekan and Gbadegesian (2005) who highlighted that climatic conditions of a place determine the seasons of the year and the seasons in turn determine the period where particular events or activities occur. If this argument is rational, it follows that climate determines when particular crops are planted or scarce and even when certain diseases would be prevalent in a place. It follows therefore that climate change affect human life and livelihood patterns.

In view of the above, it follows that any deviation from the regular weather pattern for a long period of time would affect the way of life of the people. The implication of climate change on rural population may be devastating and would affect the rural economy. It is from this background that the study tends to examine the impact of climate on the livelihood pattern of rural dwellers in Nigeria.

Impacts of Climate Change

Izuagba (2007), IPCC (1990) and Pender (2008) identified the general impacts of climate change to include:

(1) rise in sea level to about 15cm (6 inches) due to the melting of glacier ice and expansion of warmer water. Predictions highlight that sea level may rise to about 590cm (23 inches) in this 21st century, thus threatening coastal areas, wetlands and coral reefs (WHO, 2004).

(2) Melting of Arctic sea ice. It is predicted that in the past 100 years mountain glaciers in all parts of the world have decreased in size and so has the amount of permafrost in the Arctic Greenlands ice sheet, the rise in ambient temperature, increase or reduction in rainfall some places above mean annual rainfall volume

- Sea surface as well as lakes are warming up
- Heavier rainfall causing flooding
- Extreme drought increased intensity and more widespread drought
- Changes in ecosystem and species migration.

Mkpa, (2010) explained the implication of these as follows; (1) that the increase in sea level causes low lying coastal areas, wetlands to experience flooding, (2) the melting of ice and the glaciers/permafrost leads to changes in ocean circulation and the wind system (3) the increase in temperature of the sea surface water of the shallow oceans contributes to the death of World Coral reefs. Similarly, the warming of larger lakes as a result of increase in temperature have caused algae blooms in lakes and increase eutrophication in lakes and lower lake levels (Eneji, et al., 2017). Extreme drought and higher temperatures have caused higher rate of evaporation. This condition causes the withering of crops leading to a decline in crop productivity and food insecurity. Changes in Ecosystem have resulted to severe disruptions of ecosystem and biodiversity. This had altered species distribution thus aggravating diseases and pest outbreaks in some areas. These changes may cause species to either migrate to other habitats or die due to adverse conditions.

The identified impacts of climate change have great implications to livelihood patterns of many communities. Fisher, (2007) outlined the implications to include; (1) an equilibrium increase of global mean temperature in the range of 1.5^0c to 4.5^0c and a 1^0c increase over current temperature by the year 2030. Or an unequal global distribution of this increase will result in the

tropical regions, warming up by about half and at the polar region, by about twice the global average. It also implies a global mean sea level rise of 0.3 to 0.5m by 2010 and about 1m by 2050. These implies that some climatic zones will be shifted pole wards and to higher elevations. This would result in the modifications of ocean circulations (and carbon dioxide ($C0_2$) absorption) (Eneji, Ogar, Omoogun, Ojikpong, Dunnamah and Ekpo, 2013; Eneji, et al., 2017). It will also mean changes in the variability of climate (frequency and intensity of exceptional weather). The pole ward shift in climatic zones means that the boundaries of vegetation zones (i.e. boreal, tundra, temperate, forest, grassland etc) are expected to shift correspondingly over the next 50 years (IPCC – 1990a). The shifting of climatic zones has serious implications on agricultural development, especially if the climatic limits and estimated pole ward shift of 200 – 300km per degree of warming as reported by IPCC (1990) is considered becomes observable (Eneji, Ben, Headboy, Okongor-Eno, Zemba, Mubi and Oko, 2011).

Areas Vulnerable to Climate Change

IPCC AR5 WG1 (2013), impact report stated that the impact and implications of climate change vary from region to region and surprisingly, explicit with respect to impacts on specific regions. The impact and implication is far more reaching in societies where their economies are directly dependent on nature. Most of these societies are found among the developing countries. The rural economy of these regions depends majorly on climate for their sustenance and livelihood. Hence, changes in climate conditions would greatly affect other aspects of the economy. No wonder, Aliyu (2009) argued that climate change has constrained the ability of developing countries to attain their poverty reduction and sustainable development goals.

The areas which are extremely vulnerable to climate change are those already at the limits of their capacity to cope with climate events (IPCC AR5 WG1, 2013). These include populations in low-lying coastal regions and islands, subsistence farming areas, populations in semi arid and grassland regions and the urban poor. In terms of agriculture, two broad sets of regions appear to be more vulnerable. There are some semis arid, tropical and sub-tropical regions including, Horn of Africa and South Africa. Others are humid tropical and equatorial regions. In terms of water resources, the regions that appear to be at greatest risk are the Sahel region including North Africa and South Africa, where irregular rainfall, changes in hydrological cycle, moisture condition etc occur regularly. IPCC AR5 WG2 A (2014), asserted that the most vulnerable areas to climate change are those regions which depend heavily on agriculture. Such regions cannot help themselves easily when agricultural production is adversely affected by climate change. The impact of climate

change is more obvious in those regions exposed to frequent and prolonged drought and other forms of climate variability.

Climate Change and Livelihood of Rural Dwellers

Most rural areas of tropical Africa solely depend on nature for their livelihood. The primary economy of the communities is mainly agriculture, hunting, fishing etc. These activities are totally dependent on climate. Any change in climate conditions of the region would significantly affect the activities. The drought of 1982-84 in the Sahelian region of Africa for instance resulted in a sharp fall in crop yield. Such fall in crop production would have adverse impact on the livelihood pattern of the rural inhabitants. This is particularly true because, the climate change would also affect the natural resources (water, biodiversity etc) for which the people depend for sustenance and livelihood. Madukwe (2012) opined that farmers lose their farmlands and crops either as a result of excessive rainfall which leads to flooding or harsh climatic conditions. The consequences of this include - a drop in farmers' income, and quantity of crop production leading to increased hunger and famine (food insecurity). This has grievous consequences in a country like Nigeria where about 40% of the GNP is from agriculture and 70% of the population depends on agriculture. The drying up of rivers/streams/lakes as a result of climate change has effect on the coastal rural areas. The fishermen in the coastal areas would lose their means of livelihood as there would be a drop in fish catch. This may force them to seek for other means of livelihood. The diminishing fish stock as a result of the shrinking of the rivers may push the coastal inhabitants to switch to crop cultivation or hunting which would imply switching from fishing to hunting of jackal or monkeys as alternative means of survival.

Eleri (2011) argued that prolonged temperature increase in parts of Africa can cause drought and desert encroachment, a development which together, heightened food insecurity and compromised government efforts towards poverty reduction. This situation has impacted on the livelihood pattern of the people. The environmental temperature required for proper tree/crops growth is exceeded; as such the tree structure and ecology would be altered. Hence, the tree crops which the people depended upon would not produce as they ought to have produced. More so, the planting season of such areas would be shifted, meaning that crops would not mature when they are supposed to be. This is likely to affect the means of livelihood of the people. Many people will therefore explore alternative livelihood patterns (Tol, 2008; IPCC AR5 WG2 A, 2014; IPCC AR5 WG3, 2014).

It is on this basis that this paper seeks to examine the impact of climate change on the livelihood patterns of rural dwellers in Cross River State, Nigeria. The objective is to identify the implications of climate change on the rural economy of the study area. This aim is achieved by testing the hypothesis stated in a null form; there is no significant relationship between climate

change and livelihood patterns of rural dwellers in Cross River State. The rational of the study is to stimulate large scale study on the impact of climate change on the rural economy of Cross River State, Nigeria. The study would provide a basis for formulating mitigation strategies for rural dwellers. It would also provide a frame work for addressing the dwindling economy of rural areas in Nigeria.

Research Methodology

The survey inferential research design was the research design adopted for this study. This research design is most suited when dealing or studying a large population; the design allows the research to study a representative fraction of the entire population, where findings can then be used to make a valid inferential generalization about the entire population. This research design provides a platform for evaluating the impact of climate change on the livelihood patterns of the rural dwellers. Data for the study was collected through the use of a well structured questionnaire divided into two sections. Using the multistage random sampling technique, a sample of 600 respondents was selected from among a population of over sixty thousand (60, 000) rural dwellers from five communities in the study area. This population included farmers of different crops, animals and other cash crops, traders, fishermen, artisans, civil and public servants etc. The variables used in the study included lost of means of livelihood, declining socio-economic and cultural activities (crop farming, animal farming, palm wine tapping, hunting, fishing, petty trading, carpentry, fashion designing, Arts work, among others. Data collected was collated, coded and analyzed using simple percentage and Pearson Product Moment Correlation at 0.05 level of significance.

Results ad Discussion

The findings of the study are presented in line with the formulated hypothesis.

The hypothesis which states that there is no significant influence of climate change on the livelihood patterns of rural dwellers was tested and the result presented in Table 1. Table 1 revealed that there is a positive direct relationship between climate change and livelihood pattern of rural dwellers in the study area. A correlation coefficient of 0.803 was established implying that 80% of the variation in the livelihood patterns of rural dwellers is explained by climate change. This result is in agreement with studies conducted by Hunter (2007) and Pender (2008) who found in their respective studies that human livelihoods activities are affected by climate change. The implication of this finding is that most rural dwellers would likely loss their means of livelihood as a result of climate change. Such rural dwellers would need to seek for other means of survival or work beyond

the present to identify and proffer mitigation measures to reduce the influence of climate change on their major means of livelihood within the rural communities.

Table 1: Correlation Coefficient of Climate Change and Livelihood Patterns (N=600)

Variable	Impact of Climate Change	Livelihood Pattern	
Climate change impact	Pearson Correlation	1	.803
	Sig. (2 tiled)		.000
	N	600	
Livelihood pattern	Pearson Correlation	.803	1
	Sig. (2 tailed)	.000	
	N	600	600

** Correlation is significant at 0.01 level (2 – tailed)

This finding has further buttressed the earlier finding of Eneji, et al, (2017) who found that climate change has seriously affected the living conditions of most rural African communities in terms of affecting their major sources of livelihoods. These authors stated that climate change as affected the volume of water in the season and rivers thereby reducing the annual flow of fishes to seashores and banks where shallow vessels and canoes could be used for easy harvesting of fishes by rural poor community's members who are core fishermen.

Loss of Livelihood Patterns of Rural Dwellers

Table 2 presents the findings of the study on the loss of livelihood patterns of rural dwellers.

Table 2: Lost of Livelihood Patterns of Rural Dwellers in Cross River State

S/N	Livelihood Pattern	Number of People engaged in Economic Activity	Number of People who lost means of Livelihood	Percentage of Loss of means of Livelihood
1	Crop cultivation	196	66	33.7
2	Fishing	55	16	29.0
3	Hunting	61	19	31.1
4	Animal Rearing	86	24	27.9
5	Palm wine Tapping	56	18	32.1
6	Petty – Trading	39	11	28.2
7	Carpentry	30	8	26.7
8	Tailoring/Fashion designing	29	8	27.6
9	Civil/Public service	34	12	35.3
10	Artisans	14	2	14.3
	Total	600	184	30.7

Table 2 shows that on the average, a total of 184 respondents representing 30.7% of the rural dwellers in Cross River State lost their means of livelihood due to the impact of climate change, while 416 representing 69.3% are grappling with breath for survival against the threats of climate change. The most affected group of people who lost their means of livelihood are those whose main economic activities are in agriculture, hunting, fishing and palm wine tapping. These activities are totally dependent on climate; hence, any significant change in climate condition over a long period of time would have adverse impact on their activities. Another dimension of the finding is that the rate of lost of means of livelihood is lower among those engaged in economic activities that are not directly affected by weather and climate. Such economic activities include petty trading, carpentry, tailoring artisanship and public/private service. IPCC AR5 WG2 A (2014) identified loss of jobs among this group of people could be attributed to the desire to have a better one or natural factors including retirement. The influence of climate change on the means of livelihood of rural people has serious consequences on the socio-cultural life of the people. In Yakurr Local Government Area of Cross River State, for instance, climate change has impacted on the conferment and initiation of "Ledu Yam title".

There has been persistent decline on the conferment of the title to people. Infact, the conferment of the title to people is facing extinction as many years have passed without such conferment. This spells doom for food security in the study area and the nation in general. The decline in the conferment of the title implies a decline in food production. This is because the Ledu title is only conferred on those who are able to harvest and celebrate 400 (four hundred) sticks of yams.

Implication of Climate Change to the Rural Economy

The study established that impact of climate change whose indicators are change in the on-set and off-set of rainfall, prolonged dry season, excessive rainfall, flooding of coastal and low lying areas, drying off of rivers/streams would affect the livelihood of many rural dwellers. The result implies that rural dwellers whose means of livelihood was fishing would lose their means of survival. Equally, those whose means of livelihood is farming may need to look for whereas for survival because the climate change would introduce a new ecology that would not sustain the crops they were cultivating any longer. In such cases crop yield would be low. This may lead to food scarcity/ food insecurity. The farmers would therefore have to switch to other means of livelihood or migrate to other areas where conditions are more favourable. Migration to other areas may result in communal conflicts. This scenario may justify the recent clashes between the Fulani Cattle Rearers and Farmers in parts of Benue and Plateau States of Nigeria. The drought and desert encroachment in Northern parts of Nigeria has affected the growth of grasses which

provided grazing grounds for cattle. In order to feed their cattle, the Fulani Cattle Rearers have to move southwards where the climatic conditions favour grass growth.

It follows that the change in climate pattern implies the following to the rural dwellers; loss of means of livelihood, unemployment, food scarcity, insecurity arising from conflicts, displacement of people from their homelands and loss of lives and property. These incidences would affect the rural economy and livelihood patterns of the people. The loss of means of livelihood would accelerate poverty level as many would be unemployed. As people switch to other means of living, available resources would be overstretched thus leading to resource degradation. Competition for the scarce resources would result in conflicts (communal clashes are on the increase in Nigeria). Flooding has led to the displacement of rural dwellers.

Displacement of people from their homes often constrained the government to embark on resettlement and rehabilitations programmes. This involves huge capital which would have been used in providing social infrastructure which would enhance improved welfare.

Conclusion

Climate change as a global phenomenon has impacted on all aspects of human life. The rural areas have become more vulnerable to the impacts due to their major dependent on nature/climate. The excessive rainfall, flooding, prolonged dry season, delayed on set and off set of rainfall, rising temperature which are major indicators of climate change have impacted negatively on the livelihood patterns of rural dwellers in Nigeria. The resultant effect of this is loss of means of livelihood of rural dwellers. This has caused rural dwellers to switch to other forms of survival. This problem may be overcome by adopting, coping and mitigating measures as well as formulating environmentally friendly approaches in natural resources management.

Recommendations

Arising from the finding of this research, the following recommendations were made to influence the coping, mitigation and sound environmental friendly approaches that should be adopted to curb the menace of global climate change among rural dwellers in our communities:

1. The cultivation of cover crops intercropped with other legumes should be encouraged.
2. Tree planning should be encouraged, while farmers should be encouraged to go back to the traditional mulching system, this will help in the retention of moisture in the soil, mounds and ridges or beds
3. The provision of feasible, sustainable, affordable and acceptable livelihoods alternatives should be introduced in the rural areas. For instance, in communities where hunting is predominant, snail-farming, cutting-grass rearing, poultry farming among others should be introduced.

4. Improved crop and grazing land management techniques such as soil carbon sequestration should be introduced. Equally, improved rice cultivation, livestock and manure management techniques should be introduced to reduce emission.

5. Introduction of environmentally friendly technology that would promote low energy production systems is suggested.

6. Provision of high quality seedlings and introduction of integrated crop/livestock systems should be adopted.

7. Creating awareness on the consequences of climate change and coping and mitigation approaches is also advocated.

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