Journal of CUDIMAC (J-CUDIMAC)
ISSN 0794-4764 (Print) ISSN 2651-6063 (Online)
Vol. 8, No.1, September, 2020

http://cudimac.unn.edu.ng/volume-8/

Societal Awareness of the Causes and Effects of Climate Change (CC) in South-East Nigeria

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Abstract

Climate change and its attendant problems are becoming more severe, particularly in the underdeveloped and developing countries including Nigeria. This study set out to investigate societal awareness of South-East Nigerians, regarding the causes and effects of climate change. The study is a descriptive survey. Four research questions and two hypotheses guided the study, with an estimated population of 8, 275, 337 persons across the South-East Nigerian states of Abia, Ebonyi and Enugu. Adopting proportionate random sampling techniques, a sample of 300 respondents was selected from rural and urban communities in the three states under study. A validated 31-item questionnaire, with a reliability coefficient of 0.929, and interviews were used to collect data. Data was analysed and the research questions were answered, using descriptive statistics. The hypotheses were tested using t-test statistic at 0.05 level of significance. Results of the study indicated low level of awareness of South-East Nigerians about the causes and effects of climate change; there is significant difference in the mean awareness ratings of urban and rural respondents on the causes and effects of climate change, with urban respondents being more aware than rural respondents are. Implications of the findings are discussed and recommendations made including among others the need to raise awareness levels of the citizenry to the causes and effects of climate change.

Keywords: Climate change**,** societal awareness, South-East Nigeria

Introduction

Climate change requires emergency preparedness and attention because of its effects/impact on livelihood and sustenance of humankind. However, recent Nigerian history is replete with various accidents and mishaps, which reveal the lack of preparedness of the Nigerian State to deal with emergencies. Nigeria's inadequate disaster management systems were harshly exposed when the nation endured a series of air crashes from 2005 to 2006 and beyond. All the violent conflicts and civil disturbances, which flared up in many parts of the country over the past decade were characterised by slow response of the security, emergency and relief agencies to crisis spots, and the consequent needless prolongation of the suffering of victims of the crisis.

In Nigeria, perhaps, the biggest challenge in the nation's fight against climate change is lack of awareness and knowledge about this phenomenon as per its causes and effects (Olorunfemi, 2010). It is imperative for Nigeria, Africa's most populous State, to acknowledge the weaknesses in her climate change response capability, reorganize them, prepare and implement a specific plan

of action to improve the awareness level of Nigerians, so as to make for prevention and cushioning of climate change effects (Muanya, 2010).

Statement of the Problem

Nigeria, as a developing nation is particularly sensitive to the effects of climate change. A large part of the country's economy depends on natural resources, which are particularly vulnerable to climate change. When those resources are adversely affected, communities are implicated. Disease, loss of livelihoods and settlements caused by climate change, can force entire communities into relocation or refugee status, and even complete extinction. As critical as the effects of climate change are, many Nigerians appear unaware of what climate change is or its effects, and this perceived lack of awareness constitute the country's biggest obstacle in her fight against climate change. Nigerians need to be educated and informed about climate change and how it can drastically change their lives. Lack of information (awareness) and knowledge (education) about climate change also means that many Nigerians are reluctant to accept the reality of climate change. Also, apparent lack of government preparedness and commitment to promoting climate change adaptation strategies in the country only worsens the matter.

Strategies that address the challenges of CC recognize that there is no best solution. This is because the long-term horizon of climate change and current scientific uncertainties pose special challenges. In this sense, climate change provides new incentives for the need to plan ahead and to anticipate extreme events and trends. Within the context of extreme weather events that characterize climate change, this means that management strategies must meet the present need to disseminate information on climate change, while providing a path of adjustment for the future. What better strategy than climate change education, with emphasis on awareness of the effects and causes of climate change. It is against the perceived lack of awareness to the causes and effects of climate change among Nigerians and the increasing rate at which our climate is changing, that the researchers sought to investigate the extent to which societies in South Eastern Nigerian States are aware of the causes and effects of climate change. Therefore, the problem of this study put in form of a question becomes: what is the level of awareness of the causes and effects of climate change among the people of South Eastern states of Nigeria?

Literature Review

Climate

The term 'climate' describes the mean variability of relevant atmospheric variables, such as temperature, precipitation and wind that persists in a particular area for an extended period, typically decades or longer (Intergovernmental Panel on Climate Change, IPCC, 2007). Climate can therefore be regarded as a synthesis or aggregation of weather conditions. This implies that whatever is referred to as the climate in a particular region must contain an analysis of mean conditions, of the seasonal cycle, of the probability of extremes such as severe frost and storms (Wallace & Hobbs, 2006). Pearson Education (2003: 323) defines climate change as 'a permanent change in weather conditions.' This means that changes in weather conditions bring about climate change.

Causes of climate change

Literature is replete with causes of climate change, which can be grouped into natural or bio-geographical processes and human or anthropogenic activities (Olaniyi, Funmilayo & Olutimehin, 2014). Astronomical and the extraterrestrial factors make up the natural process that cause climate change. The astronomical factors include changes in the eccentricity of the earth's orbit, changes in the obliquity of the plane of ecliptic and changes in orbital procession while the extra-terrestrial factors are quantity (intensity) and quality of solar radiation, effect of impact craters, near earth objects, aerosols, and meteorites, among others.

The anthropogenic factors implicated in climate change revolve around human activities that either emit large amounts of greenhouse gases into the atmosphere that depletes the ozone layer or activities that reduce the amount of carbon absorbed from the atmosphere. These human factors that emit large amounts of greenhouse gases include industrialization, burning of fossil fuel, gas flaring, urbanization and agriculture. However, human activities that deplete the amount of carbon sinks include deforestation, alterations in land use, water pollution and agricultural practices (Odjugo, 2010). There is no doubt, therefore, that the Earth getting warmer should be blamed on human beings (Spore, 2008). Scientists agree and caution that continued release of heat-trapping greenhouse gases in the atmosphere by man and its subsequent accumulation is contributing to changes in the global climate, and in the climates of regions around the world (Crosson, 2007).

Greenhouse gases emitted into the atmosphere are carbon dioxide (CO_2), chlorofluorocarbons (CFCs), methane (CH_4) and nitrous oxide (N_2O) among others. CO_2 currently contributes the highest rate of the greenhouse gases followed by CH_4, CFCs, N_2O and others (like halogens, tropospheric ozone, sulphuric hexafluoride (SF_6) among others). Although CO_2 has the highest contribution to greenhouse gases, its potency is far lower as CH_4 has about 23 times higher effects than the same volume of CO_2 and a gram of sulphuric hexafluoride (SF_6) released into the atmosphere is about 22,000 times that of CO_2 with respect to tropospheric ozone depletion. Likewise, the life time of CO_2 in the atmosphere varies, but obviously less than ten years, while that of CH_4, N_4O, CFCs and SF_6 are 12.2, 120, 50-1700 and 3200 years respectively (Msumba, 2006; Smith, 2004).

While a molecule of CO_2 could cause damage to stratospheric ozone just for a few years, other greenhouse gases could cause ozone layer damage for between decades to thousands of years. Although the potency of CO_2 released into the atmosphere through human activities may be significantly lower than many other greenhouse gases, the much greater volume of its emissions still makes it the most important influence in humans' enhancement of the natural greenhouse effect.

Available evidences show that climate change is global, likewise its impacts, but the biting effects is felt more by the developing countries, especially those in Africa, due to their low level of coping capabilities (Jagtap, 2007; Nwafor, 2007). Nigeria is one of such developing countries. Researches have shown that Nigeria is already being plagued with diverse ecological problems, which have been directly linked to the on-going climate change (Odjugo, 2005; NEST, 2003; Ayuba, Maryah & Gwary, 2007). While Odjugo (2010) observed erratic pattern of weather elements in Nigeria, Odjugo (2013) showed the impact of climate change on desertification.

Ayuba, et al. (2007) showed that climate change impacts negatively on plant species composition in North-eastern Nigeria. These are surely not the only effects of climate change in Nigeria.

An analysis of temperature records shows that the earth has warmed an average of 0.6^{o}C over the past 100 years (Environment Canada, 2008). This warming though significant, has varied in intensity from decade to decade, across regions and from season to season, and is attributed mainly to greenhouse gases (Crosson, 2007). Thus, climate change is a global issue, manifesting in variations of different climate parameters the world over.

As a global problem and one of the most important issues on the global political agenda, climate change requires a global solution. As a result, series of efforts put in place to stem the effects of climate change have been geared towards finding solutions through International negotiations (Ann, Ebele & Ukpere, 2013). This informed the effort in December 6, 1988 by the United Nations Environment Programme (UNEP) and World Meteorological Organization (WMO) towards the formation of Intergovernmental Panel on Climate Change (IPCC).

The 4th IPCC Assessment report predicted that Africa, of which Nigeria is a part, will be worst hit by effects of climate change (IPCC, 2007). As predicted, Nigeria is experiencing adverse climate conditions, with their negative impacts manifesting on the welfare of millions of her populace, which in turn is adversely affecting productivity in the country (Ziervogel, Bharwani & Downing, 2006). Nigeria, as a developing country, has witnessed persistent droughts, flooding, off season rains and dry spells, all of which have immensely altered farming seasons in South Eastern Nigeria, increased the prevalence of diseases and drought in the Northern part of the country, increased the incidences of flooding and erosion in the South (Odjugo, 2010).

These variations in climate parameters as seen in the country affect different sectors of the economy such as agriculture, health, water resources, energy, and so on (Ministry of Environment of the Federal Republic of Nigeria (MoEFRN), 2003). As critical as the effects of climate change is, it remains unclear whether many Nigerians are aware of what climate change is or its effects (Obioha, 2008). Progress in Developmental Studies (2003) warned that:

> "The risks associated with these changes are real but highly uncertain. Societal vulnerability to the risks associated with climate change may exacerbate ongoing social and economic challenges, particularly for those parts of society dependent on resources that are sensitive to changes in climate."

It should be observed that the present effort by Nigeria to reposition agriculture as the main stay of the nation's economy would be adversely affected if relevant measures were not taken to tackle the issue of climate change, and mitigate the effects of this global phenomenon on Nigerian society.

It has been observed that as the planet warms, rainfall patterns shift, and extreme events such as droughts, floods, and forest fires become more frequent (Zoellick, 2009). Under the present circumstances, the need for concerted efforts towards tackling this menace of climate change becomes even more needful and urgent. Various countries through their governments, in response to the challenge of climate change have put in place legal and institutional mechanisms/ measures to tackle collectively the issues of climate change. The most prominent of these are the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

UNFCCC (2007) observed that climate change results in adverse unpredictable events, thereby creating devastating effects the world over, particularly in Africa. However, since climate change is also a local phenomenon, interventions to cope with climate change effects require the engagement of stakeholders at national and local levels. For instance, as response to global change, adaptation requires the active involvement of different actors and responses at multiple levels.

Nigeria's vulnerability to climate change comes both from being located in the tropics, and from various socioeconomic, demographic, and policy trends limiting its capacity to adapt to change. Nigerian Environmental Study/Action Team, NEST (2003) and Ayuba, Maryah & Gwary (2007) indicate that constant loss of forest cover and biodiversity in Nigeria is linked to global warming and climate change. Nigeria is a country already being plagued by diverse ecological problems, which have been directly linked to changing climate. These authorities are of the opinion that the effects will be more pronounced, due to existing low level of coping capabilities in Nigeria and other parts of Africa.

Effects of Climate Change

Climate change, particularly that which presents as increasing temperatures, has been observed to have significant impacts on the world's physical, biological and human systems (Sjoberg, 2002). The author predicted that these impacts would become more severe. Igwe (2003) noted that warmer temperatures cause changes in the hydrological cycle at regional and global scales, including decreases in the amount of water stored as ice in most of the world's glaciers, ice sheets and sea ice; decreasing snow cover and earlier snow melt; and changes in rainfall patterns. The author predicted that sea level rise due to losses from ice stores and thermal expansion would result in climate change that would have an increasing impact on human settlements and infrastructure.

These changes, as earlier predicted are now observed to be affecting the incidence and severity of drought and floods, which in turn present challenges for many aspects of human society and industry, for instance sectors like agriculture, rural economies, insurance, and food and water security. The general effects of climate change include ozone layer depletion, acid rains, extinction of wild life, extinction of various tropical plants, earthquakes/ volcanic eruptions, floods disaster, rock fall, mud flow, hurricanes/hail storms, melting of ice sheet in the poles region, droughts, desertification, heat wave, windstorms, forest fires and so on (Udenyi, 2010).

In Nigeria, there have been a number of indirect impacts of climate change on human health. There is now food security problem, increase in incidences of nutritional imbalances (poor nutrition and malnutrition) among Nigerians. Obinna (2017) reports that 2.5 million children in Nigeria are suffering from Severe Acute Malnutrition (SAM), a health condition associated with insufficient nutrients needed for a child's normal growth. The report indicated that of the 2.5 million malnourished Nigerian children, 500,000 of them aged five years and below, are at risk of dying of malnutrition by the end of this year, except there is an intervention to tackle the condition. The author, relying on UNICEF statistics, asserted that the number of children affected by malnutrition in 2016 in South East Nigeria was 34, 889 while 6,700 children died.

IPCC (2007) showed that climate change causes an alteration in the patterns of rainfall and temperature; a shift, which could occur in the habitat of some vector-borne diseases, such as malaria (mosquitoes), and sleeping sickness (tsetse fly). Currently, mosquitoes thriving in locations where water logging and poor drainage typify the landscape and were hitherto not

associated with malaria, because of high flood frequency and water-logging resulting from climate change, have enhanced breeding and contribute to the spread of malaria.

Water-borne diseases have also increased because of the preponderance of stagnant pools of water resulting from flooding brought about by sea-level rise induced by climate change. New evidence with respect to micro-climate change due to land-use changes such as swamp reclamation and deforestation suggest an increase spread of diseases to new areas.

Direct impacts of climate change include health problems induced by increasing incidences of heat waves. These could lead to more cases of cerebro-spinal meningitis (CSM), which today is found to correlate positively with the maximum temperature in Northern Nigeria, and inversely with absolute humidity to a lesser, although still significant, extent. The water shortages has led to dry waterbeds and movement of people and their pasture to the Southern regions, thus causing tension and conflicts between the original inhabitants and the new comers.

The case of the Fulani herdsmen who owing to desert encroachment in the North, migrate from the northern parts of the country towards the South East Nigeria, in search of pastures for their cattle is a typical example. Although their activities are the immediate cause of the ongoing crisis the Fulani herdsmen have with the easterners, however, the remote cause could be ascribed to climatic change that brings about the increasing desertification of the North.

In sub-Saharan Africa generally, interest is growing on the impacts of climate change on agriculture, economic growth and sustainable development. Changes in soil moisture, soil quality, crop resilience, timing/length of growing seasons, crop and animal yield, atmospheric temperatures, flooding, unprecedented droughts, sea level rises and many more, constitute incidences of climate change. In the humid regions of Southern Nigeria, rainfall is projected to increase. This is accompanied by increases in cloudiness and rainfall intensity particularly, during severe storms. Similarly, the savannah areas of northern Nigeria were projected to experience less rainfall, which coupled with temperature increases, reduces soil moisture availability (Ozor & Nnaji, 2011). Increased temperatures and accompanying decrease in water availability collectively modify the length of growing seasons and yield potential and hence the areas suitable for agriculture, further adversely affecting food security over the African continent (Thornton, Jones, Owiyo, Kruska, Herrero, Kristjanson, Notenbaert & Bekele,2006).

As rainfall patterns shift, and extreme events such as droughts, floods, and forest fires become more frequent, resulting in poor and unpredictable yields, thereby making farmers more vulnerable, particularly in Africa. Farmers (who constitute the bulk of the poor in Africa) face prospects of tragic crop failures, reduced agricultural productivity, increased hunger, malnutrition and diseases (Zoellick, 2009). Jones & Thornton (2003) projected that crop yield in Nigeria may fall by 10-20% by 2050 or even up to 50% due to climate change, particularly because Nigerian agriculture is predominantly rain-fed and hence fundamentally dependent on the vagaries of weather.

The most devastating adverse effects of climate change in Nigeria, and other subtropical countries, include frequent drought, increased environmental damage, increased infestation of crop by pests and diseases, depletion of household assets, increased rural urban migration, increased biodiversity loss, depletion of wildlife and other natural resource base, changes in the vegetation type, decline in forest resources, decline in soil conditions (soil moisture and nutrients), increased

health risks and the spread of infectious diseases, changing livelihood systems (Abaje and Giwa, (2007); Ishaya & Abaje, 2008; Reilly, 2009).

An analysis of temperature records shows that the earth has warmed an average of 0.60 ^{o}C over the past 100 years (Environment Canada, 2008). The warming is real and significant though its intensity has varied from decade to decade, from region to region and from season to season (Crosson, 2007). There is consensus agreement that over the coming decades, higher temperatures and changing precipitation levels caused by climate change will create unfavorable conditions in many countries (Yesuf, Difalce, Deressa, Ringler & Kohlin, 2008). To what extent this will be the case in Nigeria particularly in the southeast rainforest zone where both temperature and precipitation extremes has not received much research interest (O'Brien, Sygna, Leichenko, Adger, Barnett, Tom, Schipper, Tanner, Vogel & Mortreux, 2008).

Climate Change Awareness in Nigeria

Climate change is severely affecting livelihoods in Nigeria. Rainfall patterns have changed drastically, lands are being eroded and in some places streams and springs are drying up, causing major crop yield reductions and food shortages. To address all these issues effectively, it is essential to assess the present awareness level of Nigerians regarding climate change.

Igwe (2003) showed that the level of awareness of causes and impacts of climate change is very low in Nigeria. In another study, Ishaya and Abaje (2008) asserted that 54% of indigenous people in Jema'a Local Government Area of Kaduna State, Nigeria confirmed that the awareness level about climate change in Nigeria is low. The situation may have not changed for better, several years after the previous surveys which indicated low awareness level.

This perhaps explains why in spite of visible impacts of climate change on the country and its resources, there is a sense of negligence on the part of the citizenry to the problem of climate change plaguing the nation. This is noticeable in rural area where people cut down trees for wood and sometimes set bushes ablaze indiscriminately, without cogent reasons for the act. Such activities result in the alteration of the natural climate system of the place.

In Nigerian big cities such as Lagos, Port Harcourt, Ibadan, and Onitsha, the natural climatic conditions have been altered by the regular destruction of natural ecosystems to build roads, houses and industries. The level of CO_2 and other GHGs is also on the rise as a result of the great number of fossil fuel-consuming facilities in these cities.

The biggest obstacle to reducing the impact of climate change in Nigeria is perhaps the lack of awareness and knowledge about the phenomenon. Lack of information and knowledge about climate change also means that many Nigerians are reluctant to accept the reality. In addition, there is a lack of public policy, government preparedness and commitment to promoting climate change adaptation strategies in the country (Olorunfemi, 2009).

According to the UNDP report (2010), the level of awareness about climate change is alarmingly low in Nigeria, and it is likely to continue if no intervention measures are taken. The report noted that the awareness of climate change was highest at the Federal level and dropped sharply at the state and local government levels, where real action is needed. Nigeria, like many other countries, is exposed to climate change-induced dangers of desertification, erosion, flooding and other ecological problems. Considering the strong relationship between climate change and development, Nigeria is highly at risk in the area of food and nutrition, poverty and hunger

reduction, and most importantly, economic and social development. Consequently, Nigeria's efforts and actions must be informed by these realities and directed towards measures to curtail activities that further worsen our climate.

Perhaps, ensuring high level of awareness about climate change in Nigeria, is the first step towards tackling the challenges of the impacts of climate change. The way the causes and effects of climate change are presented to the public will determine the way the public will take it, as well as how they react to it. As the people of Nigeria strive to overcome poverty and advance economic growth, this phenomenon threatens to deepen vulnerabilities, erode hard-won gains and seriously undermine prospects for development. Therefore, there is a need for concerted efforts towards tackling this climate change menace. The first step perhaps is to ascertain the level of awareness of the citizenry about the issue of climate change. This is what informed the present study. This study was conducted with the aim of assessing the current awareness level of the South-East Nigerians with regard to the causes and effects of climate change.

Research Method

Design of the Study

The study adopted the descriptive survey design. The descriptive survey is one in which a selected portion of a population is studied as a representative of the entire population (Nworgu, 2015). In descriptive study can provide information about the naturally occurring characteristics of a particular group of people it seeks to study, and information is collected without changing the environment. Descriptive studies are flexible and can involve a one-time interaction with groups of people (cross-sectional study) or a study might follow individuals over time (longitudinal study) and may involve surveys or interviews to collect the necessary information. Descriptive survey was adopted for this research because it allowed the researchers a one-time interaction with the subjects through questionnaire and interviews that generated data on the South Eastern Nigerians' level of awareness of the effect of climate.

Area of the Study

The area of the study is the South-Eastern part of Nigeria, covering three states in the region, namely Abia, Ebonyi and Enugu. Abia State with a large commercial centre in Aba, is characterized by high traffic and industrial activities that release CO_2 into the atmosphere; Ebonyi state's population is predominantly farmers whose farming methods and activities result in destruction of natural vegetation and ecosystems in search of land to plant crops, and Enugu, the centre of the South East, with a large population of civil servants and business men, like Abia, contribute greatly to release of GHGs in the South eastern region of Nigeria. Combined, these three states constitute 60% of the States in the South East and provide a rich blend of rural and urban population. Thus, these three states represent a good area for data collection.

Population of the Study

The population of the study is an estimated 8, 275, 337 persons, being the estimated population figures from the 2006 National Population Census for the three states: Abia, Ebonyi and Enugu respectively. This population consist of 2, 833, 999 persons from Abia state; 2, 173, 501 persons

from Ebonyi state; and 3, 267, 837 persons from Enugu state (Figures culled from the 2006 National population census, available on the National Populations Commission Website).

Sample and Sampling Technique

A sample population of 300 adults were used for this study. The proportionate stratified random sampling method, a probability sampling technique, was used to draw individuals from the respective populations for the purpose of this study. This sampling technique was chosen in order to ensure that minority constituent of the population (rural population) is equally represented in the study. This served to reduce sampling errors and make for greater representativeness of the sample, relative to the actual population. In line with the sampling method chosen, the researchers organised the sampling method as shown in Table 1.

Table 1: Sample Distribution

States	Distribution	Location		Total
		Urban	Rural	
Abia	Size	50	50	100
	Proportion	0.5	0.5	1.00
Ebonyi	Size	50	50	100
	Proportion	0.5	0.5	1.00
Enugu	Size	50	50	100
	Proportion	0.5	0.5	1.00

Instrument for Data Collection

The instrument used to collect data for this study was a structured 31-item questionnaire administered to the sampled population in their respective places of residence. The questionnaire comprised of two sections; the first served to elicit demographic data of the respondents and the second, split further into five clusters, was used to gather information to answer the research questions that guided this study.

Validity of Instrument

To ascertain the validity of the research instrument, the researchers gave drafts of the questionnaire to experts in research methodology, measurement and evaluation in the Department of Science Education, University of Nigeria, Nsukka to assess how well the questionnaire was constructed. Following the assessment report and recommendations of the experts, the questionnaire was revised. The revised and final version of the questionnaire was used for this study.

Reliability of Instrument

The Cronbach's Alpha test reliability method was used to establish the reliability of the instrument. The reliability coefficient index obtained (0.929) confirmed the instrument as reliable.

Method of Data Collection

Copies of the questionnaire were administered to respondents, who were guided by the researchers to respond to each item as it affected them. Completed copies of the questionnaire were collected on the spot. There was 100% return. Separate interviews were conducted with selected respondents to ascertain their thoughts on climate change issues not captured by the questionnaire.

Method of Data Analysis

Collected data was analyzed using descriptive statistics of mean and standard deviation. A benchmark mean of 2.50 was used to interpret the data. Mean responses of 2.50 and above were considered as an indication that the respondents accept the questionnaire item with such mean rating. Mean ratings below 2.50 signified that respondents do not accept the statement in the item. t-test statistic was used to test the hypotheses at 0.05 level of significance because the research involved two groups of respondents (respondents from rural areas and those from urban areas).

Results

The result and analysis of data from the questionnaire are presented in Tables 2 and 3, according to the research questions; and Tables 4 and 5 in line with the hypotheses that guided the study.

Research Question One: To what extent are South Eastern Nigerians Aware of the causes of Climate change?

Table 2: Extent of South Eastern Nigerians' Awareness of Causes of Climate Change

S/N	Item statement	Location	N	Mean	Std.Dev	Decision
1.	Solar radiation is a cause of climate change.	**Urban**	150	2.853	1.026	High Extent
		Rural	150	2.147	1.052	Low Extent
2.	Accumulation of aerosols in the atmosphere causes climate change	**Urban**	150	2.140	.913	Low Extent
		Rural	150	1.573	.846	Low Extent
3.	Volcanic eruptions cause climate change.	**Urban**	150	2.507	1.04	High extent
		Rural	150	2.133	1.45	Low extent
4.	Impact craters/meteorites cause climate change.	**Urban**	150	2.080	1.014	Low extent
		Rural	150	1.507	.896	Low extent
5.	Changes in solar climate cause climate change.	**Urban**	150	2.547	1.097	High extent
		Rural	150	2.053	1.157	Low extent
6.	Solar flares cause climate change.	**Urban**	150	2.107	1.088	Low extent
		Rural	150	1.647	.991	Low extent
7.	Deforestation is a cause of Climate change.	**Urban**	150	3.313	.891	High extent
		Rural	150	3.347	.897	High extent
8.	Emitted greenhouse gases cause climate change.	**Urban**	150	2.887	1.046	High extent
		Rural	150	2.407	1.171	Low extent
9.	Burning of fossil fuel causes climate change.	**Urban**	150	3.167	.979	High extent
		Rural	150	2.880	1.049	High extent
10.	Increased use of chemical fertilizers cause climate change.	**Urban**	150	2.773	1.075	High extent
		Rural	150	2.561	1.167	High extent
11.	Increased emission of CO_2 causes climate change.	**Urban**	150	2.900	1.054	High extent
		Rural	150	2.280	1.130	Low extent
	Overall mean	**Urban**	**150**	**2.661**	**.517**	**High extent**
		Rural	**150**	**2.231**	**.649**	**Low extent**

Table 2 shows that all respondents are aware that items 1-11 in the questionnaire are causes of climate change. However, overall mean scores (2.68 and 2.23) for urban and rural locations

respectively on the awareness level indicate high level in urban localities and low level in the rural localities.

Research Question Two: To what extent are South Eastern Nigerians aware of the effects of climate change?

Table 3: Extent of South Eastern Nigerians' Awareness of the effects of climate change

S/N	Item statement	Location	N	Mean	Std. dev.	Decision
12.	Hotter dry seasons (increase in average temperature)	**Urban**	150	3.360	.830	High Extent
		Rural	150	2.807	.974	High extent
13.	Change in pattern of rainy seasons (increase in average rainfall).	**Urban**	150	3.187	.847	High extent
		Rural	150	2.733	.924	High extent
14.	Changes in agricultural time tables.	**Urban**	150	2.787	1.014	High extent
		Rural	150	2.747	1.018	High extent
15.	Emergence of new diseases.	**Urban**	150	3.040	1.003	High extent
		Rural	150	2.787	1.046	High extent
16.	Fluctuations in weather patterns.	**Urban**	150	2.953	.900	High extent
		Rural	150	2.607	1.080	High extent
17.	Drought	**Urban**	150	2.867	1.097	High extent
		Rural	150	2.853	1.221	High extent
18.	Floods	**Urban**	150	3.240	.974	High extent
		Rural	150	3.000	1.043	High extent
19.	Water shortages	**Urban**	150	2.820	1.024	High extent
		Rural	150	2.767	1.026	High extent
20.	Extreme weather	**Urban**	150	2.900	1.008	High extent
		Rural	150	2.667	1.047	High extent
21.	Colder *harmattan*	**Urban**	150	2.953	.907	High extent
		Rural	150	2.941	1.061	High extent
22.	Longer seasons	**Urban**	150	2.680	.985	High extent
		Rural	150	2.707	1.102	High extent
	Overall mean	**Urban**	**150**	**2.981**	**.477**	**High extent**
		Rural	**150**	**2.738**	**.527**	**High extent**

Table 3 shows that respondents indicated a high level of awareness to the effects of climate change, represented by items 12-22. The overall mean response of 2.98 and 2.74 for urban and rural societies respectively indicates that respondents are aware of the effects of CC to a very high extent.

Hypothesis One: There is no significant difference in the mean awareness ratings of urban and rural respondents on the causes of climate change.

Table 4 is a t-test analysis of the difference between extent of awareness of the causes of climate change in urban and rural localities.

Table 4: **t-test analysis of the difference between extent of urban and rural South Eastern Nigerians' awareness of the causes of climate change**

Location	N	Mean	SD	df	t.	Sig. (2-tailed)
Urban	150	2.661	.517	298	6.350	.000
Rural	150	2.231	.649			

The probability value of 0.000 for the difference between extent to which urban and rural South Eastern Nigerians are aware of the causes of CC is less than 0.05, the null hypothesis was rejected. It was concluded that there is significant difference in the mean awareness ratings of urban and rural respondents on the causes of climate change, the urban population being more aware with a mean score of 2.66, compared to the 2.23 mean score of rural population.

Hypothesis Two: There is no significant difference in the mean awareness ratings of urban and rural respondents on the effects of climate change.

Table 5 is a t-test analysis of the difference between extent of awareness of the causes of climate change in urban and rural localities.

Table 5: t-test analysis of the difference between extent of urban and rural South Eastern Nigerians' awareness of the causes of climate change

Location	N	Mean	SD	df	t.	Sig. (2-tailed)
Urban	150	2.981	.477	298	4.179	.000
Rural	150	2.738	.527			

As shown in Table 5, since the probability value of 0.000 is less than 0.05, the null hypothesis was rejected. It was concluded that there is significant difference in the mean awareness ratings of urban and rural respondents on the effects of climate change.

Summary of Findings

1. There is significant difference in awareness levels South East Nigerians on the causes and effects of climate change, with level of awareness being slightly higher in urban areas.

2. Some of the strategies already being used to inform the citizenry about climate include television programs, radio programs, sensitization campaigns, social media and newspaper columns on climate change.
3. Strategies that could be used to increase climate change awareness include use of bulk SMS to send climate change messages and infusing climate change education in school curricula. Others include organizing symposia on climate change in rural areas, organizing town union meetings to discuss evolving climate change issues, using village town criers, to pass climate change information in the people's native language and using handbills**.**

Discussion of findings of the Study

From the analysis presented in Table 1, it is evident that the awareness level of South-East Nigerians regarding causes of climate change classified as natural or biogeographical processes and human or anthropogenic causes (Olaniyi, Funmilayo & Olutimelim, 2014) is high. The extent of awareness, shown in Table 5, indicates that the urban population of South East Nigerian is more aware of the causes of climate change than the rural population is. This finding corroborates the earlier ones (Nzeadibe, 2011; Odjugo, 2013), which show that urban populations are more aware about climate change causes than people residing in rural areas. The authors attributed the finding to among other things, urban dwellers access to education, diverse forms of media, proximity to large factories and industries. Whereas, rural dwellers characterized by illiteracy, poverty have little or no access to media of any kind. A cross section of individuals interviewed in the course of the study on the causes of climate change showed very low level of awareness to the causes of climate change.

Analysis of data presented in Table 2, shows clearly that South East Nigerians are aware of the effects of climate change outlined in the instrument. These effects include weather fluctuations, increase in average temperature, prolonged rain seasons, changes in agricultural time tables appearance of new diseases, drought, flood, water shortages, longer season and colder harmattan.

Change is almost as high in rural areas as it is in urban areas. However, this slight difference in extent of awareness is significant as seen in Table 4. This finding attests to the fact that the effects of climate change are felt the world over, with as discrimination on ignorance, race, and lack or otherwise of awareness and other similar factors. For this reason, Udenyi (2010) described the effects of climate change as global.

Generally, previous studies highlight the extent and disparity in awareness levels across rural and urban areas (Odjugo, 2013) and Nzeadibe (2011). These studies point out the contrast between awareness levels in developed and developing countries, which the authors described as "striking", with more than 90 percent of people in developed countries aware of climate change while only relatively few in developing countries are aware of the phenomenon.

Implications of the findings of the study

It has been discovered among the rural people of South East Nigeria that their awareness, which is low is limited mostly to the human causes of climate change. This trend is also noticed among those in the urban areas who were expected to know better. This lack of awareness regarding the natural causes of climate change, has made people of South East Nigeria to cling to their knowledge of climate change causes and blame it on humans' activities alone. In spite of their understanding of the contribution of human activities to climate change, South East Nigerians still perpetrate such acts that damage the balance in the natural ecosystem, even though they witness the widespread effects of climate change. Because of this finding, there is the need for aggressive climate change education and awareness campaigns at all levels of government and NGO, to make for sustainable development and reduction of causal factors and effects of climate change.

Information provided on climate change should not circle around human causes and immediate effects of climate change but should also spread to natural causes of the phenomenon and its indirect effects on the people. Climate change information also should target attitudinal change on the part of the citizens by educating them of their role in climate change.

Climate change though a global phenomenon, should be taken seriously in Nigeria because of the implication of its impact on Nigeria's economic development. As a result, curriculum planners as a matter of urgency should design academic programmes at all educational levels, especially at the primary and post-primary school levels, that teach children about climate change. This will serve to catch the kind young and set their minds towards a climate friendly path. As Okorie (2011) suggested, 'there is no better place to start this awareness campaign than the various institutions of learning, - the schools where children, the future adults and leaders are groomed and to the local communities and villages. Children, to whom the future belongs, from the outset should, be made to have a good understanding of the environment, how and why they must take responsibility for safeguarding it'.

Conclusion

People of South East Nigeria are aware of the causes of climate change. The extent of awareness is higher for anthropogenic causes and greater in urban location, with the rural population being unaware of all but one of the biogeographically causes of climate change – solar radiation. The extent of awareness of effects of climate change is moderately very high in both rural and urban localities of South East Nigeria.

Suggestions for Further Studies

1. A replication of this study with a much wider scope covering all five states of the south east or in another geopolitical zone in Nigeria.
2. Another variable like educational qualification of the respondent could be added to the study. Thus, one could study the relationship between educational qualification and extent of awareness of climate change.

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