



Climate change issues and implications for sustainable development in a coastal area of Nigeria

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ABSTRACT

The Study is aimed to look at climate change issues and the implications it has on environment in a coastal area of Nigeria. Each effect of climate change is affecting sustained development in the area. Forty respondents were randomly selected for the study from four villages in the area. Questionnaires, personal observations and oral interviews were used to collect data. Data analysis was through descriptive statistics. The research has brought issues for further studies since it is exploratory in nature.

Keywords: Climate Change, Sustainable Development, Coastal Area, Coastal Area, Nigeria

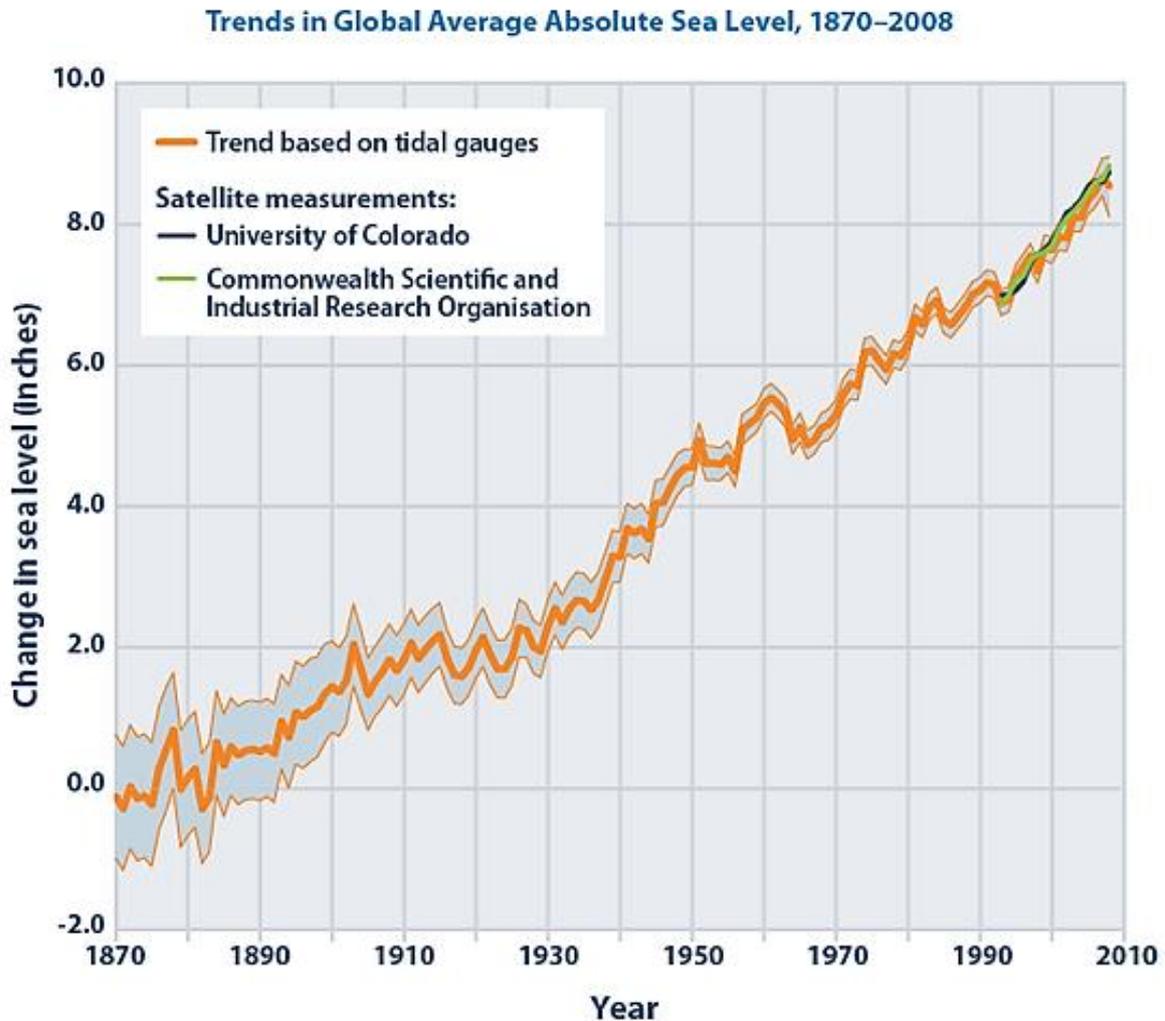
1. INTRODUCTION

According to IPCC (2007), in the last century, world population has tripled; and it is expected to rise from the present 6.5 billion to 8.9 billion by 2050. This in essence means that pressure will be on the environment as a result of changing biodiversity (Freedman, 2007).

Climate change is a major issue for the indigenous peoples around the world. Climate change is considered to be a critical global challenge and recent events have demonstrated the world's growing vulnerability to climate change. The impacts of climate change range from affecting agriculture to further endangering food security, to rising sea-levels and the

accelerated erosion of coastal zones, increasing intensity of natural disasters, species extinction and the spread of vector-borne diseases (UNPFII, 2007).

Climate change is about the growth of greenhouse gas emissions due to the burning of fossil fuels, resulting mainly from industrial activities and motor transportation, hence there is a built up of the carbon dioxide levels in the atmosphere (UNPFII, 2007). Amos et al, (2013) termed climate change as the anthropogenic activities which lead to an increase in emissions of greenhouse gases thereby causing global warming.



Data sources:

- CSIRO (Commonwealth Scientific and Industrial Research Organisation). 2009. Sea level rise. Accessed November 2009. <http://www.cmar.csiro.au/sealevel>.

- University of Colorado at Boulder. 2009. Sea level change: 2009 release #2. <http://sealevel.colorado.edu>.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climatechange/science/indicators.

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www.google.com/m?q=table+on+the+trend+of+sea+rise+level+&client=ms-opera-mini-android&channel=new
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Evidence of sea level rise has been shown by different scholars in different parts of the world. According to MOCZM (2003), sea level rise refers to the increase in mean sea level over time. Sea level has been rising around the globe for thousands of years since the end of the last Ice Age. During the last century, tide gauges and satellites recorded measurements that indicate an acceleration of sea level rise relative to the past rate. Relative sea level rise refers to the combination of eustatic, isostatic and other effects at a specific location. There is high confidence that the warming atmosphere associated with global climate change is expected to accelerate both the thermal expansion of seawater and the melting of glacier and ice sheets and will lead to increasing rates of sea level rise (Parris et al, 2012). From Church and White (2011), since the late 1800s, global mean sea level rise has been a persistent trend, at a rate of about 1.7 ± 0.2 millimeters per year (mm/yr) as recorded by tide gauges. MOCZM (2003) added that direct measurements of global changes in mean sea level are made by highly accurate satellite altimeters. Figure 1 shows trends in global average absolute sea rise, 1870 – 2008.

Climate change has made the indigenous peoples around the world vulnerable to its impact. According to IPCC (2007), climate change vulnerability is a vulnerable system e.g. low-lying island or coastal areas; or the impact of climate change on this system, e.g., flooding of coastal areas and agricultural lands. On the other hand, adaptations to climate change as the adjustment in natural or human system in response to actual or expected climatic stimuli or their effects (IPCC, 2001).

Ovuyovwiroye (2010) added that adaptation to climate change is aiming at mitigating and developing appropriate coping measures to address the negative impacts of climate change. He continues that adaptation to climate variability is not new, but climate change is expected to present heightened risks with potentially grave consequences. The developed countries will not have much problem in adaptation as a result of their high level of technological development and high per capital income, but in the developing countries adaptation will be a serious problem because of low income and poor technological base (Mshelia, 2005; Jagtap, 2007; Rockefeller Foundation, 2008; IFPRI, 2009; Odjugo, 2009).

MOCZM (2003) wrote on resilience, adaptive capacity, and risk tolerance which should be key factors in the evaluation of different sea level risescenarios for planning and decision – making. They opined that resilience in this context refers to the ability to endure impacts associated with sea level rise and to respond, recover, and adapt to consequences.

An area, site, facility, or project that is highly resilient will be able to accommodate or tolerate more frequent flooding and adverse consequences associated with increasing sea level rise, and one with low resilience and adaptive capacity will be more severally impacted, take longer to recover (or may not recover at all), and require greater resources for recovery. Risk refers to the potential for, or exposure to, loss or undesirable impacts (or outcomes) and can be characterized as the combination of probability and consequence.

Daramola and Ibem (2010) classified global warming along with others like ecological, poaching and habitat loss, increasing desertification, soil erosion and pollution and deforestation as environmental problems. Therefore, the Federal Ministry of Environment, Nigeria, together with Civil Society Organizations developed the National Adaptation Strategy and Plan of Action on Climate change for Nigeria (NASPA – CCN) in 2011 (Federal Ministry of Environment, 2011). The body acknowledges that individuals and communities are adapting to the effects of climate change.

Local farmers are known in several parts of Africa to conserve carbon in soils through the use of zero – tilling practices in cultivation, mulching and other soil-management techniques.

Before knowing what sustainable development is in an environment, Daramola and Ibem (2010) and Singh (2003) have viewed the concept of environment from diverse perspectives. Arokoyu and Umeuduji (2004) defined environment as all the external conditions influencing the development of any living organism. Daramola and Ibem (2010) quoted Porteous (1977:139) concerning the multiplicity of definitions of environment as “the multiplicity of the usage and concept of the term environment have resulted in a variety of adjectival forms which include social environment, molar environment, physical environment, home environment, psychological environment, behavioural environment and geographical environment”.

The Federal Environmental Protection Agency in Nigeria (FEPA) maintained that the environment includes water, air, land, plants, animals, and human beings living therein, and the inter-relationships that exist among them (FEPA, 1989). According to Daramola and Ibem (2010), sustainability in this context relates to the ability of the environment to meet the basic requirements for the sustenance of the living and non-living components of the ecological, economic and socio-cultural systems in a manner that does not limit the possibility of meeting the present and future needs of the various components and aspects of the environment.

According to the Brundtland Report, sustainable development is “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987:43). Sustainable development contains two key concepts which are needs, especially the need of the poor people of the world, to which over-riding priority was essentially; and limitations created by technology and social organization regarding the capacity of the environment to satisfy both present and future needs. Therefore, sustainable development is an anthropocentric (human centered) concept (Mitchel, 2002).

Statement of the Problem

Man is exploring and exploiting the environment with the view of developing it, but this in most cases has turned out to be destroying the environment. One of the activities is industry for creation of products according to Adeyemo (2004). Industrial activity is causing air pollution in large quantities; in which consequent effect is numerous, including depletion of ozone layer (Ologunorisa, 2004 and Freedman, 2007). Ibeno is a coastal area in Akwa Ibom State, Nigeria with crude oil which is exploited for many uses. According to Wilcox and Akadi (2013), livelihood is threatened in all ramifications because of a gap in knowledge on the impact of climate change on the most vulnerable groups. In the face of climate change issues, sustainability of environment should be examined.

Aim and Objectives of the Study

This study is aimed at examining climate issues: Implications for sustainable development in a coastal area of Akwa Ibom State, Nigeria, with the following objectives:

- (i) To list climate change induced activities;
- (ii) To examine effects of climate in the study area;
- (iii) To establish the implication of climate change issues on sustainable development in the study area;

It is hoped that this study will project further study and lead to proper planning for sustainable development.

Study Area

Ibeno, one of the 31 Local Government Areas of AkwaIbom State is a coastal settlement. It is located in the southern part of AkwaIbom State, occupying a vast coastal area of over 1200 sq.km with longitudes of 7°20' and 8°18', and latitudes of 4°30' and 4°32'. It stretches from Okposo 1 at the eastern flank, bordering Mbo Local Government Area and Bakassi Peninsula to Atabrikang Village on its western flank. It is bounded in the south by the Atlantic Ocean and shares border with Eket, EsitEket, Onna and Eastern Obolo Local Government Areas, see figure 2. It has a humid tropical climate characterized by high daily temperature (between 26 °C and 33 °C). Radio Commentary (2014) has it that temperature around this area was 32 °C thirty years ago, but now has become 44 °C. This increase in temperature is a clear evidence of climate change and global warming. It has relatively high annual rainfall (3000 mm – 4000 mm) and very high relative humidity (> 80%). The influence of the sea water contributes not only in moderating the high daily temperatures (Akpabio and Brown, 2012); it equally influences the relatively high annual rainfall situation in the area. Ibeno has a population of 74,840 according to 2006 National Population Census.

Two sources of water supply: the natural sources and modern supply sources are available in Ibeno. The modern sources include borehole which may be sponsored by government, multi-national, private and non-governmental organizations. Being a rural coastal settlement, vast majority of the people still depend on the natural sources of water supplies from available rivers/streams, hand-dug wells and rainwater. According to Akpabio and Brown (2012), rainwater (harvested from the roof top) has emerged as a long time historical and cultural practices in addressing the domestic water needs of the settlements which are largely affected by salinity of ground water and a lack of fresh water sources. The quality of local ground water is extremely poor and polluted that it cannot be used for cleaning, bathing, washing and drinking. This demand is achieved by private and commercial water supply initiatives which are rather expensive for low income earners in terms of distance and cost. Therefore, rainwater harvesting serves as a viable alternative. The natural sources of water are used for bathing, laundry activities and disposal of wastes products.

Ibeno people have a dialect that seems slightly different from the general Ibibio language even as Ibibio language is understood by all and freely spoken. The prime occupation of the people is fishing. However, farming and petty trading are also practiced. The presence of some oil multinationals in the area has contributed in the transformation of the area (both positively and negatively) in the forms of influencing the cost of living, provision of some physical infrastructures (roads, electricity etc), environmental degradation through oil spillage and gas flaring etc. (Akpabio and Brown 2012). For example, figure 3 shows gas flaring by oil multinational in Ibeno. Agriculture and related economic activities for livelihood and income are still practiced by the rural people.

Despite the presence of some physical infrastructures of the oil multinationals, the people depend on individual and communal efforts in surviving through the constraint of natural environment. In such circumstance, it is natural that surviving in such difficult environments will depend, to a large extent, on the rich cultural and religious beliefs (Akpabio, 2012).

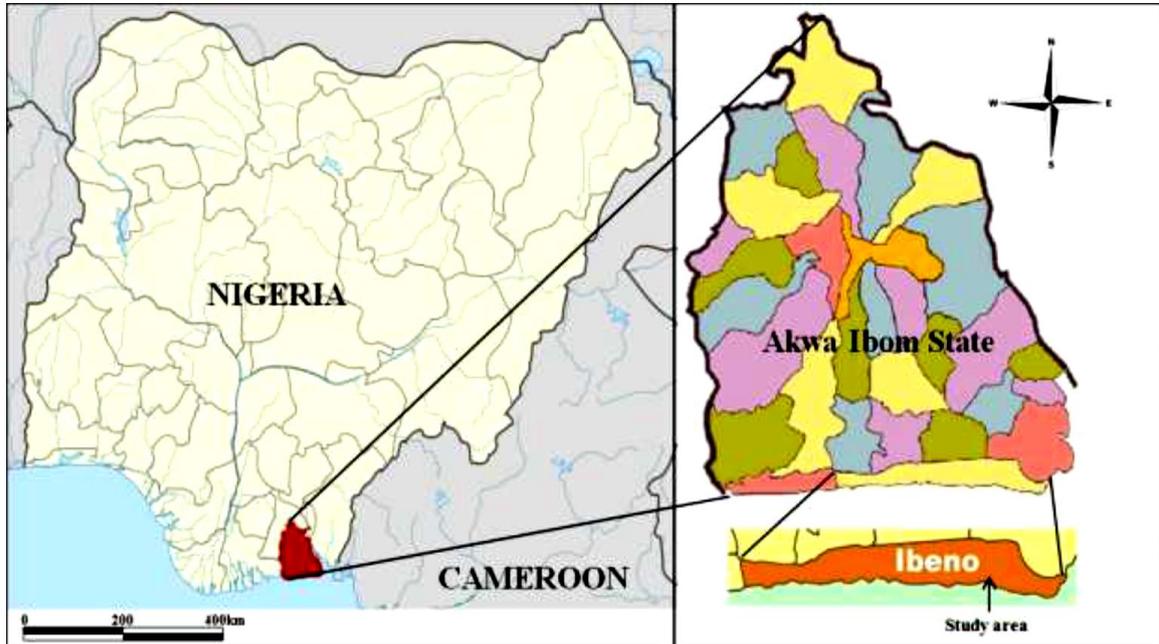


Figure 2. Map of the study area.



Figure 3. Gas flaring by oil multinational in Ibeno (Umoh, 2014).

Climate Change in Africa

According to the studies conducted by the Climate Reality Project (2014), climate change has impacted Africa in many ways, which include:

Temperature and Precipitation Trends

- Much of the continent of Africa appears to be warming at a faster rate than the global average. The tendency is for drier regions to warm at even faster rates than moist, tropical areas.

- Ethiopia's average annual temperature increased 1.3 °C (2.3 F) between 1960-2006. The average number of hot days each year increased 20 percent between 1960-2003.
- Kenya's average annual temperature has increased 1.0 °C (1.8 F) since 1960. The average number of hot days each year increased nearly 16 percent from 1960-2003.
- Africa experienced widespread drying from 1950-2008 due to increased evaporation (driven by higher temperatures) and changes in rainfall. The trend was strongest in central and western Africa. The Horn of Africa, by contrast, got *slightly wetter* from 1950-2008.
- Surface (soil) drying as global temperatures increase is likely in Southern Africa.
- Rainfall is expected to increase in parts of Eastern and Central Africa. There is also the possibility that tropical cyclones will become more intense and that heavier rainfall events will become more frequent.

Sea-Level Rise

- Coastal erosion caused by rising sea levels, increased rainfall, and changes in land use, is destroying villages and threatening cities all along the coast of Western Africa.
- Sea-level rise may have the biggest impact on the Nile River delta and areas along the continent's west coast. Over 6 million people would be at risk in the case of a 1-meter (39 inches) rise.
- Between 1970-2003, sea level along Durban's coast rose 2.7 millimeters per year. The Durban government expects this rate of sea-level rise to accelerate and is planning for up to 1 meter (39 inches) of sea-level rise (above the 1980-1999 baseline) by 2100.
- Southern Africa is one of three coastal regions in Africa and one of five regions in the world identified as being at the highest risk of floods by 2080.

Extreme Weather

- The number of recorded flood disasters in the Horn of Africa has steadily increased every decade since the 1960s. There was an average of 0.4 events per year in the 1960s and 8.5 events per year from 2000-2009.ⁱ Although this result is consistent with the trend toward more rainfall, the apparent increase in number of flood disasters could also just reflect increasingly better data collection and reporting.
- The 2011 drought in the Horn of Africa sparked a severe food crisis and high malnutrition rates. In the summer of 2011, more than 10 million people were living in drought-stricken areas of Djibouti, Ethiopia, Kenya, Somalia, and Uganda.

Wildfire

- One modeling study estimates that, on average, there are 30,000 wildfires that burn 3 million hectares (7.4 million acres) of land in South Africa annually. Longer dry spells and rising temperatures may increase fire risk in the future.
- A study estimated that the majority of the approximately 339,000 annual deaths that took place globally from wildfire smoke inhalation between 1997-2006 occurred in Sub-Saharan Africa (approximately 157,000) and South-East Asia

Impacts on Human Health

- Climate change and variable weather patterns will likely worsen food insecurity and

malnutrition in parts of Africa. With warming of 1.2-1.9 °C (2.1-3.4 F), the number of people undernourished in Western and Eastern Africa could increase by 25-90 percent. Higher temperatures and prolonged rainy seasons in some areas may see an increase in mosquito-borne illness.

- It is possible that climate conditions will become more favorable for the spread or introduction of malaria into new areas including parts of South Africa, Ethiopia, Kenya, Rwanda and Burundi.
- The U.S. government estimates that more than 29,000 children under the age of five died in the space of 90 days from May to July 2011, due to the drought and subsequent food crisis in Eastern Africa.

Impacts on Water Stress or Scarcity

- One-third of Africa already lives in drought-prone areas.
- Land- and water-use practices, population growth, and climate change may lead to more issues related to water availability, accessibility, and demand. Stream flow is expected to be considerably lower for much of Southern Africa.

Impacts on Agriculture

- Several crops grown in Africa are already growing at their maximum temperature limit. These may not be viable as warming continues.
- The Sahara may be most susceptible to climate change, in terms of agricultural impacts. Projections indicate potential losses of 2-7 percent of GDP in that sector by 2100.
- Saltwater intrusion due to sea-level rise might impact fisheries and aquaculture inland.

Impacts on Livelihoods

- Climate change has already impacted livelihoods dependent on natural resources in Africa, including the Sahel. Livelihoods centered on farming, fishing, and herding are most likely to be impacted by precipitation variability and warmer temperatures. Climate change impacts can contribute to instability and migration.

Impacts on Human Settlement, Migration and Displacement

- Extreme weather events and temperature and precipitation variability could lead to new sets of refugees as well as a variety of migration patterns including repetitive migrants and so-called short-term “shock” migrants.
- During the peak of the 2010-2012 drought, more than 1,000 refugees arrived at the Dadaab camp in Kenya each day to seek help. As of the end of April 2011, more than 52,000 people fled rural areas for urban centers in search of water and food.
- Above-average rainfall across East-Central Africa in early August 2012 produced flooding that displaced at least 15,000 people throughout Sudan.

2. METHODOLOGY

Primary and Secondary sources of data were employed in this study. Primary data involved the administration of questionnaire, oral interview and field observation. Four villages were randomly selected in Ibeno Local Government Area for the administration of ten (10) questionnaires in each village, based on systematic random sampling technique. This led to the administration of forty (40) questionnaires in all. Enoh (1997) confirmed that the best statistical method of selection is the use of table of random numbers because it is more scientific in a condition of uniform characteristics. These villages are Upenekang, Iwouachang, Okorutip and Atabrikang. Data collected with questionnaires involved bio-data of respondents, climate change induced activities, and effects.

For the validation of data collected through questionnaires as the objects of study were observed *in situ*, personal observation was made. Secondary data in form of textbooks, journals and internet materials were used. Analysis of data was descriptive statistics, and the research exploratory in nature.

3. RESULT AND DISCUSSION

Table 1. Socio-economic characteristics of the respondents.

Parameters	-	-	-	-
Age brackets	18-20 years 6 (15%)	21-30 years 9(23.5%)	31-45 years 15 (37.5%)	46 years and above 10 (25%)
Sex	Male 25(62.5%)	Female 15 (37.5%)	-	-
Education	No Formal 6 (15%)	Primary 20 (50%)	Secondary 10 (25%)	Tertiary 4 (10%)
occupation	Fishing 20(50%)	Farming 20 (50%)	Civil Service 6 (15%)	Trading 20 (50%)

Source: Field Survey (2014)

Table 2. Climate Change Induced Activities.

Activity	No. of respondents	% no. of respondents
Bush burning	30	75%
Gas flaring	40	100%
Deforestation	35	87.5%
Fossil fuel		
Burning	37	92.5%

Table 3. Effects of Climate Change.

Effect	No. of respondents	% no. of respondents
Rise in temperature	32	80%
Increase in rainfall	30	75%
Flooding	35	87.5%
Corrosion of buildings	37	92.5%
Reduction of crop yield	37	92.5%

In Table 1 above 40 interviewees produced 25 males (62.5%) and 15 females (37.5%) had socio-economic characteristics dominated by 15% no formal, 50% primary, 10% secondary and 10% tertiary education. Occupational structure is a typical of the scenarios in the rural areas in developing countries. Fishing and farming activities were prominent occupational practices, but small businesses like trading crafts, commercial transports were complementary livelihood sources of local specialization. 15% of civil servants still depend on farming and fishing.

The Table 2 above shows that 100% of the respondents were gas flaring as the major cause of climate change followed by fossil fuel burning (92.5%) deforestation (87.5%) and bush burning (75%).

Table 3 shows the effect of climate change in the study area of which corrosion of buildings and reduction of crop yield take the highest percentage of 92.5. This is as a result of rise in temperature, flooding, increase in rainfall which is acidic according to oral testimony.

Implication of Climate Change for Sustainable Development

With various negative effects of climate change, it is difficult for a developed project to withstand longevity. According to oral testimony in the area, “agricultural production is dwindling or declining. In the last forty years, bumper crop yield was usually achieved but as a result of consequences of climate change it is not so. More farmlands are now wasteland because they do not provide high crop yield”, a negative effect on food security. According to IPS (2014) the UN Food and Agriculture Organization Assistant Director-General for Forestry, Eduardo Rojas said that “resilient agriculture is more environmental because it does not use fertilizers, but no matter how much we do there are systemic limit. We could reach a limit as to how much agriculture can adapt”. We should be mindful that more commercial agriculture leads to deforestation which promotes climate change because forests are cleared. That is the paradox of sustainable development in agriculture. On the issue of building structures, oral testimony has it that, roof is the point of attack as it corrodes quickly and easily. This is as a result of acid rain which is still an aspect of climate change. On the aspect of health, more cases of illness are observed. When flooding occurs there is consequent health effect; the same goes to drought. According to oral testimony, the issue of flooding destroys farmlands, buildings, roads, fish ponds, etc.

4. CONCLUSION

Climate change is a threat to sustainable development as long as man will continue to do activities that induce climate change. The questions are: can man stay without engaging in climate change induced activities, will new ways of living sustain environment, and how long will it take environment to become normal after ceasing to promote climate change? Since this research is exploratory in nature, it calls for its expansion as the purpose was to raise awareness and perception of the issues of climate change and sustainable development.

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ⁱThe International Disaster Database. (Center for Research on the Epidemiology of Disasters, 2013). <http://www.emdat.be/disaster-list>