

Climate Change In Africa

Problems, Prospects and Perspectives



Editors
Kanu, Ikechukwu Anthony
Ndubisi, Ejikemeuwa J. O.

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Kanu & Ndubisi (Eds)



A Publication of
Association for the
Promotion of African Studies

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Introduction

One of the factors that characterizes human existence and human society is change. Change is an existential reality. Experience has shown that some changes are natural, that is, they have been designed by nature to occur on their own. There are also man-made changes. These are changes that came to be through human influence. The reality of climate change can be said to be both natural and man-made. Today, the question of climate change is a global issue and there are many challenges associated with it. Researches have shown that Africa bears heavy brunt of the negative effects of climate change. In this regard, these and the related questions should occupy the mind of any reasonable and right-thinking African: What are the challenges of climate change in Africa? What are the factors that encourage the negative effects of climate change in Africa? How can we curb the challenges posed by climate change in Africa? What is the place of climate change to socio-economic development in Africa?

It is important to note that the intersection of present vulnerability and the prospect of climate change in Africa warrants proactive action now to reduce the risk of large-scale adverse effects. The process of planning adaptive strategies requires a systematic evaluation of priorities and constraints, and the involvement of stakeholders. The most effective strategies are likely to be to reduce present vulnerability and to enhance a broad spectrum of capacity in responding to environmental, resource and economic perturbations. The Association for the Promotion of African Studies (APAS) believes that proper study of the effects of climate change on Africa and the attendant solutions proffered in this book by seasoned researchers and scholars will go a long way to help policymakers and indeed all Africans and lovers of Africa to be better disposed to tackle the problems of climate change in Africa. The present book is a contribution of APAS members to the ongoing discussion on climate change as it affects Africa as a continent.

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Africa and Climate-Related Disasters

¹*Prof. Ikechukwu Anthony KANU*

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Introduction

According to ISDR Report (2011), Africa is the least emitter of greenhouse gases into the atmosphere, yet the most affected by the extreme impacts of climate change. The impacts come in the form of hazard-related disasters (Floods, erosion, drought and storm). Today, these disasters strike unexpectedly in different countries found in Africa. Many are, therefore, displaced or forced to move by the occurrence of these climate related disasters. As a push factor towards migration, it has increased the number of Africans on the migration list and with its expected increase in the years to come, it is expected that the contribution of Africa to the migration pull can only increase. Although many countries in Africa have ratified the United Nations Framework Convention on Climate Change (UNFCCC) Convention Treaty of 9th May 1992 and the Kyoto Protocol of 1992, though effective in 2015 and some do participate in COP deliberations and have their own Intended National Determined Contributions (INDCs) working towards reductions in greenhouse gas emissions under the United Nations Framework Convention on Climate Change, a lot needs to be done and put in place. It is also good to note that few

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governments have invested resources to reduce the risk to climate-related disasters (ISDR, 2011).

This paper would study Africa's ability to handle climate related disasters on its own. To understand Africa's ability, this paper will first of all define disaster and show how it is related to climate change. It will also look into the different types of disasters that are caused by climate change. In addition to these, it will also look into the gaps and challenges faced by African countries in their bid to adapt and mitigate the climate related disasters. Finally, we have a way forward through which African countries can navigate out of the climate related disasters and a conclusion.

Disaster in Relation to Climate Change

Disaster by definition is a serious disruption of the functioning of a community or a society involving wide spread human, material, economic or environmental losses and impacts which exceeds the ability of the affected community or society to cope using its own resources (UNISDR, 2009). According IPCC (2012) anthropogenic activities cause climate change which in turn influences the natural hazards hence making people vulnerable to droughts, floods and storms. The link between disasters and climate change are therefore wrought in the impacts to the society. The impacts range from region to region. In the horn of Africa and the Sahel desert, severe droughts have been experienced in the past years especially the year 2011 and 2012. The consequences of the droughts are lack of sufficient food as the droughts affect agricultural production that is pegged on rain fed agriculture. There is also loss of livestock due to lack of pastures and water (Kolmannkog, 2009). In the areas that receive rain, the people experience flash floods and diseases.

Types of Disaster

The noticeable impact of climate change is the increase in the frequency and severity of the hazard related disasters. Hazards combined with vulnerability results in disasters (Kolmannkog, 2009). Majority of the climate- related disasters are drought (climatological), flood (hydrological) and storm (meteorological). Many households and communities have been affected by these disasters in different countries found in Africa.

a) Drought

The horn of Africa has suffered drought in the past two decades and it has the highest vulnerability indicators for drought (ISDR, 2011). In the last thirty years, seven out of the ten worst droughts disasters in the world took place in the sub-Saharan Africa. The worst one took place in 2011 that took place in the horn of Africa and it hit Ethiopia, Somalia and Kenya as many people were affected and suffered from acute shortage of food (Dorsouma 2015). This accounted for close to eighty percent of loss of life and seventy percent loss of property (Dorsouma 2015). During the droughts seasons, the most affected and vulnerable sector is the agricultural sector (IPCC, 2012). It is the source of livelihood to many and contributes approximately 50% of Africa's total export value and approximately 21% of its Gross Domestic Product (GDP) (PACJA, 2009). As such now, food production is minimal and the lives of many cannot be sustained

b) Floods

This occurs in the form of river flooding and hence the displacement of many people living around the riverine areas. The worst experienced was in 1998 that affected many parts in Eastern Africa due to a record of an unusual rainfall (El Nino 2014) and disastrous flooding (Dorsouma 2015). Flash flooding has also been experienced in the Arid

and Semi-arid lands that covers most of the horn of Africa and it results from excess rainfall (Dorsouma 2015). Cyclones occur in the south eastern coast of the Indian Ocean with Madagascar, Mozambique and Indian Ocean islands at risk (Dorsouma 2015).

c) Storms

Research has indicated that climate change will cause hurricanes and tropical storms to become more intense unleashing stronger winds and causing more damage to the coastal ecosystems and communities (The Nature Conservancy (2019). The strong winds will therefore destroy the houses and other property. Further, scientists have pointed out that higher ocean temperature as the main cause, since hurricane and tropical storms get their energy from the water (The Nature Conservancy (2019). As sea temperatures rise developing storms will contain more energy hence putting many communities at risk for devastation from floods (NRDC 2016).

Impact of disaster

The impacts of climate-related disasters vary from one country to another, in some regions they are common (horn of Africa). They include: decreased grain yield hence food insecurity, decrease of water levels and water availability, increase in droughts, floods and other extreme events, significant extinction of plants and animal species and finally, coastal erosion and an inundation caused by rises in sea levels (IPCC, 2001). These impacts now make people in different countries to migrate to places where there is either good pasture for livestock if they are pastoralists or to urban centers to seek for alternative livelihoods. It is also good to note here that disasters have different effects on human migration, with some people voluntarily migrating or being forcibly displaced, others trapped and forced to remain and yet others choosing to remain (Kolmannskog and Tamer, 2014).

In addition to this, climate-related disasters have also rendered most of the countries in Africa poor and as such there is no economic growth. When the disasters strike, most of the households lose their incomes. The infrastructure (road) is also destroyed due to the floods. Once the roads are destroyed access to markets is impossible and the exchange of goods and services is difficult to realize (IEG-World Bank, 2007). Lastly, the poverty levels rise as the livelihoods are affected and altered due to overreliance on rain fed agriculture.

Gaps and challenges that exist in African governments in dealing with climate–related disasters

Africa is blessed with natural resources; however, it is also one of the most affected by the climate-related disasters. Most of the African countries lack systems and structures that deal with these disasters because of the following: first, they have weak Early Warning Systems (EWS) compared to the developed world. In addition to the weak EWS, they lack modern tools and technology to monitor, predict and forecast future climate trends and the disasters they portend (Nwaniki, M. and Chagutah T. 2011). Telecommunication networks in most of the NMHS in Africa are also inadequate and obsolete hampering the efficient flow of observation (Nwaniki, M. and Chagutah T. 2011). This now limits the ability of the NHMS to provide and disseminate information to the rural areas. Second, most of the African governments lack policies and laws that safeguard the environment. Third, there is lack of financial instruments. Most of the African countries rely on donor funds to from overseas to put in place policies and structures that mitigate disasters. For instance in Kenya, the National Drought Management Authority is funded by the European Union. Fourth, Africa lacks robust research and data for evidence as far as disasters are concerned. In fact, lack of data availability is a major

constraint to measuring the disaster impacts effectively. Evidence remains patchy as availability of data on disaster losses in Africa is low (UN-ISDR, 2011). Fifth, lack of capacity and knowledge among the vulnerable on prediction and preparedness as far as disasters are concerned. Last, there is lack of participation as all communication is top-down. This is why there are no solutions to the problems affecting the vulnerable. Participation demands that there is need to listen to the people and problems and solutions must collectively be identified (Chagutah and Laudato Si, 2015).

Way Forward/Recommendations

Africa is alive to the climate-related disasters and has made efforts on how to reduce the disaster of climate change. In most of the countries therefore there exist policies, laws, bills and national strategic plans that give them strategies and inform their decision on what, when and how to deal with different disasters. Many countries have therefore put in place different approaches to address climate-related disasters. Some have concerted efforts as regions to deal with the disasters. For instance we have Intergovernmental Authority on Development (IGAD), Southern African Development Coordination Conference (SADCC), Economic Community of West African States (ECOWAS) and East African Community (EAC). All this are regional bodies formed to advise countries found in that region. Above all, African countries by the virtue of ratifying the UNFCCC Convention and the Kyoto Protocol participate in Conference of Parties (COP) to discuss the pathways and how to handle climate change.

For Africa to be able to manage the climate-related disasters, this paper makes the recommendations:

1. There is need for practical actions that demonstrate results in order to reduce risk related to climate disaster. The practical action here is good financial systems.

2. Innovations that help the communities to build resilience against the climate-related disasters must be pursued. This includes innovations on social protection, food security and insurance of livestock and crops (Oxfam, 2011). These innovations will spur economic development and economic development reduces exposure to natural hazards (IEG world Bank, 2007)
3. There is need for collaboration and partnership between the African governments, private sectors, NGOs communities and learning institutions. This partnership should be guided by a trans-disciplinary research approach to find solutions to the problems and disasters affecting the people. This will help the African countries develop more robust adaptation and response capability to disasters as part of their development planning (IEG World Bank, 2007).
4. African governments must set aside or make budgetary allocations to development and recovery of drought prone areas especially the arid and semi arid lands.
5. African governments need to put in place working and actionable EWS and information derived should be cascaded to all and made accessible to all (ISDR 2012)
6. African governments need to document evidence of the investment made in disaster risk reduction of both short term and long term impacts of disasters on individual households and communities at large
7. Use of indigenous knowledge. To succeed in reducing the climate-related disasters, African countries should make good use of the indigenous knowledge. The information obtained from IK should be used to develop seasonal climate forecasts that incorporate both IK and modern science (Ouma, 2010).

Conclusion

This work has studied the African continent in relation to its capacity to handle climate related disasters on its own. To understand Africa's ability, it began by first understanding what disaster means in relation to climate change and showed how it is related to climate change. It also looked in brief at the types of disasters that are caused by climate change. In addition to these, it studied the gaps and challenges faced by African countries in their bid to adapt and mitigate the climate related disasters. Finally, we have a way forward through which African countries can navigate out of the climate related disasters and a conclusion. This, notwithstanding, the paper submits that whatever the cause of hazards, that is, either by nature or by anthropogenic activities, climate-related disasters affect African countries more than any other in the world. As such now, Africa as a continent has the ability when the points on the way forward are acted upon and implemented in all the countries in Africa.

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2

Gas Flaring and Climate Change: Impact on Niger Delta Communities

Dr. Igbokwe, Clement Chimezie

Introduction

There is no doubt that gas flaring is negatively impacting on the climate – leading to the much talked about climate change. Bonny Island, Ogoniland, Portharcourt, etc are urban cites surrounded by the Atlantic Ocean. Gas flaring is visible within and around the above mentioned communities all year round with the oil companies and the Nigerian government doing nothing pragmatic at reducing or stopping this dangerous phenomenon. The danger resulting from this is that besides the health implications of gas flaring, these communities are at the risk flooding. When oil was first discovered in Oloibiri in 1956 and in Ogoniland a few years later, the local people naturally looked forward to the social and economic benefits that this natural resource endowment would confer. Paradoxically, the blessings expected from the oil industry have, in many respects, turned out to be a curse. The time to act is now on the part of both the federal government of Nigeria and the oil companies operating in the Niger delta. Practical and pragmatic steps must be taken aimed at reducing the health risk of gas flaring as well as averting the impending flooding that is seriously looming.

The implication of flooding of these communities will be disastrous and unmanageable especially in Bonny Island which harbours the

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multinational company's terminals. Apart from the dangers to the people and the communities, the colossal loss will be detrimental to the Nigerian government that depends heavily on oil and gas as her main foreign exchange earners. Climate change is top on any chains of global agenda. Little wonder this book as well as the international community has taken this phenomenon very serious. The book chapter identified that in spite of official posturing, the Nigerian government and the multinational corporations operating in the Niger Delta pay only lip service to the environmental and health risks associated with gas flaring or have done little but inconsequential towards managing the risk associated with this phenomenon. Gas flared in Nigeria is released as methane which is contributing to the depletion of the ozone layer resulting in climate change.

Axiomatically, gas flaring has been a recurrent problem in the Niger Delta, with devastating effects on the environment. Many rural and urban communities are exposed all year round to the black soot (black rain), air pollution, the corrosion of zinc and other environmental hazards that result from gas flaring. Furthermore, the low lying communities of Bonny, Ogoniland and some other Niger Delta communities are particularly vulnerable to flooding, displacement and other disasters that may result from climate change. Nigeria is ranked 7th on the list of countries involved in gas flaring around the world. About half of this gas is flared by Shell Petroleum Development Company. This chapter examines the impact and implications of gas flaring in Nigeria's Niger Delta region, and considers how the environmental and health risks associated with the oil and gas industry can best be addressed. Following the UNDP Niger Delta Human Development Report and other recent accounts, this study highlights the adverse health and environmental impact of gas flaring and other activities associated with the extraction of oil and gas in the Niger Delta.

Climate Change

The most general definition of climate change is a change in the statistical properties (principally its mean and spread) (*Solomon; Qin; Mannin; Chen; Marquis; Averyt,; Tignor; Miller, 2007*) of the climate system when considered over long periods of time, regardless of cause. The term “climate change” is often used to refer specifically to anthropogenic climate change (also known as global warming). Anthropogenic climate change is caused by human activity, as opposed to changes in climate that may have resulted as part of Earth's natural processes. In this sense, especially in the context of environmental policy, the term climate change has become synonymous with anthropogenic global warming. Within scientific journals, global warming refers to surface temperature increases while climate change includes global warming and everything else that increasing greenhouse gas levels affect (*Hulme, 2016*).

The United Nations Framework Convention on Climate Change (March 1994) states:

Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Niger Delta at a Glance

The Niger Delta comprises 70,000 km² (27,000 sq mi) of wetlands formed primarily by sediment deposition. It is a home to 31 million people and 40 different ethnic groups, [Bini](#), [Efik](#), [Esan](#), [Ibibio](#), [Igbo](#), [Annang](#), [Yoruba](#), [Oron](#), [Ijaw](#), [Ikwerre](#), [Abua/Odual](#), [Itsekiri](#), [Isoko](#), [Urhobo](#), [Ukwuani](#), [Kalabari](#), [Okrika](#), [Ogoni](#) and [Obolo](#) people, are among the inhabitants of the political Niger Delta, speaking about 250 different dialects. This floodplain makes up 7.5% of Nigeria's total land

mass. It is the largest wetland and maintains the third-largest drainage area in Africa. The Delta's environment can be broken down into four ecological zones: coastal barrier islands, mangrove swamp forests, freshwater swamps, and lowland rainforests.

Historically and cartographically, the Niger Delta consists of present-day Bayelsa, Delta, and Rivers States. In 2000, however, Obasanjo's regime included Abia, Akwa-Ibom, Cross River State, Edo, Imo and Ondo States in the region. The Niger Delta and the South South geopolitical zone (which contains six of the states in Niger Delta) are two different entities. The Niger Delta separates the Bight of Benin from the Bight of Bonny within the larger Gulf of Guinea. The *Niger Delta* is the *Delta* of the *Niger River* sitting directly on the Gulf of Guinea on the Atlantic Ocean in Nigeria (Hogan, 2013). It is typically considered to be located within nine coastal southern Nigerian states, which include: all six states from the South South geopolitical zone, one state (Ondo) from South West geopolitical zone and two states (Abia and Imo) from South East geopolitical zone. Of all the states that the region covers, only Cross River is not an oil-producing state following the handover of Bakassi Peninsula to Cameroon.

The Niger Delta is a very densely populated region sometimes called the *Oil Rivers* because it was once a major producer of palm oil. One will recall through a sense of history the role of the middle man King Jaja of Opobo during this period. The area was the British *Oil Rivers Protectorate* from 1885 until 1893, when it was expanded and became the Niger Coast Protectorate. The delta is a petroleum-rich region and has been the center of international controversy over pollution.

Overview of Oil Exploration in Nigeria

The voyage into the history of oil exploration in Nigeria is traceable to 1907 when Nigerian Bitumen Corporation embarked on the first

exploratory work in Nigeria, however, at the beginning of the First World War the firm was forced to leave. Following her exit, license was then granted to D'Arcy Exploration Company and Whitehall Petroleum. Although both companies' effort did not yield the desired result as they could not discover oil in commercial quantity and returned their license in 1923. (Frynas, 1999).

A new license covering 357,000 sq. miles was given to a new consortium called Shell D'arcy Petroleum Development Company of Nigeria, the new firm was a consortium of Shell and British Petroleum (then known as Anglo-Iranian), the company was incorporated in 1936 but began exploratory work in 1937. The consortium was granted license to explore oil all over the territory of Nigeria but in 1951 and between 1955 and 1957, the acreage allotted to the company in the original license was reduced. Drilling activities started in 1951 and the first test well was drilled in Ikeduru - Owerri area. Oil was discovered in non-commercial quantities at Akata, near Eket in 1953. (Frynas, 1999). Prior to the Akata find, the company had spent around \$6m pounds in exploratory activities in the country. Shell-BP in the pursuit for commercially available petroleum found oil in Oloibiri in the present Bayelsa state, Nigeria in 1956.

Other important oil wells discovered during the period were Afam Ndoki and Bomu in Ogoni territory. Production of crude oil began in 1957. In Feb 17th 1958 the first 18000 tons of crude was exported to Europe through Bonny River by a tanker called Hemifusus, and in 1960, a total of 847,000 tonnes of crude oil was exported. Towards the end of the 1950s, Non-British firms were granted license to explore oil; Mobil in 1955, Tenneco in 1960, Gulf Oil and later Chevron in 1961, Agip in 1962, and Elf in 1962. It is imperative to note that by July 1971 Nigeria has succeeded in becoming the 11th member of the

Organization Petroleum Exporting Company (OPEC) originally formed in 1960 by 5 Arab oil countries, and in 1979 Nigeria first reached the then considered peak of oil production by producing an average of 2.4 million barrel per day.

Dangers Associated with Gas Flaring

Apart from black soot with its health challenges, the gas flared on daily basis has its attendant health and environmental consequences. Below are some of the pictorial display and complaints from host Niger Delta communities



Picture showing a gas flaring from the ground in one of the remote Niger Delta community.





The above picture shows the method adopted by oil companies to get rid of waste gas released through drilling by oil industries. This flow station is located less than 100 meters (109 yards) from a residential area in a small village near Ekpetiama Yenagoa in the Niger Delta region. The burner close to this area has resulted in respiratory problems for the residents of the area.

The residents recount their ordeal “Suddenly everything smells like gas.” The air pollution that takes place in this area is unbearable. Flame as tall as 10-storey building burns day and night in most villages in Nigeria's Niger Delta irrespective of the season. But the heat from this fire is neither soft nor warm; it's fierce and prickly not just to the human body but also to the ecosystem.

The constant noise sends bush animals fleeing, and people have to shout for them to be heard over the roaring flames. Fields of crops, once green, have turned yellow or stopped growing entirely and palm trees close by have stopped producing. The gas flaring caused a rise in soil temperature and thereby declining crop yields. The village no longer enjoys the respite of cool or darkness of night.

Statistics show that in the oil-rich Niger Delta of Nigeria, about 2 million people live within 4 kilometers (2.5 miles) of a gas flare point.

The picture above show the flames produced when oil is being extracted. With the oil comes gas - considered by the oil industry to be a dangerous waste product to be burned off in a process called gas flaring.

Suffice to note that the fears of the people of Niger Delta are legitimate because constant exposure to air pollutants released by gas flaring have been linked to cancer and lung damage, as well as neurological and reproductive problems. Although the oil industry brings jobs, residents in the Niger Delta suffer many negative consequences from gas flaring which is neither comparable nor commensurate with the type of jobs provided by these firms

Prior to gas flaring rainwater was a major source of drinking water for most families who have no access to pipe born water but all of that is in the past now due black soot rain which is not only dangerous to health, skin but also corrodes the zinc roof. On a visit to Port Harcourt I washed my ash colour vehicle at night hoping to travel in it the next morning, I woke up to see tiny black soot all over it the next morning. Invariably, since air occupies space, people must whether at sleep or waking on the streets of the Niger Delta stand the risk of inhaling soot in a bid to taking in oxygen.

According to the NNPC report in 1983, long before popular agitations and unrest erupted:

We witnessed the slow poisoning of the waters of this country and the destruction of vegetation and agricultural land by oil spills which occur during petroleum operations. But since the inception of the oil industry in Nigeria, more than twenty-five years ago, there has been no concerned and effective effort on the part of the government, let alone the oil operators, to control environmental problems associated with the industry. (Greenpeace)

Gas Flaring on the Rise in Nigeria

Nigeria has been exporting oil for more than 60 years, and the sector accounts for more than half of the government's foreign exchange earnings. The Niger Delta is among the world's most oil-rich regions. Since the start of crude oil exploration and exploitation in the area in the 1930s and 1950s, thousands of oil spills have fouled the Delta, and helped fuel conflicts in the region such that led to the killing of the 8 Ogoni men including the famous Ken Saro Wiwa in 1995. The people of Niger Delta cannot forget this incident in a hurry including the genocide in Odii town which was turned into a ghost village under Olusegun Obasanjo's administration.

Suffice to observe that gas flaring was officially banned in 1984, but the federal government of Nigeria rather than harness gas flaring into gas wealth, has repeatedly failed to fulfil her promises to end the practice.

In an event to help Nigeria fulfil this promise to end gas flaring, a London-based non-profit organization On Our Radar tested whether the government's most recent vow to put an end to gas flaring by 2020 were realistic. It commissioned geospatial data expert Rory Hodgson to analyze and measure hotspots from gas flares using infrared data. Unfortunately, Hodgson observed that the satellite data appears to show a marked increase in radiant heat emitted by gas flares in Nigeria starting late 2017.

The National Oceanic and Atmospheric Administration (NOAA) satellite that collected the data began recording infrared readings in 2012. In 2018, it yielded the highest readings for gas flaring in Nigeria. Imperatively, the data reveal that 2018 have more gas flares burning more intensely than has been seen for the past five years. The indication is that Nigeria goes against the global trend by substantially flaring

more gas in recent decades (World Bank, 2018). It's estimated that gas worth about a billion US dollars is burned every year in the Niger Delta.

Negligence and its Consequences in the Niger Delta

According to Okeke (2019) the reduction in the weight of derivation from 45% to 20% in 1975 was expedient and indeed justifiable. In his view, if 20% were sustained, the Niger Delta states would have long become the most prosperous states in the country, with the best developed infrastructure. They would not have been crying of underdevelopment and marginalization today. The injustice and utter neglect witnessed in the Niger Delta has a long history Okeke refers to it as an oppression which started during the Shagari era, when the weight of derivation was grossly reduced to 5% and ultimately under the Babangida era, to 1%.

It took the Ogoni to bring this issue to global attention. Under the Babangida regime, the federal government attempted to pacify the region through the introduction of twin policies of appeasement. It abolished the onshore-offshore dichotomy and established the Oil Minerals Areas Development Commission (OMPADEC) and allocated 3% of revenue from oil allocated to it (Okeke, 2019)

After General Sani Abacha became Head of State, and as a means of gaining legitimacy for his government, he convened what he called a Constitutional Conference. At that conference delegates from the southern states campaigned strongly for state ownership of mineral resources. It was decided that delegates from each state would cast one vote. A North v South conflict was imminent. The North would have won as it had two more states than the South. But, as the media hinted at the time, the federal government brought pressure to bear on delegates from Lagos, Oyo and Osun states to vote with the Northern states.

However, to conciliate the oil producing states, potentially the main beneficiaries of state ownership of resources, the Northern delegates conceded to a significant increase in the weight of derivation, from 1% to 13%. The Abacha regime adopted it and included it in its (unpublished) 1995 Constitution. The proposal was subsequently adopted by Abdusalami Abubakar regime, and became Section 162 (2) of the 1999 Constitution: “[The] principle of derivation shall be constantly reflected in any [revenue] formula as being not less than thirteen percent of the revenue accruing to the Federation Account directly from any natural resource”(Okeke, 2019).

Oil Revenue Sharing Formula					
Year	Federal	State*	Local	Special Projects	Derivation Formula**
1958	40%	60%	0%	0%	50%
1968	80%	20%	0%	0%	10%
1977	75%	22%	3%	0%	10%
1982	55%	32.5%	10%	2.5%	10%
1989	50%	24%	15%	11%	10%
1995	48.5%	24%	20%	7.5%	13%
2001	48.5%	24%	20%	7.5%	13%

World Bank Report, 2001

Citizens of Niger Delta believe that they have not been able to see the economic benefits of oil companies in their environment. Moreover, Nigerian government officials have remained majority shareholders in the profits created by the production of Nigerian oil to detriment of

their host communities, and this has led to the unrest and pipeline vandalism often witnessed in the area. The above table provided by the World Bank justifies this assumption. Below is also a display of one of such groups and their activities. Until the Nigerian government shows sincere commitment to addressing the plights of the people of the Niger Delta, I doubt there would be an end in sight of wanton destructions of this nature. Oil exploration and production within the area are destroying not just the aquatic life but also constituting environmental degradation and air pollution without commensurate socioeconomic benefits. This has led to the people's insistence on oil companies' compensation. But unfortunately, the internal forces collaborator attitudes with the oil companies and the federal government have made it relatively impossible for violent not to occur.

Beside the fears and complains, there is also the “fear of the unknown” I called it so because no one can predict for sure when these inevitable will occur. I have mentioned it in passing somewhere in the introduction that the Niger Delta communities are at the risk of over flooding as a result of climate change and that no doubt will be catastrophic to communities close to the Atlantic Ocean. Considering the level of explorative and exploitative activities in the Niger Delta coupled with sustained increase in the magnitude of gas flaring, the people and the environment of the Delta may be submerged one of these days. It will not only be disastrous to the people and their environment but also to the Nigerian economy that is heavily dependent on oil and gas. Bonny in Rivers State is an Island and a host community to most oil firms such as Shell, ExxonMobil, Elf, Agip, NLNG, etc and serves as a route through which crude oil and natural gas are exported to various parts of the world, imagine what will happen if this island is taunted by a natural disaster resulting from climate change. The time to think and act rationally is now.

Politicization and paying of lips service to this issue just as the government have done in the past holds the fate of a mutual assured destruction for all.



Soon after the Niger Delta Avengers, one of the deadliest rebel groups in the region, announced that it was resuming hostilities in the area, other militant groups under the umbrella of a coalition of militants also followed suit.

Community leaders in the oil-rich Niger Delta urged the militants to shelve their planned attacks on pipelines and allow for peace talks with the government. The administration reiterated that it was willing to negotiate. Unfortunately, the negotiation like the previous ones could not produce any tangible result.

The coalition of rebel groups blames the resumption of hostilities on the federal Government's neglect of the region which is consistent with her previous dispositions in the demands of the Niger Delta. The continuous attack by militant groups on oil installations and shutting down of offices of oil companies have always proved disastrous to the economy. The people of the Niger Delta as well as the militants also view with dismay and see the newly adopted military strategy otherwise called “Python Dance (now Atilogwu) and Crocodile Smile”

as direct attack on the region. A strategic targeted at silencing the people's legitimate agitations following years of neglect and marginalization is unnecessary and provocative.



This incredibly well-endowed ecosystem, which contains one of the highest concentrations of biodiversity on the planet, in addition to supporting the abundant flora and fauna, arable terrain that can sustain a wide variety of crops, economic trees, and more species of freshwater fish than any ecosystem in West Africa have been neglected for too long and the impacts are visible all over the Niger Delta.

The effects of oil exploration in the fragile Niger Delta communities and environment have been enormous. The indigenous people of these communities have seen little if any improvement in their standard of living while suffering serious, acute and life threatening damages to their lives and natural environment.

Though Nigeria is a major oil exporter, years of maladministration, corruption and nepotism have contributed to the inefficiency witnessed in the oil industry in Nigeria. Nigeria rank 7th among the top gas flaring nations of the world yet it imports most of its gasoline when the gas being flared on daily basis can produce enough energy for the country.



Fishing without fish

The Nigerian village of Bodo (Ogniland) used to subsist on fishing. But following oil leaks from Shell pipelines in the Niger Delta in 2008 and 2009, the nets have remained empty. People who want to make a living from fishing are forced to go out on the open sea. That means longer working hours and higher costs. The so called “Clean up Ogniland” project has witnessed no serious action but much rhetoric.



Oil streaks everywhere

The United Nations Environment Program (UNEP) released a report in 2011 about the oil leaks in Bodo and other parts of Ogoniland - recommending that the government and oil companies provide one billion dollars for the clean-up. So far though, the oil streaks that shimmer on the water still haven't been addressed.



Black Gold is King

Since the beginning of oil production in 1958, Nigeria has risen up to become the world's eighth biggest oil exporter. That makes the country extremely dependent on 'black gold,' which accounts for 90 percent of export profits. That's why people have tolerated pipelines like this one in the Rivers State.

Recommended Reduction Strategies

Gas flaring in Nigeria's oil industry poses a major health risk to the urban and rural communities of the Niger Delta. Protests against government neglect and the recklessness of the oil and gas companies are rife, especially in the rapidly growing city of Port Harcourt and other Niger Delta communities. In the light of the above:

1. The federal government in conjunction with the oil companies should build world class and well equipped medical facilities that will provide medical treatments for the people of Niger Delta. Suffice to state that none of the cancer treatment facilities are located in the Niger Delta. The only functional Ibadan machine often brakes down living the people at the mercies of either travelling abroad for treatments or die as they may not be able to afford the trip.

2. Efforts geared at reducing gas flaring which can even be harnessed for energy generation has become urgently necessary and expedient. This can be done by building more gas plants for the collection of much gas flared into the air.
3. There is the need for Nigeria to converge a team of experts who may have to borrow ideas from other oil and gas producing nations whose gas flaring levels have been drastically reduced.
4. There is a need for the relevant agencies to scale up environmental and biological monitoring of air pollutants. The implication of a possible relationship between gas-flaring and hypertension, cancer, respiratory challenges, etc brings to the fore the need for interventions to regulate gas-flaring activities.

Conclusion

This chapter has examined the attendant consequences of climate change on the environment by isolating the degree to which gas flaring is a contributing factor.

When Shell-BP discovered the oil in commercial quantity at Oloibiri in the Niger Delta, there were high hopes of a better Nigeria and a much more better Niger Delta - wishing that the maximum utilization of this newfound oil opportunity will pay greater dividends than the abandoned agriculture which was originally the mainstay of the national economy will forever be forgotten. Unfortunately, all of these hopes were dashed following the attendant health and environment challenges the oil exploration has brought upon the Niger Delta people. According to a report extracted from **an online source, it is** estimated that \$770 million (€678 million) was a lost income for 2016 alone, based on a 2016 gas price of \$2.49 per gallon (**www.dw.com**). There is no gainsaying drawing from the above fact that flaring of gas is tantamount to burning money.

In a country where about 35 percent of the population does not have access to electricity, this waste can be transformed into wealth for the economy as well as for the general good of the populace living in the Niger Delta. Gas flare can be converted to light. If there is light, no doubt, there would be micro and macro development.

Gas flaring is a significant contributor to global warming resulting in climate change. The United States Environmental Protection Agency's greenhouse gas calculator estimates emissions from flaring in Nigeria in 2016 were equivalent to more than 3.5 million passenger vehicles driven for one year (www.dw.com). The time to take action is now even though the 2020 deadline to end gas flaring in Nigeria is almost a mirage,

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3**Climate Change and the Niger Delta Experience***Cyril Emeka Ejike***Introduction**

Climate change is a global phenomenon that poses an impending danger to humanity. It is human made and its impacts are global in scale, affecting global stability. It occurs when there is a rise in atmospheric temperature precipitated by the cumulative level of greenhouse gas concentrations and emissions. Greenhouse gases (GHGs) are gases in an atmosphere that “absorb and emit radiation within the thermal infrared range” (Nwaonicha, 2018, para 1.). They absorb infrared radiation from the earth leading to rise in atmospheric temperature.

Although GHGs occur naturally and are indispensable for the survival of human and millions of other living things since they block out some of the warming of the sun from being thrown back in the space, and make the Earth liveable, their quantities have risen to an unprecedented scale in three million years as a result of industrialization, deforestation, and large scale agriculture (United Nations, n.d.). Increase in average global temperature was observed since the mid-twentieth century in the wake of increasing concentrations of greenhouse gases. Since the emergence of global warming, atmospheric temperature has risen between 0.4 and 0.8°C in the last 100 years (IPCC, 2005).

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Prior to the discovery of oil in commercial quantities in 1956 at Oloibiri in Rivers State and its subsequent production on a commercial scale in 1958, Niger Delta states, especially Rivers and Bayelsa, were the home of many immigrants. Rich natural endowments in the states were the main source of attraction that prompted the migration of people to the Niger Delta region in search of arable land for arable farming, trade, and jobs (Obodoegbulam, Kpe, Amadi, & Ngbara 2019). Regrettably, the reverse is now the case, as the Niger Delta communities are forced to migrate to other regions and countries as a result of gross environmental damages and ecological disasters occasioned by oil spill, gas-flaring and greenhouse gas emissions arising from indiscriminate oil and gas exploitation in the region.

The main thrust of this paper is to demonstrate the impacts of climate change on Niger Delta region. Attempts are made to suggest measures to be taken to rise to the challenge of climate change in the region. To this end, the rest of this paper will conceptualize climate change and explain its causes and effects. It will thereafter show the impacts of climate change on Niger Delta region. Finally, the paper will give concluding reflections.

Meaning of Climate Change

Climate change is a periodic modification of Earth's climate system occasioned by interaction between the atmosphere and other factors, especially chemical and geographic factors, within the Earth system (Jackson, 2019). Climate change occurs when there is a long-term change in typical weather patterns in a place. It is a variation in general weather conditions over a long period of time in a particular area, resulting in an increase in average temperature of the Earth's surface and of the Earth's near-surface air.

Climate change refers to “seasonal changes over a long period with respect to the growing accumulation of greenhouse gases in the atmosphere” (UAE Government, 2019, para. 1). Climate change can sometimes be called global warming – the rise in average global temperature.

Causes of Climate Change

There is a consensus among the scientists that climate change is mainly precipitated by the burning of fossil fuels such as coal, oil, and natural gas. Burning of fossil fuels emit carbon dioxide (CO₂) and methane (CH₄) and other harmful greenhouse gases such as water vapour, nitrous oxides, ozone, and fluorinated gases (halocarbons) which include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride. Scientists have established that CO₂ which is largely the product of burning fossil fuels accounts for about two-third of GHGs (United Nations, n.d.).

When GHGs are released into the air, they trap heat energy from the sun or above the Earth, leading to the gradual rise or warming in the temperature of the Earth's atmosphere and oceans. This is known as greenhouse effect. Therefore, climate change is caused by increase in atmospheric temperature in the wake of increased amounts of greenhouse gases around the Earth or in the air. Thus, a steady rise in greenhouse emissions and concentrations leads to global warming or an increase in average global temperature.

Climate change can also be caused by other human activities such as industrialization, deforestation, and large scale agriculture which contribute to increased quantities of greenhouse gases in the atmosphere. GHGs that emanate from industrial activity are mainly sulphur hexafluoride, HFCs, PFCs, and nitrous oxides. Agricultural

activities such as clearing of land, the combustion and decay of organic matter increase atmospheric CO₂. Thus, climate change is predominantly caused by anthropogenic (human-induced) greenhouse gas emissions.

Effects of Climate Change

Climate change has deleterious effects on ecosystem – all the animals and plants in a particular area together with the complex relationship that exists between them and their environment. Its effects include, but not limited to, rising sea levels, extreme heat and cold, harsh weather events like severe drought and additional rainfall. An increase amount of carbon dioxide in the atmosphere results in ocean surges and acidification. Rising sea levels are precipitated by melting of the polar ice caps caused by warm climate. Rise in sea level changes the amount and pattern of precipitation, including expansion of subtropical deserts, changes in frequency and intensity of severe weather events, changes in agricultural yields, and species extinctions (Nwaonicha, 2018).

When the ocean temperature is warm, it could engender frequent severe storms leading to catastrophic flooding, displacement of people from their homes, destruction of lives and property, destruction of natural habitat, and so forth. Besides, plants and animals are deprived of sufficient water needed for survival when there is severe drought, thus exposing them to wildfire. Hence, the United Nation's Intergovernmental Panel on Climate Change (IPCC, 2014, as cited in Vanguard Nigeria, 2014, para. 6) warns that “rising greenhouse emissions will 'significantly' boost the risk of floods while droughts will suck away sustainable water supplies.”

Nwaonicha (2018) summarily states that seven indicators that would increase in a warming world are sea level, humidity, tropospheric

temperature, sea surface temperature, temperature over oceans, ocean heat content, and temperature over land, while three indicators that would decrease in a warming world are sea ice, snow cover and glaciers. By International Energy Agency's assessment (as cited in Nwaonicha, 2018) greenhouse gas emissions will be up to 130% by 2015 if the alarming rate of the emissions is not reduced.

The Impacts of Climate Change on Niger-Delta Region

Climate change presents a serious threat to life, property, security, peace, and development in the Niger Delta Region. Niger Delta has had more than its fair share of adverse effects of climate change due to enormous oil spillage, excessive gas-flaring and the proliferation of greenhouse gas emissions arising from oil and gas exploration and production. Excessive greenhouse gas emissions arising from burning of fossil fuels warm the earth surface (land and oceans) of the region which has deleterious effects on crop production, livestock rearing, fisheries, and forestry. Anthropogenic distortion of climate has thus brought ecological disasters for the coastal region. Niger Delta region has the highest kilometre (km) of coastlines in Nigeria. Bayelsa/River States (390km), Delta State (126km) and Akwa Ibom/Cross River States (108km) constitute 712 km of 960 km of coastlines in the coastal states of Nigeria (Ayansanwo, 2003).

Fishing and farming are the major sources of livelihood for many people in the region. Increased amount of carbon dioxide in the atmosphere arising from the burning of fossil fuels in the region causes ocean acidification – decline in the pH of oceans due to high temperature. Atmospheric carbon dioxide dissolves into oceans, rivers and lakes, and reacts with water to form carbonic acid, resulting in carbonic acid molecules. Some molecules split into bicarbonate ion and a hydrogen ion which cause a surge in ocean acidity.

Consequently, aquatic life of organisms and the entire marine ecosystems are threatened. In the long run, aquatic organisms are decimated.

This accounts for drastic reduction in fish catches which means decline in fish production or supply of fish from the region with its concomitant loss of income and widespread poverty in the region. Salt water intrusion coupled with flooding pollutes streams and make water unsafe for drinking, thus leading to portable water shortage. Sample water examined in April 1997 which was taken from water used for drinking and washing by villagers in Luawii in Ogoniland, Rivers State revealed that water contained 18ppm of hydrocarbon which was 360 times the level allowed in drinking water in the European Union (Nnoli, 2006). Again, an analysis of a sample of drinking water taken from Ukpeleide, in Ikwere Local Government Area in Rivers State showed that the water contained 34ppm which was 680 times the European Union standard (Human Rights Watch, 1999, as cited in Akpuru-Aja, 2007, p. 103). Therefore, pollution of stream water does not only destroy aquatic life of organisms and deny fishermen their source of livelihood, but also make water unsafe for drinking.

Besides, excessive greenhouse gas emissions and gas flaring, which released methane that has a higher warming potential than carbon dioxide, make the Niger Delta region most vulnerable to the potential effects of rising sea levels (Akpuru-Aja, 2007). Ocean surges as a result of a surge in atmospheric carbon dioxide and warm climate lead to catastrophic flooding, erosion of farmlands, salination of irrigated farmlands, sand deposition, and damage to general soil fertility (Idowu et al, 2011). Frequent severe storms occasioned by ocean surges in the wake of warm climate often result in loss of housing units, farmstead stores, post-harvest sheds, poultry/piggery sheds, forest resources, and so forth (Idowu et al, 2011).

Flooded farmlands or wetland expansions lead to loss of arable land for crops within the areas with limited crop facility capacity, thereby reducing vegetable or root crops production (Idowu, Ayoola, Opele, & Ikenweiwe, 2011). Related to this are the excess rainfall, high temperature and high humidity due to climate change. Variations in the pattern and frequency of rainfall and flood precipitated by greenhouse gas emissions increase the incidence of pests and diseases, which go haywire under severe weather events, resulting in decline in crop harvests. Thus, high rate of growth of parasites living in or on livestock due to climate change has led to an increase in livestock mortalities and a reduction in the volume of livestock production in the region.

Destruction of farmlands, soil fertility, marine ecosystems, biodiversity, housing, and natural ecology in the region have brought about the displacement of the Niger Delta communities and forced migration, while the remaining poor masses are plunged into misery on a vast scale. Alade (2019, as cited in Olowale, 2019) notes that over 14 million people have been displaced in Nembe, Eket and other coastal settlements in Bayelsa, Delta, Cross River, Rivers and so forth, on account of climate change. The remainder of poor inhabitants in the Niger Delta region are being ravaged by extreme hunger due to food insecurity. Water scarcity exposes them to water-borne diseases, while severe rainstorm and wind have killed hundreds of people and destroyed property worth billions of naira (Alade, as cited in Olawale, 2019).

The above-stated deleterious effects of climate change on the Niger Delta region combined with decades of developmental neglect by the forces (state officials and petrobusiness actors) that control the Nigerian State are responsible for the eruption of conflict and violence in the region as well as a struggle for resource control over time. The

crisis is compounded by political posturing and egocentricity of petrobusiness actors (the petrobusiness class, the middle class and foreign capitalists) created during years of military rule (Nnoli, 2006). While the foreign capitalists invest in the petroleum sector, the petrobusiness class and the middle class “use the state to get and execute public contracts” (Akpuru-Aja, 2007, p. 108).

Akpuru-Aja (2007) notes that it is widely speculated that the petrobusiness actors play double standard to preserve the parochial lines of petrobusiness activities in the region. On the one hand, they provide the community militant youths with arms to support the youths' demands from the government and multinational oil companies. On the other hand, they allegedly hire armed youths to safeguard the activities of the multinational oil companies against hostility by the community militants youths (Akpuru-aja, 2007). The petrobusiness actors therefore seems to perpetuate violence in order to protect their private interests and ensure continuous exploitation of oil and gas in the region, mindless of the plight of the host communities.

Political and ruling elites of the Niger Delta region, who are part of the petrobusiness and middle classes, are also complicit in the impoverishment of the masses in the region. They exploit the youths' struggle for resource control to negotiate a good deal with the government on resource sharing and get public works contracts, while the issue of environmental degradation, displacement, and ecological disasters with all their concomitant widespread poverty and endemic diseases are left unattended. There is a general feeling that the ruling elite of the region collude with the government officials to embezzle funds earmarked for the development of the region, as they have privatized the instrument of the state to pursue their selfish interests “through public works contracts and outright misappropriation of public funds” (Ibeanu, 2009, p. 22).

The findings of a study of oil revenue governance in the Niger Delta region by Ibeanu and his colleagues indicate that development has failed in the region due to lack of accountability, transparency, public participation in development programmes and spending, and so forth (Ibeanu, 2008, pp. 32-33). It is paradoxical that oil wealth has created poverty in the region – the major source of oil wealth – and the economic growth achieved through oil wealth has underdeveloped the region (Ibeanu 2009). In this regard, Nwosu (2009, p. 546) laments that “the oil which has brought so much wealth to the multinational oil companies and the Nigerian State has at the same brought to the people of the Niger Delta untold poverty, disease, persistent pollution, ecological and environmental degradation.”

The impacts of climate change on Niger Delta region as a result of indiscriminate oil and gas exploitation can be summed up in the following words of Gewirth (1984, pp. 560-561):

The poor are made to pay for the advances in technology over which they have had no control, while the controllers of industry and enterprise who have created and understandably used these advances have been freed from all responsibility for the resulting deprivations. In this regard, the deprivations are what economists call 'externalities', which also include the air and water pollution and other harmful effects produced by the unregulated operation of large-scale industry.

Concluding Reflections

We have stated in this paper that climate change is precipitated by too much concentration and emissions of greenhouse gases in the atmosphere as a result of human activities, especially fossil-fuel combustion. We argue that the burning of fossil fuels arising from oil exploitation in the Niger Delta region is mainly accountable for environmental degradation, desertification, widespread soil erosion, destruction of aquatic life of organisms as well as farmlands and, above

all, destruction of ecosystems of the region, resulting in shortage of food and water supply, displacement of the host communities, forced migration, economic, conflicts and violence.

For ecosystems to adapt naturally to climate change and to ensure that food and water are not shortened further, Nigeria government must minimize the proliferation of greenhouse gas emissions at a threshold that would forestall indiscriminate human-induced interference with the climate system (UNFCCC, 2019). This can be achieved by formulating and implementing effectively climate change policies, and taking measures to clampdown indiscriminate and mindless exploitation of oil in the Niger Delta. As the nation strives to industrialize by means of burning fossil fuel, gas flaring, and agriculture, it must tread cautiously and properly to preserve ecosystems in the region and save the community from imminent decimation. In the light of this, Bello rightly states that an approach to climate action should be guided by this consideration: “the need to be pragmatic and sustainable: we bear in mind the costs and the trade-offs involved and thereby adopt policies that balance both economic growth and sustain the environment (2013, para 7.)

The major challenge of transforming the Niger Delta narrative is treading on the toes of corrupt and self-serving government officials and Niger Delta elite who are complicit in the impoverishment of the Niger Delta communities. However, it is expedient to fight systemic corruption and unbridled greed in the exploration of petroleum in the Niger Delta region which violate the communities' sense of fair play and engender their growing clamour for resource control. Niger Delta communities are in dire need of long-term prospects for food and water security. The current amnesty granted to all former militants is just a short term palliative that only brings a fragile peace in the region. The

emergence of new militant youths demanding for amnesty or resource control is looming on the horizon and another group is bound to emerge thereafter. The trend will continue unabated with all its attendant conflicts and violence.

As a matter of great urgency, the government needs to focus more on introducing, developing and promoting renewable energy sources like solar, domestic waste management, water management and purification, and climate-smart agriculture (Alakija, 2019) to ensure environmental sustainability and arrest the worsening food and water shortages in the region. Beyond this, given that climate change is a global phenomenon that poses a global security threat, it requires global and multilateral cooperation from all relevant stakeholders. In this regard, Yusuf urges “world leaders, policy makers, governments and corporate organisations to work together in a bid to tackle the threat posed by climate change” (2019, as cited in Adegboye, 2019, para. 1.). Nigerian government must remain open to international cooperation and assistance in mitigating the deleterious effects of climate change in the Niger Delta region.

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4

Climate Change and its Impact on African Traditional Religion and Culture

Festus Chimezie Ajeli

Introduction

Religion in its simplest meaning is a fundamental set of beliefs and practices generally agreed upon by a group of people. These set of beliefs concern the cause, nature, and purpose of the universe, and involve devotional and ritual observances. The Oxford advanced learner's dictionary (2010) defines religion as the belief in the existence of a god or gods and the activities that are connected with the worship of them. They also often contain a moral code governing the conduct of human affairs. To this end, religion shapes the moral behaviour of a people who practices it and people who are born into the religion are indoctrinated in line with the tenets of the religion in order to maintain the same reasoning with the rest of the group. Thus religion has to do with a belief in a particular being. This being is known or called by different names, but one thing is clear, it guides and directs the totality of the people who believes in it.

From time immemorial, man has demonstrated a natural inclination towards faith and worship of anything he considered superior/beyond his understanding. His belief/religion consisted of trying to appease and get favours from the Supreme Being who he feared. This resulted in performing rituals and keeping traditions or laws to earn goodness and/or everlasting life from the supreme one.

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In Nigeria, we have three main religions, the African Traditional Religion, Christianity and Islamic religion. The beliefs and practices of these religions vary but they all believe in the existence and supremacy of the Supreme Being. This Supreme Being who is believed to be everywhere and is responsible for man's mission on earth is usually appeased and respected to make a man's way smooth both here and hereafter.

Climate change on the other hand is the significant increase in the earth's temperature over a long period of time. Long-term averages of weather are called "climate" while changes in the long term average are called "climate change." Thus McLean and McMillan (2009) have described climate change as "a phenomenon whereby solar radiation that has reflected back off the surface of the earth remains trapped at atmospheric levels due to the build-up of carbon dioxide and other greenhouse gases rather than being emitted back into space". The effect of this is the warming of the global atmosphere otherwise known as "global warming".

Although, climate change is a global phenomenon with impacts affecting the world over, these impacts are more deeply felt in developing countries, especially those in the continent of Africa. Climate change has caused the rise in poverty level, drought, flood and famine, with developing countries bearing the brunt of these impacts. Awolalu (1979) in concurring with the above asserts that there have been cases of droughts in the Horn of Africa, Southern Africa and the Sahel areas of Africa. To be sure, climate change has affected the socio-economic, cultural, health and political life of Africans in all ramifications. This paper seeks to critically evaluate the impacts of climate change on the African Religious and Culture with special emphasis on Nigeria.

The Concept of African Traditional Religion

African Traditional Religion refers to the indigenous religions of the African people. It deals with their cosmology, ritual practices, symbols, arts and society. Because religion is a way of life, it relates to culture and society as they affect the worldview of the African people. The African man have unflinching respect for his religion and always ensures that nothing comes between him and his God so as not to attract the wrath of his God. Traditional African Religions are not stagnant but highly dynamic and constantly reacting to various shifting influences such as old age, modernity, and technological advances. According to Ogbonna (2018), five married men who conspired and raped a widow because she rejected their sexual advances was stricken by the gods for forcing the woman against her wish. Its origin is lost in antiquity. However, it is believed to have been practiced by African fore-bears who handed it down from one generation to another. Awolalu (1979) also contends that "African traditional religion is the indigenous religion of the Africans. It is a religion founded on African soil, and undoubtedly interwoven with the culture of the people, expressed in beliefs and practices, myths and folktales, songs and dances, liturgies, rituals, proverbs, pithy sayings and names, "sacred spaces, places and objects; a religion which is slowly but constantly updated by each generation in the light of new experiences through the dialectical process of continuities and discontinuities".

African traditional religion is built on truth as going against the truth will incur the wrath of the gods. Thus, in Achebe (1958) Okonkwo was able to provide Ikemefuna for rituals and personally beheading him despite training him for years to the extent that Ikemefuna calls him father. He did this to justify the demand of the spirits who they held at high esteem.

Africans believe in the supernatural being(s) known as God and spirits which affects all aspects of their daily lives, from what they eat (or cannot eat), the way they farm, dress, do everyday chores, hunt, make tools and clothes, arrange themselves in families, marry, divide work among family members, educate their children, treat illness, and bury the dead". In fact from the above, the life of the African man is coordinated by his religion. There are days in the week which people abstain from doing any serious work such as the eke day. This suggest a holy day for according respect to the Supreme Being and this is absolutely what the Christians observe today as Sunday.

In the words of Baum (1999), African traditional religion, like most religious systems, "focuses on the eternal questions of what it means to be human. What is the meaning of life, and what spiritual powers are with the natural world and it seeks to portray the world as operating with some degree of order and predictability". African traditional religion places so much emphasis on the existence of ancestral spirits. Thus, lending credence to the belief in life after death. The belief in incarnation, life after death, protection of the living by the dead and appeasing the spirits to remove illness, catastrophe and disaster upon the living is a major characteristics of the African traditional religion.

In concurring with the above assertion, Ezechi (2011) observes that African families believe that the "dead are never gone". They believe that people continue to live through their spirits, after death. These spirits are often referred to as ancestral spirits. It is believed that spirits of the ancestors remain very interested in what happens in their families and communities. Hence, they provide protection against misfortune, drought, disaster, and disease, heal illness, and provide children, protection for livestock, rain and fertility of crops. The above assertion by Baum is buttressed by the belief in re-incarnation (ino uwa) of the dead, thus the dead comes back to the family through the birth of a new

child in the family. This child somewhat takes after the re-incarnated person and sometimes behaves and act like him.

The Concept of Culture

Culture is the characteristics and knowledge of a particular group of people, encompassing language, religion, cuisine, social habits, music and arts. Edward Burnett Tylor (1871) defines Culture as that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society. From Taylors definition it could deduced that culture encompasses morals, laws and customs which is crucial to people living in the society. Thus, it can be seen as the growth of a group identity fostered by social patterns that is unique to the group. Culture encompasses religion, food, what we wear, how we wear it, our language, marriage, music, what we believe is right or wrong, how we sit at the table, how we greet visitors, how we behave and relate with loved ones.

Culture according to Kroeber & Kluckhohn (1952) consists of patterns, explicit and implicit, of and for behaviour acquired and transmitted by symbols, constituting the distinctive achievements of human groups, including their embodiment in artefacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values; culture systems may, on the one hand, be considered as products of action, on the other, as conditional elements of future action.

In Nigeria, culture is held at high esteem, respected and revered, no one culture is adjudged better than the other because it is people's way of life. Thus, whichever way a people practices their culture, it seems nice to them. In Igbo land, a universal culture which cuts across tribes and cultures is the new yam festival. The new yam festival is

commemorated by all Igbo tribes and in the diaspora as a mark of respect for the gods for keeping them alive to witness another year of harvest in the land of the living. There are other cultures practiced by the Igbos which makes them different from other ethnic nationalities in Africa. This includes, masquerade display, method of burial and marriage to mention a few.

Origin of African Traditional Religion

The origin of African indigenous religions is traced to antiquity, beginning with the origin of human civilization on the continent, perhaps as early as 200,000 B.C.E., when the species *Homo sapiens* is believed to have emerged. Because they date back to prehistoric times, little has been written about their history. These religions have evolved and spread slowly for millennia; stories about gods, spirits, and ancestors have passed from one generation to another in oral mythology. Practitioners of traditional religions understand the founders of their religions to be God or the gods themselves, the same beings who created the universe and everything in it. Thus, religious founders are described in creation stories.

For indigenous African peoples "history" often refers to accounts of events as narrated in stories, myths, legends, and songs. Myth and oral history are integral elements of their culture. Such history, however, can be difficult to cross-reference with historical world events. Nevertheless, the truths and myths conveyed through an oral culture may be as authentic as those communicated through the written word. Evidence such as archaeological findings, carbon dating, and DNA has corroborated certain elements contained in African myths, legends, and narratives, thus validating the claims of its origin and history.

Over the years African traditional religions have increased and diminished in regional importance according to social and political

changes. One of the biggest influences on African traditional religions has been outside cultures. In particular, both Islam and Christianity have affected the practice of African traditional religions. Christianity, the first world religion to appear on the continent, was taken there in about the first century C.E., spreading across North Africa. It was overtaken in the region by Islam in the seventh century—frequently by military incursion, commercial trading, and the non-violent missionary efforts of merchants. Persian and Arab merchants introduced Islam in East Africa by trading in coastal towns up and down the eastern seaboard. Islam was readily adapted in many instances because of its compatibility, or at least tolerance of, traditional African religions. By the 1700s Islam had diversified and grown popular.

In the fifteenth century Christian missionaries became the first wave of Europeans to invade and occupy African lands. They relied on the backing of European medicinal remedies and colonial military power. By using local languages and converting Africans from their ancestral religions to Christianity, missionaries paved the way for early modernization and Western colonialism. Western colonialists negotiated and drafted treaties with African leaders, stripping Africans of their lands, depopulating the countryside, destabilizing their economies, overturning political rule, and uprooting cultural and lineage continuity. By the 1900s Christianity was firmly entrenched in most of Africa.

Today Muslims worship throughout much of Africa. The success of Islam is partially a result of its continued toleration of traditional beliefs and practices—or at least its allowance of indigenous beliefs to adapt to a form compatible with Islam. At the end of the twentieth century, Islam spread into areas such as Rwanda, where the trauma of civil war, ethnic violence, and genocide implicated Christianity and left Islam with a reputation for being on a higher moral level. On the other hand,

in predominantly Muslim states such as the Sudan, Islamic fundamentalists and pro-Arab Sudanese have been implicated in the oppression and slavery of millions of Sudanese Christians and ethnic minorities.

The rapid spread of Pentecostal Christianity and fundamentalist Islam has greatly affected the role of indigenous religion in African society. African traditional religions have creatively responded to this religious onslaught by formulating new ways of survival, such as developing literature, institutionalizing the traditions, establishing associations of priests, and creating schools for the training of its priests. Moreover, they have also extended outward and influenced global culture, especially in African diaspora communities. From the 1500s to the 1900s the transatlantic slave trade took African religions to the Americas and the Caribbean. Contact with Catholicism in Brazil, Cuba, and Haiti produced new forms of religious syncretism called Candomblé, Santería, and Vodun. Since the 1980s the religions of African immigrants have influenced American culture. A new wave of conversion to indigenous African traditions has been noticeable in the United States, especially among African Americans. New forms of Yoruba religion have been emerging that are quite different from the Yoruba *Orisa* traditions in Nigeria. These forms have introduced African healing practices among the black population of the United States. There are a number of West African *babalawos* (diviners) of African origin practicing in major American urban centres, such as Atlanta, Miami, and New York City.

The interaction between Western and traditional African religious traditions has influenced religious innovations in Africa, such as African Initiated Churches and Islamic mystical traditions (Sufism). As a result, Islam and Christianity have become Africanized on the continent, significantly changing the practice of the two traditions and

leading to a distinct African expression of them. Thus in Nigeria we have different gods that performs different functions. They are called different names in different tribes and cultures based on the type of function they perform. We have the Sango in Yoruba land, the Ubini Ukapbi in Igbo land Fiji Oku in Delta area.

Unlike other world faiths, African traditional religions have no predominant doctrinal teachings. Rather, they have certain vital elements that function as core beliefs. Among these beliefs are origin myths, the presence of deities, ancestor veneration, and divination. African cosmology (explanation of the nature of the universe) tends to assert that there is a Supreme God who is helped by a number of lesser deities. Spirits are the connection between the living and the invisible worlds. Anyone can communicate with the spirits, but priests, priestesses, prophets, and diviners have more direct access to invisible arenas of the world.

Impact of Climate on African Traditional Religion

Basically climate impacts on African traditional religion in two distinct ways namely, direct and indirect. Direct impact of climate on African traditional religion in the area of traditional medicine has totally changed the way people view traditional medicine in Africa. Traditional medicine is no more valued by the African man as he attach more importance to western medicine both in administration, treatment and healing. Indirectly, climate change has affected virtually everything that is of spiritual importance to the African man, Christian (2014).

Ugwu and Ugwueye in Christian (2014) have observed that “the African world is suffused with religion. In other words, an African sees his world and interprets it in a religious perspective”. Africans carry their religion into their daily routine activities such as – farming,

rearing of livestock, hunting, during illness and health, what they eat and drink etc., and whatever happens to them at any time, and anywhere, is given a religious interpretation. Decrease in plant yields, high rate of death, sickness, disease, drought, flood, windstorm and even crime are all believed to have been occasioned by climate change. The impact of climate change on African traditional religion is discussed under the following subheadings.

Impact on Agriculture

Climate change no doubt has impacted much in agricultural productivity. Low yields of farm inputs occasioned by erratic, little or no rain or drought is as a result of changes in climate and is very likely to contribute substantially to food insecurity in the future, by increasing food prices, and reducing food production. Due to scarcity of rain, outbreak of pests and diseases has become rampant thereby affecting food production. Food may become more expensive as climate change mitigation efforts increase energy prices. Water required for food production may become scarce due to increased crop water use and drought. Competition for land may increase as certain areas become climatically unsuitable for production. In addition, extreme weather conditions associated with climate change may cause sudden reductions in agricultural productivity, leading to rapid price increases. The situation can be likened to the case of Okonkwo in *Things Fall Apart*, in which Okonkwo waited endlessly for rainfall after cultivating and planting his crops, but could not get a drop. This led to the loss of entire crops he planted as they died under the devastating rays of the sun. From the above, we can see that climate change affects agriculture which invariably leads to poverty and hunger.

Again, despite technological advances, such as improved varieties of crops, genetically modified organisms and irrigation systems, weather

is still a key factor in agricultural productivity, as well as soil properties and natural communities. The effect of climate on agriculture is related to variability in local climates rather than in global climate patterns. Thus in Nigeria, people no longer go into agriculture because of high risk of outbreak of pests, low yield as well as high cost of agricultural inputs which is occasioned by change in climate.

Furthermore, the practice of rain making to support farming during the dry season has been relegated to the background and termed fetish. People rely on nature for rain. In the process drought claims the crops cultivated in the farms giving rooms for poor or no yield at all which invariably results to famine in the land. The agricultural sector which is the mainstay of some countries in Africa has not been spared in this ecological onslaught. In many parts of Africa, farmers and pastoralists suffer poor yields as a result of flood and droughts and climate change is likely to further reduce the length of growing season as well as force large regions of marginal agriculture out of production.

Impact on Traditional Medicine and Healing

The impact of climate is largely felt on traditional medicine and healing. Before now, the African man relies heavily on African traditional medicine for healing. The traditional medicines appears in the form of herbs and administered by herbalists. There are also herbalist who are native doctors, but not all herbalist are native doctors. The core herbalist uses herbs to treat and cure ailments in traditional ways which was considered most effective in the treatment of an illness than the present western medicine which has been found to contain some chemicals which is harmful to the body system. The native doctor also uses both herbs and divination to treat ailment, forecast the cause of an illness and proffers solution in the African style which may include incantations, sacrifice, administration of herbs and spiritual cleansing.

Today, people view African traditional religion and culture as fetish. They see it as backward and an evil practice. They take solace in western medicine which is well packaged and better preserved. Most of them do not even know that the western medicine are made with the local herbs used by the herbalist and native doctors. The only difference is the specification and packaging. Thus, climate change has affected how an African man values what nature have packaged for his wellbeing in the African milieu.

Impact on Traditional Festivals

As a result of the negative impacts on farming and crops yields, it is common to expect or experience some changes in some ceremonies meant to celebrate bountiful farm harvests and other natural events. Particularly, the first class festivals “whose timing, nature and intent are closely associated with the cycles of the natural universe, such as festivals that commemorate planetary movements and seasonal changes, planting, harvesting, hunting and fishing”. Festivals implies acts of worship offered periodically to the supernatural, often to thank him for his blessings and benevolent acts in nature. But as a result of climate change and its attendant implications, it becomes increasingly difficult to believe that these religious festivals and ceremonies were not or have not been affected in one way or the other.

Furthermore, there are other ways through which the traditional religion of the African might have been affected by climate change. For instance, the floods that swept through many communities especially in Nigeria might have destroyed some traditional religious elements like shrines, statues and so on. Also, some displaced persons from different communities who are African traditional religious practitioners and who might have received aids from persons and Non-governmental Organizations (NGOs) owned by other religions like Christianity, Islam etc. might have been converted into new faiths

different from that of their fore-bearers. Thus, climate change has acted as a catalyst through which African traditional religion and culture has been dislodged and rendered impotent.

Impact on our Belief System

Climate change which is a new phenomenon on the African thinking has affected the way the African man operates and how he thinks. The emergence of drought, flooding, rainstorms, pests, diseases and other disasters which is currently a nightmare has affected the belief system of the African man. All these put together have undoubtedly impacted on the religious beliefs and practices of the people. Thus they view this changes as an act of punishment from the gods for negligent on the part of the people to obey the voice of the gods. “The gods are angry” might be on the lips of traditional religious priests as the people would be praying to the spirits of their benevolent ancestors for a remedy from this array of misfortunes and ecological disasters. This does not imply that they are completely ignorant of the ecological changes; but that even the changes in the climate which has brought these misfortunes, did not occur without a cause. This 'cause' whether viewed religiously or scientifically, is largely man-made. Hence, perhaps, for the African traditionalists, a propitiatory sacrifice to the spirit of ancestors for forgiveness and remedy is not in the wrong direction, Christian (2014). This is so, because it is firmly believed that “calamities such as epidemic, famine, drought, floods, serious illness etc. are often incurred as a result of man's disobedience to the gods”.

Conclusion

African Traditional Religion refers to the indigenous religions of the African people. It deals with their cosmology, ritual practices, symbols, arts and society. Because religion is a way of life, it relates to culture and society as they affect the worldview of the African people.

Climate change has greatly affected African traditional religion and cultural practices. It is believed that disasters such as drought, epidemics, flooding, avoidable deaths, poor crop yields, harsh weather and some unfortunate human conditions are the effects of climate change.

Therefore to manage this ugly phenomenon, The African traditional religious practitioners should be made to understand the dangers of climate change as well as their roles in mitigating these dangers. Deforestation, bush burning, should be discouraged among rural dwellers as these practices contribute to climate change. There should be a collective as well as community adjustment approach to the new realities of climate change. African traditional leaders should lead their respective affected communities to embrace and adjust to the changes in the global climate and resultant ecological realities.

We also noted that climate change has affected the African traditional religion in areas such as agriculture, belief system, medicine and healing as well as traditional festivals. Indeed, our discourse is not intended to spark a conflict of interest among religions or spring surprises as other religious systems and cultures like Christianity, Islam. It however, suggests that climate change is a global challenge with effects spread across board. Hence, awareness should be created to inform all and sundry that it is not a curse or punishment from any quarter but as a result of human activities on earth. Thus all hands should be on deck in the global eco-sustainability campaign in order to achieve a sustainable environment for all.

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Impact of Climate Change on Agriculture, Food Security and Sustainability in Nigeria

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Introduction

From inception, climate change is already a challenge to the world at large and Nigeria in particular. It becomes imperative that Nigeria takes serious action in adapting and curbing the effects of climate change. There is need for Nigeria to use this opportunity of covering wide ground in developing among the people, a sharp understanding of impacts of climate change, adaptation and mitigation of the effect on the environment. According to Nji, Chinyelugo and Robert (2018) opined that climate change could be seen as a long-term alteration or change in global weather patterns as a result of increased greenhouse effect, natural climate variability and anthropogenic and natural processes. Nasheed (2012) observed that climate change is an urgent and real threat that knows no border nor respects a nation's sovereignty and truly, a global issue. Climate change according to Uja (2008), is a process of making some lands unenviable and affecting water supplies threatening people's basic needs and triggering displacement in Nigeria. He went further to state that, Nigeria is experiencing

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increasing incidence of disease, declining agricultural productivity, increasing number of heat waves, unreliable or erratic weather patterns, flooding, declining rainfall in already desert prone areas in the north causing increasing desertification, decreasing food production and destruction of livelihoods by rising waters in coastal Areas where people depend on fishing and farming (p.6).

However, Offorma (2010) posit that climate change is seen as the average weather conditions of a place over a period of year; the prevailing set of conditions such as temperature and humidity and is influenced by its latitude, attitude, ice or snow cover, as well as nearby water bodies and their currents (p.19). Offorma buttressed that climate includes patterns of temperature, precipitation, humidity, wind and seasons. These climate patterns play fundamental role in shaping natural ecosystems, the human economies and cultures that depend on them. Hence, a change in climate can affect many related aspects of where and how people, plants and animals live such as food production, availability and sue of water, and health risks (Department of Ecology, State of Washington, (2012). Consequently, Department of Ecology, State of Washington (2012), referred climate change in the weather stating that some short-term climate variation is normal, but longer-term trends now indicate a changing climate. This shows that, it is not all changes in climate that become climate change rather the change must endure over a long period of years like over a decade.

Furthermore, N.W.S. (2007) stated that, the global climate is currently changing, noting that the last decade of the 20th century and the beginning of the 21st have been the warmest period in the entire instrumental temperature record, starting in the mid-19th century. Moreso, the federal ministry of environmental, special climate change unit (2011) observed that, Nigeria's climate is already changing and

noted that, between 1941 and 2000, annual rainfall decreased by 2-8mm across most of the country and in the extreme northeast, extreme northwest and extreme southwest, average temperature rose by 1.4 – 1.9^oC.

Over the years, the economy of Nigeria has experienced issues of flooding, erosion, heat waves, drought, wind storm, unreliable or erratic weather patterns, rising sea level and so on all leading to exacerbation of poverty, breakdown of infrastructure, loss of environmental pattern, political, economic and social security; decreased in agricultural inputs and destruction of livelihoods among others. In view of this, Department of Ecology, State of Washington (2012) gave the following as indications of global climate change as noted by international panel on climate change (IPCC, 2007). This includes: retreating mountain glaciers on all continents, thinning ice caps in the Arctic and Antarctic, rising sea level – about 6 – 7 inches in the 20th century, more frequent heavy precipitation events (rainstorm, floods or snowstorms) in many areas; and more intense and longer droughts over wider areas, especially in the tropics and sub-tropics (p.3).

Causes of Climate Change

According to Nji (2018) asserted that Greenhouse gases such as carbondioxide, fluorocarbons, sulphur hexafluoride and halocarbons are gases that trap the heat from the sun and warm the earth's surface to keep the earth's temperature at reasonable levels in order to support life. This process of heat trapping from the sun to keep the earth warm by the greenhouse gases is known as greenhouse effect. Yanda (2012); Department of Ecology, State of Washington, (2012) stated that other factors responsible for climate change may be grouped into natural factors and human activities/anthropogenic factors. They are explained below:

Natural factors: National Weather Service (2007), noted that climate change is a normal part of the earth's natural variability, which is related to interaction among the atmosphere, ocean and land as well as changing in the amount of solar radiation reaching the earth. These natural factors contributing to climate change include variations in solar radiation, variations in the earth's orbit, volcanism and ocean variations.

Anthropogenic forcing: According to Nyi (2018), as human population increased, the demand for land and fuel increases. Nji emphasis that trees and other plants absorb carbondioxide; when they are felled and forests encroached into, in a bid to meet human demands they no longer absorb carbondioxide. However, this increases the level of carbon emissions in the atmosphere. More carbondioxide and other greenhouse gases in the atmosphere increases in temperature levels. The level of greenhouse gages has risen as a result of man's activities. Nji (2018) cited state of Washington (2012) that one of the biggest ways people contribute to greenhouse gases is by burning fossil fuels. Fossil fuels formed by long-dead-plants and animals are the single biggest source of humanity's greenhouse gas emissions. Nji (2018) cited Alero (2012); noted that, methane emitted by massive herds of livestock, rice farms, waste dumps, nitrous ride, hydrofluorocarbons, perfluorocarbons used in air conditioning and refrigeration all eventually enter the atmosphere causing enhanced greenhouse effect.

Impact of Climate Change on the Environment

Moreover, the current impacts of climate change may escalate in future leading to extreme poverty and low standard of living. Federal Ministry of Environment special climate change unit (2011) noted that, the impacts of climate change in Nigeria are expected to increase in the future affecting all sectors in the country (Education, agriculture, fresh

water resources, coastal water resources, fishes, forests, biodiversity, health and sanitation, human settlements and housing energy, transportation and communications, industry and commerce, disaster, migration and security, Livelihoods and vulnerable groups). The ministry stated that, in the absence of adaptation climate change could result to a loss between 2% and 11% of Nigeria's GDP by 2020, rising to between 6% and 30% by the year 2050 which is equivalent to and ranges between N15 trillion (U.S\$100 billion) and N69 trillion (US & 460 billion).

In view of this, the impact of climate cannot be neglected because of its rigorous cycle in nature. Climate change can affect all aspects of life and sector connected to it both directly and indirectly. Ibe (2012) noted that, the impacts of climate change affect every aspect of human endeavour. Department of environment and conservation, Government of Western Australia (2012) observed that even a very small rise in the earth's mean temperature will have quite dramatic negative impacts on the environment, which are predicated to include melting of polar ice caps, weather patterns, including prolonged droughts that will reduce agricultural productivity, recreational and tourism activities.

Sequel to this, it has been in the time past that Nigeria is highly vulnerable to the negative impacts of climate change. This vulnerability of climate change stems from the fact that, the country depends largely on land, natural resources and climate patterns for her survival coupled with the low lying nature of some coastal cities in the country and high population density among others. Nji (2008) cited the Federal Ministry of Environment (2010) noted that, due to climate change, the rapid southern expansion of the Sahara Desert had compounded access to water, increased incidences of drought, desertification and exacerbate the degradation of agricultural land with

increased gully erosion in the South East and coastal erosion in the southern region which is devastating the lives and livelihoods of over 50 million Nigerians living along the low laying coastal region and potentially posing threats to Nigeria's oil facilities located within these areas.

Problems and Consequences of Climate change on Agriculture and Security in Nigeria

According to Igwebuike, Odoh, Ezeugwu and Oparaku highlighted the major problems and consequences of climate change on agriculture and food security in Nigeria.

Climate change affects Agriculture in a number of ways

Extreme weather event such as thunderstorms, heavy winds and floods devastate farm lands and can lead to crop failure. Pests and crop diseases migrate in response to climate variation (e.g., the tsetse fly has extended its range northward) and will potentially pose a threat to livestock in the drier northern areas. Consequently, food security is vulnerable to extreme weather events such as drought and floods. When the Sahelian zone suffered drought in the 1970's and 1980's harvest failure was remarkable throughout the region. Close to one million livestock were lost, affecting meat and dairy supply throughout the country flood hazards in both the northlands south of the country consistently posed a danger to farmlands and hence, to food security. Food security is dependent on rainfall and rainfall amount, and is affected by the age – long ability of farmers to predict when to plant their crops. Unpredictable changes in the onset of rains in the last 20 to 30 years have led to situations where crops planted with the arrival of early rains to get smothered in the soil by an unexpected dry spell that can follow early planting.

The late arrival of rain due to climate variability, results in harvest failure in ecosystems that rely on rain-fed agriculture. The occurrences of extreme weather events usually causes irreparable damage of food crops and other livelihood material on which small Island populations depend. Extended droughts often causes damage to agricultural crops resulting in low exports and high imports, the latter usually resulting in a huge burden on foreign exchange earnings. The proliferation of pests and crop diseases can hinder storage when the need arises because of temperature increases. The pests in turn attack crops and animals. The current warming trend hinders livestock production. As well, livestock are usually subjected to long treks to find water and grass in the more southerly areas of the country during the dry seasons warming trends also affect the growth of grain crop such as maize, guineacorn, millet and rice and makes storage of roots crops and vegetables difficult.

However, land degradation reduces the quality and productivity of land. Many factors contribute to it; and climate change can be one of the factors, result in water and wind erosion of land, drought and the creation of deserts, acid and salt accumulation; depletion of materials, and heavy – metal contamination. All forms of land degradation in Nigeria occur in different scales; but no part of the country is safe from it. The low – lying nature of Nigeria's 800km coastline makes it prone to coastal erosion and flooding, all of which are climate change – induced forms of land degradation. In the Sahelian zone of Nigeria's north, the most pronounced climate change related forms of land degradation are wind erosion and related sand dune formation, drought and desertification.

Moreso, changes in climate conditions can also modify tree growth and development, reducing the availability of non-timber forest products such as spicy vegetables and mushrooms. Climate change can increase

inadent of pests and diseases that attack and de4cimate forest trees, it can lead to species extinction in the various ecozones of Nigeria for example, the iroko and oil bean in the south east; various mahogany in the northwest. Bio-diversity – a natural treasure can be disastrously affected by climate change. Many species of plants and animals are rapidly becoming extinct. The fruiting intensity of some trees is diminishing; aberrations in animal mating habits and changes in bird and animal migratory patterns are evident fish spawning patterns have changed; the rare and endangered species of plants and animals has increased.

Strategies to Reduce the Vulnerability of Climate Change in Agriculture and Food Security in Nigeria

In view of this, Igwebuiké et al (2009) streamlined some of the possible solutions to the problems of climate change on agriculture and food security. They are:

Agricultural production could be increased by doubling the crop areas or by investing in agriculture management and technology. Producing more drought – resistant crops would help, as would better management of water resources, more efficient food storage systems, improved processing methods and better pest management of water resources, more efficient food storage systems, improved processing methods and better pest management. Government policies favourable to the agriculture “industry” could be instituted (for example, providing all season access and industry can alter its ways of doing things and adopt strategies to increase agricultural productivity in Nigeria.

Farmers can learn to exercise discretion in planting with the arrival of the earliest rains in the season. Water reservoirs can be created in dry

areas such as the Sahel. Mixed farming practices can be introduced individuals and communities need to adopt behaviours or policies geared at restoring and conserving the environment. Increased self-reliance, avoiding unregulated forest exploitation, planting appropriate tree species, protecting water sheds, using agro-forestry and organic farming techniques and maintain adequate food supplies will lesson the vulnerability of the food supply sector, so too will maintaining water levels so that fish can spawn planting drought – resistant crops, draining wetlands for rice cultivation, and reforming land tenure and lad management policies. Government initiatives (such as greater support for research, improving transportation, offering subsidies and other productive trade regulations devices, making soil and water conservation a high priority) can help the adaptation process along. At a local level, erecting contour bunds around farm lands as a safeguard against soil erosion and flooding; using organic manure instead of the more preferred chemical fertilizers, establishing wood lots with fast – maturing plant species hat yield domestic fuel wood for community members; reducing bush burning; using disease – resistant, quick – maturing crop and plant species (cassava sticks, fruits and nuts); properly preserving seeds and plant seedlings to ensure healthy germination in the succeeding farming season; and disseminating research findings to farmers, would help mitigate the effects of climate change.

Furthermore, other adaptation measures could include: adopting new farming approaches using improved varieties; setting up gene banks; identifying and conserving threatened and endangered species of planting and animals in zoological gardens; and raising public awareness on the importance of bio-diversity.

Conclusion

There are many reasons to be concerned about the impact of climate change on agriculture and food security. These include deforestation, over-cultivation of grasslands, increased poverty, unplanned urbanization, loss of flora and so on. The scientific community must be involved in studying climate change and forecasting weather, and then transmitting this information to all sectors of Nigerian society, industry and economy so that these sectors can adapt and be ready to meet a very different future than the present. However, the Nigerian government must adopt strategies and policies that will encourage improved farming and agricultural methods, and that will protect our cherished forest and the bio-diversity of this great country.

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6

Insecurity and Climate Change in Africa: Evaluating the Struggle for Resource Control and Conflict in Darfur Region of Sudan

Chike A. Ezenwa PhD.

Introduction

The Darfur region, in the Western part of Sudan has long borne the stigma of insecurity in the form of sporadic violence between and among the numerous ethnic groups that make up the vast area. The Republic of Sudan, the largest country in Africa in terms of land mass lies on the Western shore of the Red Sea. It is bordered by Eritrea and Ethiopia to the East, Kenya, Uganda and Democratic Republic of Congo to the South, the Central African Republic, Chad and Libya to the West and Egypt to the North. Darfur is the most underdeveloped region in the country and is prone to drought and famine-two factors which have fueled conflict between Nomadic Arab tribes and local African villagers (Offodile, 2011) Darfur is therefore characterized by a lingering culture of internecine violence over resource control due to the influence of climate change.

Abusharaf (2005) observed that Darfur comprises an area of approximately 25,000 kilometers with a population of about 6 million people. Sedentary African farmers such as the Fur, Massalit and Zaghawa tribes predominate Darfur. The rest of the population consists of nomadic Arab tribes. From the pristine times, Darfur had always been associated with skirmishes and squabbles over land and grazing

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rights. These occasional misunderstanding between the diverse co-existing ethnic groups had always been amicably resolved, using time tested and traditional mechanisms. However, the situation assumed a more sinister dimension in the 1970s and 80s in the wake of environmental challenges occasioned by different forms of climate change.

Geographically, Darfur is made up of a Plateau some 2000 to 3000 feet above sea level. The volcanic Jebel Marra Mountain range runs North and South for a distance of some 100 miles, rising to between 5000 and 6000 feet. (Offodile 2011). The combination of desertification, drought, deforestation, massive population explosion and migration exacerbated tension in Darfur as the various stakeholders competed for control of the scarce economic resources. According to a United Nations Environmental Programme Report (2007), environmental degradation is one of the major causes of conflict in Sudan and Darfur. The report indicates key environmental problems: land degradation, desertification (especially South wards by an average of 100 kilometers over the past four decades) over grazing of fragile soils (Livestock population has increased in Sudan from 27 million animals a few decades ago to around 135 million today) and deforestation (in the last fifteen years, Sudan has lost 12% of its forest). It thus stands to reason to submit that the tide of insecurity in the Darfur region which came to a head in 2003 can only be analyzed and understood within the context of climate change. Battiste (2005) had also noted that much of the peace between the region's ethnic groups have been destroyed due to environmental degradation from the spread of the Sahara Desert as a result of drought, coupled with the divide and rule tactics of the central government and the influx of modern weaponry.

As a global phenomenon of immense significance, climate change distorts and alters the systematic equilibrium in both atmospheric and

weather conditions with far reaching impact on human habitation and environment. Extreme weather phenomena associated with climate change have compounded the challenge of environmental sustainability. Various forms of land degradation, resulting from climate change induce human migration; at times across National Boundaries. In recent times, a new phenomenon described as 'climate change refugees' has emerged which if not properly addressed may lead to serious security issues and may also trigger socio-political conflicts. Anuforum(2012, citing Hay etal 2001).

Conceptual Definition/Clarifications

Climate Change

Climate change is paramount on the global scale of high priority issues. It encapsulates the weather atmospheric and human activities and their impact on the environment. According to Anuforum (2012) climate change is defined by the Inter-governmental Panel on Climate Change (IPCC) as a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer) climate change involves a motley of natural atmospheric processes, pollution, shrinking natural resources and depletion of the Ozone layer. Human activities in diverse forms accentuate the incidents of climate change. Reckless deforestation, and other forms of human development which lead to road construction or building of new cities has implications for climate change. As corroborated by Anuforum (2012) the challenge of increasing Green House Gases (GHG) concentration is compounded by increasing urbanization and economic development. Nature provides trees and other green vegetations as the natural sink for atmospheric CO₂. With growing population, there is increasing pressure on land to meet the need for food crops and livestock production. This puts more pressure

on the environment, leading to its eventual degradation. The combined effect of fossil fuel burning, destruction of green vegetation and unwholesome land use practices is the increasing concentration of Atmospheric CO₂ and worsening of Green House Effect.

Climate change is both naturally and human induced. Activities of man that encourage this environmental hazard have been outlined as follows: Soil loss and deterioration, water and forest degradation, atmospheric pollution, species and gene pool extinction, Papp (1988). In their own contribution, Onweremadu and Asiabaka (2013) defined climate change as a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It is associated with extreme weather events. Generally, climate change represents alterations in the statistical properties of a climate system considered over long period of time, regardless of cause.

In relation to insecurity and conflict across Africa, climate change has direct implication for escalating violence due to scarcity of resources like water and land for economic sustenance. In addition to contributing to World hunger, the shrinking of natural resources relative to demand has the potential to contribute to international conflicts (Kaarbo and Ray, 2011).

It is equally worrisome to note that climate change influences migration of population from the hinterland to the cities in search of jobs due to unplanned urbanization, destruction of the ecosystem through deforestation. According to Shevel (2014), climate change affects Agriculture, people will have less water, they will not be able to cultivate their land and they will migrate to the cities. This is the main risk for Africa. The constant conflict between the pastoralists and farmers across Africa is linked to climate change. From Sudan to

Nigeria, the situation is the same. For instance, in Nigeria, pastoralists with their animals continue to traverse the country in search of 'free' pasture; unfortunately, in many instances, this resulted in road accidents and bloody clashes with crop farmers. This will in all likelihood exacerbate since the human population is expected to double within a few decades with the attendant necessity for more land for crop production (Okeudo, 2017).

For Africa, climate change has become a nightmare and a threat that can hardly be ignored. The consequences are not just unfolding but mounting by the day: land encroachment, water scarcity, poor production, conflicts, famine and increasing poverty and hunger among the people. While advanced economies have coping strategies, to manage climate change, Africa, especially the sub-Sahara region is at the receiving end of challenges emanating from the environmental hazard.

Onweremadu and Asiabaka (2016) observed that sub-Saharan Africa has the largest number of water stressed countries than any other place on the globe and as of an estimated 500 million people who live in Africa; 300 million live in a water stressed environment. It is estimated that by 2030, 75 million to 250 million people in Africa will be living in area of high water stress, which will likely displace anywhere between 24 million and 700 million as condition become increasingly unviable. Climate Change is a threat to the African Continent, and that it will have a major impact on life through a series of possibly cascading events: desertification could trigger a vicious circle of degradation, migration and conflicts over territory in transit and destination area. This in turn may significantly increase instability in weak or failing states by over stretching the already limited capacity of governments to respond effectively to the challenges they face.

Insecurity

Insecurity essentially means absence of security. It therefore connotes danger, threats to lives, property, welfare and translates to a general atmosphere of fear or uncertainties of being protected. According to Freedictionary.com (2012) insecurity is a state of being subject to danger or injury-a condition of being susceptible to harm or injury, the state of being exposed to risk or anxiety. The concept of insecurity is quite vast.

However, insecurity in the context of this study revolves around the impact of climate change and how it gave rise or affected the conflict in Darfur and indeed across Africa. Insecurity at the national level reflects a state that is incapable or unwilling to secure its citizens or boundaries. This failure or inability inevitably breeds conflicts with the diverse and opposing groups taking laws into their hands to protect and advance their different interests. This is symptomatic of fragile states.

According to Khalid (2007) Sudan's government policed Darfur by promoting loyal Chiefs and arming their militias. Most of these loyalists were Arabs who fueled Arab Supremacists Ideology and underwrote an escalating land grab. Insecurity thrives in an environment of ecological devastation and poor leadership. Eme and Onyishi (2014 citing Dyke (1966) maintained therefore that for a state to achieve security, the aggregate of the people organized under it should have a consciousness of belonging to a common sovereign political community, enjoy equal political freedom, human rights, and economic opportunities. On the contrary when the state is weak or fragile, it is basically incapable of protecting the citizens from challenges of the environment. As an institution which has the legitimate use of coercive apparatus of power, the state controls the security architecture of a country. In the case of Sudan, the state reflects

symptoms of weakness or fragility. Fragile or failing states have the following features:

- I. A security threat from organized non-state violence
- II. The government lacks legitimacy in the eyes of many citizens.
- III. The state has weak capacity for essential functions.
- IV. The environment for private investment is unattractive.
- V. The economy is exposed to shocks and with little resilience
- VI. Deep divisions in the society (Fasan, 2018)

These conditions depict the Sudan situation where the state abdicated its responsibility to ensure security of lives and property of her teeming population with the failure to ameliorate the impact of climate change in the country especially in the Darfur region. Against the backdrop of the general failure of governance, the struggle for control of economic resources in Darfur took a dire turn of genocidal proportion.

Background to Darfur Insecurity

Since her earliest history, Darfur had always experienced occasional outbreaks of inter and intra ethnic rivalries and violence over the ownership and control of land, access to water and vegetation for animal grazing. It was then perceived as part of the local culture. The disputes were easily and quickly settled through some traditional mediation processes.

O'Fahey(2004) writes that conflicts were settled with spears or mediation by elders and religious figures. Darfur was not originally part of Sudan. It was a flourishing sultanate established around 1650. It was then famous as a prosperous Trading Centre for such goods as Ostrich feathers, Ivory and black slaves (Daly, 2007). The Sultanate was considered one of the region's most powerful kingdoms, wholly separate in culture and heritage from the rest of Sudan.

However, in 1916, Darfur was annexed by Britain merging it with Sudan, two states with vastly different cultures and political structures (Pruner, 2006). The cohesion and solidarity that once defined Darfur dissolved into the massive British colony of Sudan. As such, Darfur lost its original structures and distinct identity. Sudan's colonial experience which lasted from 1820 to 1956 must be factored in to properly streamline the Darfur conflict, within the context of climate change.

Pavlish and Ho (2009) recalled Sudan's colonial antecedents....which resulted in deep divisions between the Northern and Southern Sudan. As a result, since gaining Independence from Britain in January 1956, Sudan had experienced two prolonged Civil wars, from 1955-1972 and 1983-2005 (UNHRC, 2008). The history of Sudan since independence has therefore been a history of war and instability.

Darfur emerged after annexation in 1916 as the 'weeping child' of environmental violence in Sudan. At the earliest stages, under British colonial domination, Darfur was grossly marginalized. Differing administrative patterns emerged between agricultural and pastoralists communities, but the administrative structure created 'owed as much to British innovation as to indigenous custom (Johnson, 2003) Darfur region actually suffered structural atrophy under British colonial administration. After decades of dislocation and forced migration as a result of colonial conquest, 'many of Darfur's tribal units were unviable alone and dispersed from their original Dars (Land), (Daly 2007). The region of Darfur was totally subdued and disoriented. The attempts at amalgamation and hierarchical re-ordering resulted inevitably in the accession and despotism of "Supra-tribal-Overlord" whose authority was conferred by the colonial power rather than derived from kinship (Peter, 2007) Herein lies the persistence of violence within and

between the various ethnic groups that make up the Darfur region in the Post-Colonial Sudan as they struggled for scarce resources. Before colonialism land was equitably shared even with little climate change effects then.

In re-organizing the province as an administrative mosaic of tribal politics” British rule discriminated against the so called 'settler' tribes in terms of entitlement to land and posts in the native administration. Such system fuels ethnic tension between residents in every 'dar' based on discriminatory political land rights. More fundamentally, it separated tribes with a 'dar' (land) from those without. It was this tribes division pertaining to rights of access to productive natural resources that erupted in the Darfur crisis of the mid 1980's (Mamdani, 2009).

The emergent Sudanese power elite who inherited power at the end of colonialism in 1956, failed to redress the marginalization and underdevelopment of Darfur orchestrated by the departed colonial power. Instead the new leadership consisting mainly of Arab extraction of Northern Sudan worsened the situation by introducing ethnicity and religious bigotry into the already bad security condition. Darfur became more neglected, more divided and abandoned to the vagaries of mounting pressures of climate change. In addressing the Darfur security challenge, Sakainga(2009) described it as a complex history of deeply entrenched social inequalities, an environmental crisis and competition over natural resources, conflicting notions of identity, the militarization of rural societies and above all, a chronic problem of bad governance that has plagued the Sudan since its independence from British colonial rule in 1956.

Darfur was caught in the web of debilitating security challenge of climate change and the hideous activities of the central government of Sudan to divide and rule Darfur through the process of induced intra-

ethnic violence. This gave rise to serious economic problems of poverty and heightened sense of insecurity. As farmers, crop farming is the main economic activity of the majority of the population. Cultivation depends heavily on rainfall and land fertility, absence of which renders the population vulnerable to climate change hazards of natural disasters-droughts, desertification and population growth which combined to produce sharp decline in food production and with it wide spread famine (Sikainga, 2009).

Climate Change and Insecurity in Dafur

Climate change has a sweeping and preponderant negative influence on the entire social fabric of the Darfur society. From the initial on set in the 1950s, to the 1980s and 90s when it got to its height, the scourge of climate change brought with it an endemic culture of insecurity in Dafur. Every facet of the society was marred by violence and intrigues. The Dafur society broke down into atomistic enclaves always at war with itself. The people viewed the society through the prism of deprivations, and a general sense of impending disaster brought about by the impact of climate change. It is in this wise that insecurity became a way of life in Dafur. The economy, governance, political leadership, ethnic configuration and race were organized in such a way as to promote insecurity within the context of overcoming climate change. It was a contradiction: aspiring to contain and control the problematic effects of climate change through a process of group immolation.

Abella (2010) confirmed that unrest and periodic violence in Darfur is not new. On the contrary, numerous reports identify a timeline of tension and violence in the region dating back to a decade or more. In the same vein the Sudan Country Report (2009) traced violence to the age old economic competition between the nomadic Arabized herdsmen and the sedentary farmers of African tribe over land use and

water. Climate change has a wearing away impact on land through desertification, thus increasing the struggle for the remaining space. Food security is equally at risk. This was the point made by Anderson (2004) when he said that desertification and famine intensified competition over grazing area and land, which is why the most common crimes involve livestock and crops.

Libya's Muammar Ghadaffi exploited the 1985 famine in Sudan by bringing guns to the Arab herdsmen in Darfur. This cross border gun running introduced different types of high caliber arms and ammunitions with mercenaries and soldiers of fortune getting involved in the Darfur crises. This raised the tempo of the conflict and with harsh economic realities caused by the effects of climate change and insecurity, Darfur slipped into serious multidimensional conflict. Wall (2004) noted that as law and order collapsed and the Darfurian tribe's men acquired weapons to defend their farms and herds, the central Sudan government in Khartoum failed to act as an honest broker in the numerous local conflicts.

Successive Sudanese governments neglected the Darfur crisis, partly because the government dominated by the mainly Muslim northern Sudanese elements was equally facing a stiff opposition from the Southern part of Sudan over issues of marginalization and exclusion of the South from the government in Khartoum. Rather than seeking amicable solution to the uprising from the South, the Arab dominated government of Sudan reached out to those ethnic groups in Darfur who consider themselves Arabs for assistance in fighting the insecurity from the South. This alliance between the central government in Sudan and the Arab elements in Darfur introduced sharp intra-ethnic divisions and racial antagonism between the black Africans of Darfur (who are mainly sedentary farmers) and the Arabs of Darfur

(who are mainly herdsmen or pastoralists.) Sudan employed this divide and rule policy to emasculate the Darfur region and heightened the struggle over resource control.

Starting in the 1980's, drought, famine and the spread of desertification caused increased competition for land, severely upsetting the structures of the Darfuri society. Farmers had claimed every available bit of land to farm or forage for food, closing off traditional routes used by herders. The herders, desperate to feed and water their animals in a dwindling landscape, tried to force the Southern route open. They attacked farmers who tried to block their routes. (Jewish World Watch 2009). The impact of climate change aggravated the climate of insecurity in Darfur with multiple conflicts and war of attrition within and between ethnic groups. The black farmers resented Camel-riding Arabs who trampled their land looking for pasture. Arabs resented those blacks who herded cattle across their grazing land. Fighting began, people and cattle were killed, Villages and nomad tents were burnt. (Jewish Darfur Coalition, 2009). The cycle of violence in Darfur continued unabated.

As already established, conflicts were predominantly clashes between Arab nomadic groups with the farming communities over access to pasture and water for cattle or outright theft of animals. Since the 1980's drought has driven these nomadic tribes to systematically occupy the land in the central part of the Darfur region known as Jebel Marra Massif. At one point, the conflict rose to the level of a civil war, with entire villages destroyed and thousands of lives lost on both sides (Battiste, 2005).

As the impact of climate change engulfed Darfur, the government of Sudan did not seek either palliatives or measures to mitigate or manage the effects. The inability of African countries to evolve coping

strategies to manage climate change has been problematic. Stern (2006) had noted with concern that while many sub-Saharan African countries remain the most vulnerable to threats, they have limited capacity to address the climate crisis. Vulnerability represents the degree which a system is susceptible to, or unable to cope with adverse effects of climate change including climate variability and extreme weather events. Also, a lack of capacity available for coping with environmental changes is experienced in lower income communities, a majority of which are found in sub-Saharan Africa. The cycle of poverty heightens the potential negative impact of climate change.

As a result of this structure and institutional incapacity, Sudan abandoned Darfur to stew in its own juice of environmental denudation and degradation. The violence continued to characterize Darfur. In the 1990's hostilities resumed in West Darfur.

Arab Nomads moved their flocks into land predominantly populated by Massalit Farmers (Battiste, 2005). From 2002 and beyond, the Darfur insecurity profile gained international attention due to its escalation to an outright shooting war with the Sudan armed forces. The Darfur group had formed the Sudan Liberation Army (SLA) and the Justice and Equality Movement (JEM). These Darfur based rebel groups attacked a police station in 2002 and burned government garrisons in early 2003 with high causality on the side of the central government of Sudan. This attack opened the flood gate of counter insurgency measures by the government of Sudan against the Darfur communities which culminated in a genocide against defenseless and innocent civilians mainly women and children.

Anderson (2004) noted that the factor of struggle for land and water, racial bigotry and religious consideration constituted the fuel that ignited the fire of violence in Darfur. The struggles came to a climax

when in 2003; Sudanese forces launched the first of two major offensives against rebels in Darfur. The cumulative consequence on Darfur was colossal and genocidal. The armed resistance by the Darfur rebels was met with the full might of advanced military hardware by the central government of Sudan. Since the war started, an estimated 1.9 million Darfurians have died, 2.5 million are famine affected and 350,000 crossed the border to neighbouring Countries. This war continues to expose Darfur to widespread instability, forced capture and slavery, destruction of physical and natural environment, disturbance of cultural life and social Cohesiveness, death and displacement. Approximately, 4million people have been forced to flee their homes....(Abusharaf,2006)

Conclusion

The paper took time to outline and properly situate the raging conflict in the Darfur region of Sudan within the context of climate change. It is an issue that has often be neglected or subsumed under the erroneous paradigm of ethno-religious and power politics in Sudan. Although these factors were later grafted to advance some selfish political interest, it never eclipsed the true essence of the insecurity that snowballed from the struggle for ownership, and control of economic resources in the form of land, access to water and grazing fields among other necessities. The lack of coping strategies by Sudan, contributed to worsening the effect of climate change on the people and environment of Darfur.

In an effort to escape from the debilitating impact of climate change, Darfur people engaged in series of violent conflicts, which ultimately disorganized the society and led to other forms of insecurity on the scale of a shooting war between the region of Darfur and the central government in Khartoum.

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7**The Creature (Man) and His Environment: An Ethical Examination**

Dr (Mrs.) Veronica Uduak Onyemauwa

Introduction

This paper begins with the proposition that in any functional sense, man and his environment are inseparable and form only one unitary system. Man cannot exist without the environment and the environment has descriptive properties only if it is connected to man. However, the conception of man in his relationship to the environment has probably been problematic and controversial. This is because the creature (man) and his environment were created to interact with each other on a balance basis. While the natural environment is to create a fair decent shelter and to provide food supplements including economic resources and so on. Man on the other hand is supposed to care and protect the environment from destruction. However, when placed on measurement scale, there seems to be inequilibrium in the relationship existing between the two, that is (man and his environment). Hence, the analysis done in this paper based on ethical perspective is to provide in-depth information on numerous issues pertaining to the role of humankind in the environment with which he is associated. This is done to make people have a better understanding of the impacts of our activities on our environment, and the need for proper management against wanton exploitation.

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Explication of Conceptual Framework

(A) The Creature (Man)

Practically, every African society has its own myth or myths concerning man. African ontology is basically anthropocentric. Man is at the very Centre of existence, and everything else is seen in its relation to this central position of man. God is the concrete explanation of man's origin and sustenance. It is as if God's existence is for the sake of man. The spirits are ontologically between God and man. Man is not merely a passive element in the rhythm of nature. He plays an active role in nature. He actively participates in the mysterious forces which keep the universe going. He is not just a parasite living off the earth. He lives in it, feeds and sustains himself. According to Aquinas, man is not only a rational animal, incarnate spirit, and thus free but above all a person. There is then, in nature, nothing superior to man, Gilson, writes: "Now, every man is a person, it is his act of being which gives men that combination of gifts which he alone possesses: Of being a reason and person; all he knows, all he does, all he wills, issues from the fact by which he is what he is." As *homo-religiosus* (a religious being), man lives in a religious universe, so that nature and its objects are intimately associated with God.

However, aside the African perception of 'man,' Fatubarin (2014: 49) observes that what is generally known as "Man," is also known by such other names as Mankind, Humankind and Human being. These are generic names that cover both sexes, male and female of the organism that goes by the biological name of *Homo sapiens*. This is a name that means the "perfect man," This is the form of human being that is also known as the "modern man." This is a name that reminds people that the humankind of today is scientifically, a product of organic evolution, which involved translating from lower forms of human

beings, through less perfect, to the perfect human being we have today. This biological evolution involved the translation of human forms from *Dryopithecus*, through *Australopithecus*, *Homo habilis* and *Homo erectus* to *Homo sapiens* (Fatubarin, 2008:82).

It is this evolution of humankind that confers on him, the traits that makes him more highly developed than other animals. It is also this evolution that makes man to be more sophisticated than other living things, which he not only exerts dominance upon, but can also manipulate to suite his purpose. According to Pastor Adeboye (2012:54), humankind, is a special being, comprising of a three-fold-components of physical, social and spiritual being, who acquired his special endowments during his evolution that involved thousands of years. However, it can be said without fear of contradiction that, all the natural endowments of humankind have no parallel in other living things. They are what have added together to confer supremacy of humankind over other living things. They are also what are contributing to making him not only to dominate over any environment he finds himself, but also manipulate such environment the way he chooses. It is the complex interplay of his interactions within the environment that give rise to the title of this paper.

(B) The Concept of Environment

Ever since the word environment entered the lexicon of the English Language, it has attained an omnibus status that makes users of the English Language apply it to as many deserving situations as possible. Therefore, the word is used for such things as Third World Environment (Akinrinade, 2012:23), enabling environment, business environment, among others. However, Fatubarin (2014:49), remarks, “though environment and a number of other terms have for long been recognized as important terms in ecology, as part of the active

vocabularies of the subject, it is the recognition of the importance of environment in sustainable development and in particular, the phenomenon of climate change that have made the term environment, to move to the front burner among other ecological concepts.” Climate change – a major environmental concept, has been recognized the world over as about “the greatest crisis ever faced collectively by humankind” (Foley, 1991 cited in Fatubarin, 2014:49).

However, in the context of this study, the term environment means the total surroundings of any living organism: man, plant and animal. It is divided into three components: (a) Natural environment composed of plants and animals, water, air, gases and soil, (b) Artificial environment composed of factories, cities, markets, roads, houses and the modifications obtained from these environments, (c) social environment composed of people's culture, art, law, etc. The influence of man here is centered on the natural environment which is made up of the following factors of climate: temperature, land, wind, light, rainfall, water, population explosion. For instance, agriculture, forestry, wildlife, fisheries all represent some aspects of the modification and exploitation of natural environment by man. All that have been said so far point directly to the fact that man's influence on the natural environment to which he belongs or exerts some impacts on, is very tremendous and could be looked at individually so as to deduce their specific ecological impact on the environment.

Man and his Activities within his Environment: An Ethical Appraisal

When God created the universe, human beings inclusive, He saw all that He had made to be good, cf. Gen.1:4, 10, 12, 18, 21, 25, and He entrusted all those creations to humans to care for it with high sense of responsibility. “The Lord entrusted all of creation to their (man and

woman) responsibility, charging them to care for its harmony and development (cf. Gen. 1:26-30).” Therefore, it can be said that, it is the will of God that man, with his intelligence, should use the earth to better the condition of his life and that of humanity at large. The care of the earth, our common home, which according to Aristotle is the center of the universe, and “is occupied by the life-bearing earth, the home of diverse creatures (Barnes, 1990:391), is therefore a duty incumbent on human beings, so that the goodness given to it by the Creator should not in any way be disfigured, and that both the present and future generations will live dignified life as the creator willed it.

However, as observed in the world today, the creature (man), rather than being the responsible and prudent custodian of his environment, has, through his daily activities, which at times are motivated by some selfish or ulterior reasons that do distort the nature of the other inhabitants of environment, become its adversary. As the center of the universe, every other thing becomes relative in so far as man's convenience is the ultimate value. Whatever does not serve his interest becomes irrelevant and so can be discarded at will. Here lies the root of man's inhumanity to man in all its ramification as well as his inhumanity to nature.

The effects of all this man's misguided knowledge and behavior, especially with regard to the environment, are evident today precisely in the issues of climate change and the endangered species. The depletion of the ozone layer due to large scale of environmental pollution by the industrialized “super powers” is taking its toll on life on earth- the excess heat, the massive draught and its attendant famine and hunger, the desertification of the environment and its attendant erosion menace, the menace of flooding in some places due to the disorganization of river ocean channels-reclaiming of land for housing and industrial developments, to mention only a few. Complex

technology releases the so-called “anthropogenic” (human induced), greenhouse gases – carbon dioxide, methane and chlorofluorocarbons – into the atmosphere and these are the greatest contributors to climate change. These anthropogenic greenhouse gases are distinct from the ones found naturally in the atmosphere.

For the man of technological age, nature has become an object for manipulation by means of technology, since he sees nature from the mechanistic point of view; and development from the consumerist standpoint. Nature becomes something to be manipulated and consumed. Hence, **doing** and **having** taken precedence over **being**, the **transcendence in nature** is being thrown over-board. Rich and industrialized nations have been competing on technological powers and superiority, thereby jeopardizing the life and equilibrium of mother earth.

The Impacts of Man's Activities on His Environment: Environmental Crisis

This section deals with the crisis that results from the relationship between the human person and his environment. Since every relationship has its challenges, that of the man and his environment is not devoid of such problems. The intrinsic dignity of the world has been compromised. “When human beings fail to find their true place in this world, they misunderstand themselves and act against themselves” (*Laudato Si*, 111). The identified underline cause of this problem can be seen in man's pretention of exercising unconditional dominion over things, heedless of any moral considerations which on the contrary must distinguish all human activities. The human origin therefore is at the origin of environmental crisis. The earth now cries out because of the harm inflicted on her by man's irresponsibility. The situation of our planet is depressive, it seems the human person has embarked on a self-destruction journey.

It suffices to move from one major town to another and, then one will get the true picture of the magnitude of the damage of what human beings have done to mother earth, ranging from pollution to deforestation. Exploitation of the resources of creation and the conquest of this resources seems to be the expression of the understanding of the power God has given to humanity to dominate nature. All this affects the quality of human life because there is obviously a decline in the quality of life. The growing capacity transformative intervention of the human person has become a threat to the environment hospitable aspect. According to John Paul II, “the powerful means of technological civilization threatens the environment as a whole.” Nature seems like an instrument in the hand of a human person which he must manipulate constantly especially by means of technology, consequently the disastrous effects are seen as follows:

Deforestation

In Nigeria, deforestation has led to climate change. The loss of tropical forests which will otherwise help mitigate climate change is alarmingly on the increase. However, going by Biblical account, on the third day in His creation project, God commanded the earth to produce vegetation and so it was (Gen.1:11-12). The act of deforestation is working contrary to this desire of God as human beings today, seem to be saying: “let every vegetation be turned into desert land.” If we neglect to monitor the harm done to nature and the environmental impact of our decisions, we will be signaling our disregard not only for the message contend in the structures of nature itself but also the message of Scripture that human beings should care for the earth (Gen. 1).

Pollution

Some forms of pollution are part of people's experience. The rate at which our earth is exposed to atmospheric pollutants produces a broad spectrum of health hazards. There is a whole lot of pollution ranging from industrial fluids, means of transportation, agro toxins used on different plants, substances which contribute to the acidification of soil and water, such as petroleum spillage (Gerry, 1999: 24, Freedman and Jaggi, 1993: 1 - 3). A drive through some of our towns shows a whole lot of filths and piles of things around the city corners. This also is hazardous to people's health.

Climate Change

The world over is presently witnessing a very disturbing climatic system. Some decades ago, one can confidently identify the different seasons of the year and the characteristics of such season. In recent times, it is difficult to say when the rain will begin in Africa, when the snow will stop falling in Europe or America, etc. Excessive heat is experienced within in different part of Africa, while excessive snow fall is experienced in America and flooding is experienced in some other part of the world. Apart from the warming which results from volcanic activities, variations in the earth's orbit and axis and the solar cycle, there is a whole lot of human activity which aggravate it. In recent times, the great concentration of greenhouse gases such as carbon dioxide, methane, nitrogen oxides, etc. has been identified as responsible for this global warming. One need not to be told about the effect of warming on the carbon cycle, which creates a vicious cycle that aggravates the situation and could end in an unprecedented destruction of the ecosystem. The quality of water available to the poor is such that is hazardous to human health as a result of pollution (Dublin 8, Gill and McMillan, 1983:1).

What can we do to stop this or at least reduce it to the barest minimum? Does that imply that we should do without or away with technology? Must we make a return to the stone age in order to salvage our common habitat? The environmental concern is no other than a tragic consequence of the unchecked activity of man. All of us at one time or the other in one way or the other has contributed to environmental crisis. Whenever the human person degrades the integrity of the earth by causing changes in its climate by stripping the earth of its natural forests or destroying its wet land, contaminating the earth's waters, lands, air and its life, sins are being committed against itself and God (Chryssavgis, 2012:51). The magnitude of the abuse of the earth by the human person is such that a critical review of the crisis will lead any reflective mind to begin to ask series of questions such as the following: what is happening to the earth, our home? Is technology bad? How do we engage the new techno-science without destroying our environment?

However, we cannot ignore the fact that humanity has entered a new era of advanced technology which has brought us to crossroads. We are beneficiaries of two centuries of enormous waves of change. We must admit that science and technology are wonderful products of a God-given human creativity and it is good to rejoice in them and be grateful for the possibilities this progress offer to humanity especially in the area of medicine, engineering and communication. The whole technological progress seemed like solving a problem to create others.

Pathetically, our immense technological development has not been accompanied by a development in human responsibility, values and conscience. We have little awareness of our limitations. The human person has constantly intervened in nature which for a long time meant being in tune with it and disrespecting the possibilities it had to offer us.

It was a matter of receiving whatever nature itself allows but now the contrary is what is obtainable, we are now the ones to lay our hands on things to extract everything possible from nature without respect. All these affect the quality of human life.

Today our world is being plagued and ravaged by so many illnesses. People are dying of strange illnesses that were not heard of before because of our carelessness. Cases of different forms of cancer are alarmingly on the increase. Many people have died and are still dying as a result of this and we ask God why (Eric Chivian et al; 2008: 286-323). But I am of a contrary opinion; I think the “why” of all these strange deadly diseases should rather be addressed to us. Are we not largely responsible for all the different forms of pollutions and other ecological catastrophe which are consequences of all our technological and scientific activities? There is need for a change! Environmental ethics should be imbibed by all and sundry.

Environmental Ethics in Perspective

It is pertinent to have a foray on the definitions of ethics, especially environmental ethics as it is perceived and transmitted through the Biblical studies perspectives. As a term, ethics originates from the Greek word, *ethos*. The concept was introduced by Aristotle, the Greek philosopher, to designate a location where people lived and shared life experiences together. According to Manus (2008:307), “with the advancement of human civilization, the term, '*ethos* came to acquire such other significations as custom, temperament, character, in fact, before the ancient knew it, it has come to denote a way of thinking and a way of behaving.” Furthermore, he maintained that, “for the Greeks and under the continued inspiration of Aristotle, human beings are endowed with the capacity for rational behavior as the 'real' basis for ethics and human conduct.” In related development, Manus (2008:307)

sees 'environment' *inter alia*, as the aggregate of social and cultural conditions that influence the life of an individual or a community. It also means the locale where people live, move and have their being.

In the light of these definitions, their significance bear relevance on the various concepts: naturism and environmental ethics to our context in contemporary society, Africa in particular. For Manus (2008:307), the concepts of nature and environmental ethics, is co-extensive to deep iconology or value ethics, “a secular environmental ethics that recognizes value. In all life forms, the natural system and diversity of earth and rejects anthropocentric ethics.” In his analysis, Bowie in Manus (2008:307-308) avers:

Values ethics prescribes that we humans must respect our environment through the preservation of species, the conservation of habitats, the non-depletion of biodiversity and natural resources, the ozone layer and the effects of air and water pollution.

In his own view, Bowie (2004:100) writes that “value ethics concerns itself with human behavior and conduct towards creation which has value in itself and reveals God's own love for creation as human life depends on it.” “It rouses our consciousness on the environment and sustainability issues. It insists on their conformation to the essential norms of human values, conduct and behavior....” One can say here that, value ethics places a demand on us to insist on what ought to be in order to allow our generation to share the good life, the life worth living; especially life that is satisfying to the taste of the average human craving for a fulfilled life on earth.

All religions of the world have traditionally expressed some ethical concern for the environment and its creatures. They have accorded some moral significance to other creatures and proposed some ethical dimensions towards optimum care of our natural environment. For instance, Pope John Paul II in Keith (2009:11) made a significant

contribution to the retrieval of stewardship ethics within Christianity; In 1990 he wrote a *World Day of Peace Message* entitled, “*The Ecological Crisis: A Common Responsibility*”, here, he asserted that, environmental problems are a moral crisis for all humanity, and that the environment is ethically significant in its own right.” In other words, nature has intrinsic value as God creation. Its conclusion reads:

Today, the iconological crisis has assumed such proportions as to the responsibility of everyone, as I have pointed out, its various aspects demonstrate the need for concentrated efforts aimed at establishing the duties and obligations that belong to individuals, peoples, states and the international communities. Thus, all members and groups in the human family, regardless of their faith or whether they have faith, have responsibilities to the environment.

Within Christianity, the vision of living within a sacramental universe complements the idea of stewardship ethics. According to Keith (2009:11), a 'sacrament' is a visible expression of divine love and Christians celebrate certain rituals (e.g. baptism, eucharist) as sacraments. He further states that, “recent their logical thinking has sought to recover the ancient understanding of these rituals within a broader understanding of the entire created world as having religious significance. This approach reveals the continuity between the formal sacraments and the physicality of our world.” Thus, the scope includes all life, indeed, all of the created world. This is in line with Obilor's (2003:135) definition of religion as, “the whole complexus of attitudes, beliefs, practices, gestures, rituals, emotions, convictions, and institutions through which we express our deep fundamental relationship with reality and not excluding the created order.” The phrase “created order” is equally important to ensure that religion begins with creation and the creator. St Francis of Assisi is an example of someone who understood himself to live in a world charged with divine life, in a sacramental world. He was named Patron Saint of

Ecologists because he celebrated the beauty and diversity of creation through his prayer and preaching. He viewed the entire created world as members of the divine family. By implication, the entire created world should be well managed by human persons for the common good of all without exploitation and destruction through unethical practices that lacks moral justification.

Way Forward: Time for Change

We (humans) play a vital role in our environment just like everything else. However, experience shows that what most of us lack, is the ability to understand our place within it. This cognitive capacity of ours has historically been the cause of a perceived division between man and his environment. However, in order to achieve a sustainable future in which humans assume a more reasonable role and have less of negative impact, it is imperative that we reconsider our role and relationship with our environment. A change in the way we regard and treat God's gift upon mankind. By implication, such change of attitude will enable us to reevaluate our position in the world rather than continue to degrade it.

There are a number of ways in which we can begin to reconsider our relationship with our environment, but all of which require an enormous effort. Through a universal education curriculum, it is possible to encourage people everywhere to consider themselves as part of a larger picture. By teaching people about the environment, evolution and ecology, we can provide them with the tools for change. In order to bring about necessary change it is critical that people take action. Through a universal environmental education program, it is possible to galvanize people into forming new ideas and opinions of their environment and to understand their place within it.

A universal education program would go a long way in encouraging change in how we view each other and our environment. Changing attitudes are a primary component in achieving a sustainable future—one in which nature is allowed to run its course without human intervention or will allow people, machines and nature to work together for each other's mutual benefit. In order for the Earth to retain its balance, it is important that we not overstep our bounds as species. This requires a universal effort to reevaluate our relationship with nature and make adjustments as needed.

Conclusion

The discourse so far shows that, the present environmental situation is an indication that there are lots of cracks in the planet that we live in and this definitely calls for solutions which can help us to escape the spiral of self-destruction which engulfs us. Folding arms and watching from afar, is not the best option, rather adherence to environmental ethics, encompassing Christian environmental ethics would finally be the turning point in alleviating environment crises. It is believed that, with the establishment of a Christian ecological conscience and the involvement of institutional commitments, new ideas, spiritual contemplation as well as political activism, environmental crises shall be gradually eliminated in Nigeria and the global world. Hence, all hands must be on deck; the set time to right all the wrongs is now, for tomorrow may be too late.

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8

Impact of Climate Change on Africa

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Introduction

The human race from earliest times has suffered from a lot of existential problems. One of the greatest problems facing mankind is that of climate change. This ecological problem is of great concern to human beings because it has adverse effects ranging from effects on human contents to effects on non-human contents in the environment. Climate change refers to some alterations in the climate system and this is caused mainly by the activities of human beings. Global warming is a term that is closely related to climate change and it refers to the gradual increase in the average temperature of earth's atmosphere and its oceans and this change is permanently changing earth's climate forever.³ The effects and impacts of this phenomenon is seen, noticed and felt in all countries and continents of the world including Africa. An example of this is seen in the southern part of Nigeria where gulley erosion has devastated many settlement areas and farmlands, leading to poverty among the local populations. This work therefore, is geared towards exposing the impacts of climate change on Africa with particular focus on Nigeria.

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The Notion of Climate Change

Climate refers to the weather conditions prevailing in an area in general or over a long period. Climate means the usual condition of the temperature, humidity, atmospheric pressure, wind, rainfall, and other meteorological elements in area of the earth's surface for a long time.⁴ It is pertinent to note that climate is not the same thing as weather. Whereas weather is the condition of the atmosphere of a particular place over a short period of time, climate is the weather pattern, using statistical data, of a place over a long enough period to yield meaningful averages.⁵ Change in weather may not be harmful but change in climate is very harmful.

The most general definition of climate change is a change in the statistical properties of the climate system when considered over long periods of time, regardless of cause. Climate change is a rise in average surface temperatures on earth. It is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). The Environmental Protection Agency (EPA) defines climate change as "any significant change in the measures of climate lasting for an extended period of time."⁶ The term 'climate change' is often used to refer specifically to anthropogenic climate change. Anthropogenic climate change is caused by human activity as opposed to the ones caused by natural processes. Finally, climate change is now used as both a technical description of the process, as well as the noun used to describe the problem.⁷

⁴Wikipedia, "Climate", <https://simple.m.wikipedia.org/wiki/climate>. (Accessed: 27.11.2019)

⁵Wikipedia, "Weather and Climate", https://en.m.wikipedia.org/wiki/Weather_and_climate, (Accessed: 27.11.2019)

⁶EPA, "Climate Change: Basic Information", <https://www.epa.gov>., (Accessed: 27.11.2019.)

⁷M. Hulme, Concept of climate change, (USA: Blackwell,2016) p.34

Causes of Climate Change

It has been argued that human beings are undoubtedly the major causes of climate change. Other natural factors like volcanoes, variations in sun's energy, decay of organic matter etc. also contribute to climate change. Therefore, in this subsection, we shall take a look at the causes of climate change under two major subheadings: human and non-human causes.

Human Causes

Below are some of the causes of climate change that can be attributed to the human person:

- 1. Industrialisation:** In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change, a group of 1,300 independent scientific experts from countries all over the world under the auspices of the United Nations, concluded that there is a more than 95 percent probability that human activities over the past 50 years have warmed our planet. The industrial activities that our modern civilization depends upon have raised atmospheric carbon dioxide levels from 280 parts per million to 400 parts per million in the last 150 years.⁸ Since the industrial revolution in 1700, the level of carbon dioxide on earth has increased by 34%. This is a clear indication of the negative effects of industrialisation on our ecology.

The major source of energy for most factories and machines is the burning or combustion of fossil fuels which release potential greenhouse gases like methane (CH₄), CO₂, etc. Fossil fuels are natural fuels like gas formed in the geological past from living organisms. Pollution whether it is vehicular,

⁸Nasa, "Causes of climate change", <https://climate.nasa.gov/causes/>, (Accessed: 27.11.2019)

electrical or industrial is a main contributor to global warming. Everyday billions of vehicles release various gases into the atmosphere. Electricity also causes pollution in many ways. Over 75% of the electricity worldwide is produced by burning of fossil fuels like coal. Coal is the major fuel that is burnt to produce power. Coal produces around 1.7 times as much carbon dioxide per unit of energy when flamed as does natural gas and 1.25 times as much as oil. Other fossil fuels burnt to provide power for machines, plants and cars include: fuel, kerosene, gasoline etc. Also, mineral exploration processes like mining and oil drilling are included here. As these compounds burn they release greenhouse gases like methane which contribute in a great manner to the warming up of our planet. They not only increase greenhouse gases but are also responsible for large scale deaths due to asthma and other respiratory diseases.

2. **Deforestation:** Deforestation particularly man-made is the cutting down of trees and forest vegetation, for economic, residential, industrial or agricultural purposes. Plants play an important role in regulating the climate because they absorb carbon dioxide from the air and release oxygen back into it. However, it is sad that people clear vast areas of vegetation around the world for farming, urban and infrastructure development or to sell tree products like timber and palm oil. When vegetation is removed or burnt, the stored carbon is released back into the atmosphere as CO₂, contributing to climate change. Up to one-fifth of global greenhouse gas pollution comes from deforestation and forest degradation.
3. **Population Influence:** Another cause of climate change is the influence of over population. Since carbon dioxide contributes

to climate change, the increase in population makes the problem worse because we breathe out more carbon dioxide in the atmosphere. More people means more demand for food, more carbon dioxide in the atmosphere, more demand for cars and more demand for homes. More demand for food will lead to more transportation since movement of goods and services is done by transportation sector. More demand for cars means more pollution in the air and more traffic on the roads which means longer waiting time on the traffic lights and that will result in burning of more fuel. More demand for homes means cutting down of plants and trees to make way for homes, schools and colleges. This factor is in congruence with the philosophy of Paul Ehrlich as portrayed in his work *Population Bomb* where he conveyed his fear that the population growth of humanity is threatening life support system.

4. **War:** During war situations a lot of combustive bombs are detonated. Long range missiles and ICBM (inter-continental ballistic missile) are dispatched. Again the locations where these bombs are detonated go up in flames burning houses, buildings, forests etc. the smoke from all these put together contain carbon dioxide which is a greenhouse gas. In such a manner, wars contribute its own quota to the problem of climate change.
5. **Agriculture Vis-à-Vis Animal Rearing:** Animals particularly livestock like sheep and cattle, produce methane, a greenhouse gas. When livestock are grazed at a large scale, as in Australia, the amount of methane produced is a big contributor to climate change. Some fertilisers that farmers use also release nitrous oxide, which is another greenhouse gas.

Nitrous oxide (N₂O) is 300 times more dangerous than carbon dioxide. The EPA (Environmental Protection Agency) strongly warns that the farming industry's use of fertilizer is one of the leading causes of global warming.⁹

Non-Human Causes

There are some non-human causes of climate change as outlined below:

- 1. Volcanic Eruption:** A volcano is a naturally occurring opening in the surface of the earth through which molten, gaseous and solid minerals are ejected. Volcanoes are usually cone shaped mountains or hills. The principle is that as a result of the pressure and heat in the crust of the earth, magma (i.e. molten rock) rises through cracks or weaknesses in the earth's crust. When this pressure is released, e.g. as a result of plate movement, magma explodes to the surface causing a volcanic eruption. The lava from the eruption then cools to form new crust. Over time, after several eruptions, the rock builds up and a volcano forms. However, what concerns us here is not the rock formed but the gases emitted during the eruption. Volcanic eruptions inject enormous quantities of dust and gases into the upper atmosphere. Large amounts of sulphur dioxide are included which through photochemical reactions using the sun's energy are transformed to sulphuric acid and particles.¹⁰ Typically, these particles remain in the atmosphere forming part of the greenhouse gases which eventually cause global warming. For example, two major volcanic eruptions, El Chichon in 1982 and Pinatubo in 1991, pumped sulphur

⁹EPA, "Causes of Global warming", <https://www.conserve-energy-future.com/GlobalWarmingCauses.php>. (Accessed: 27.11.2019)

¹⁰J. Houghton, *Global Warming: The Complete Briefing*, (Cambridge University Press: Cambridge, 2001), pp 5-6

dioxide gas high into the atmosphere. The gas was converted into tiny particles that lingered for more than a year, reflecting sunlight and shading Earth's surface. Temperatures across the globe dipped for two to three years.¹¹

2. Position of the Earth Vis-A-Vis Earth's Orbit and Axis:

This refers to the changes in the position of the earth as it rotates on its axis and revolves around the sun. This in turn goes on to determine when and where sunlight falls on the earth's surface. These fluctuations in the earth's orbit around the sun are known as the Milankovitch cycles. The principle is that it determines the amount of solar energy reaching the earth from the sun, thus having an adverse effect on climate by changing the seasonal and latitudinal distribution of incoming solar energy at Earth's surface. During the last few thousand years, this phenomenon contributed to a slow cooling trend at high latitudes of the Northern Hemisphere during summer, a trend that was reversed by greenhouse-gas-induced warming during the 20th century.¹² Again, another effect of this positioning of the earth is that some regions receive more sunlight than the others for example the regions in the equator. This makes the region hotter, increasing the chances of warming in that area. It worsens if these areas are sites of heavy industrialisation, for the effects of ozone layer depletion will be highly felt, thereby increasing the greenhouse effect in these areas.

3. Variation in the Sun's Energy Output: Variations in the energy produced in the sun itself have alternately increased and decreased the amount of solar energy reaching the earth.

¹¹Nasa, "Global warming", <https://earthobservatory.nasa.gov/Features/GlobalWarming/page4.php>, (Accessed: 27.11.2019)

¹²Wikipedia, "Global warming", https://en.wikipedia.org/wiki/Global_warming, (Accessed:27.11.2019)

The rate at which energy from the Sun reaches the top of Earth's atmosphere is called "total solar irradiance" (or TSI). TSI fluctuates slightly from day to day and week to week.¹³ In addition to these rapid, short-term fluctuations, there is an 11-year cycle in TSI measurements related to "sunspots" (a part of the Sun's surface that is temporarily cooler and darker than its neighbouring regions). When the sun is at its peak, it is known as solar maxima, and when it is at its average, it is known as solar minima. Direct measurements of solar irradiance, or solar output, have been available from satellites only since the late 1970s. These measurements show a very small peak-to-peak variation in solar irradiance (roughly 0.1 percent of the 1,366 watts per square metre received at the top of the atmosphere, for approximately 0.12 watt per square metre). However, indirect measures of solar activity are available from historical sunspot measurements dating back through the early 17th century. However, the effect of the amount of energy produced by the sun on global warming is so pronounced that a decrease in solar activity is thought to have triggered the Little Ice Age between approximately 1650 and 1850, when Greenland was largely cut off by ice from 1410 to the 1720s and glaciers advanced in the Alps.¹⁴

- 4. Decay of Organic Matter and Waste Products from Respiration of Animals:** The gradual decomposition of organic matter brings about the presence of greenhouse gases in the atmosphere for during this process, they release as CO₂, the carbon they stored during their lifetime. Animals on the other hand are to take in oxygen while giving out CO₂ during

¹³"Impacts of Global warming", <http://www.ucsusa.org/global-warming/science-and-impacts/science/effect-of-sun-on-climate-faq.html#bf-toc-1> (Accessed: 27.11.2019)

¹⁴Nasa, Op. Cit.,

respiration. Worthy of note is the fact that nature balances the effects of minor causes of greenhouse gases such as these through sets of physical, chemical, or biological processes, called “sinks,” that removes CO₂ from the atmosphere.

5. Water Cycle Process: The effect of this process is that it contributes to the presence of water vapor in the atmosphere which is the most abundant greenhouse gas in the atmosphere. When the earth heats up, vapor from the oceans and seas rise up to the atmosphere thus acting as greenhouse gases.

It is important to note here that although these natural causes are still in play today, their influence is too small and they occur too slowly to explain the rapid warming seen in recent decades.

Impacts of Climate Change on Africa: The Nigerian Experience

Climate change is an existential problem and its effect is felt and seen in all parts of the world including Nigeria. Nigeria, as a developing country with population of more than 200 million has been adversely impacted by climate change due to its vulnerability and low coping capability.¹⁵ Evidences have shown that climate change impacts on Nigeria arise from various climate change- related causes such as increase in temperature, rainfall, sea level rise, extreme weather events, flooding etc.¹⁶ Its negative effects are seen on humans, on the environment and on the economy.

On Human Beings

There are some negative impacts of climate change on humans being.

¹⁵Ruth During, “Impact of Climate change on Health in Nigeria”, <https://allafrica.com/stories/>. (Accessed: 28.11.2019)

¹⁶Ibid.,

These changes, especially as observed in Nigeria, threaten human life by affecting the food we eat, the water we drink, the air we breathe, and the weather we experience.

1. Heat Wave: It is a prolonged period of abnormally hot weather. Increased warming of the earth brings about heat waves among the population on the earth. Exposure to extreme heat can lead to heat stroke and dehydration, as well as cardiovascular, respiratory, and cerebrovascular disease. Excessive heat is more likely to affect populations in northern latitudes where people are less prepared to cope with excessive temperatures. Heat waves are also often accompanied by periods of stagnant air, leading to increases in air pollution and associated health effects. This is the case in the northern parts of Nigeria.

2. Physical and Mental Health: Another impact of climate change on human health is the increased spreading of diseases in a warmer world. Many insect carriers of disease thrive better in warmer and wetter conditions. For instance, epidemics of diseases such as viral encephalitides carried by mosquitoes are known to be associated with unusually wet conditions which occur in the Australian, American and African continents associated with different phases of the El-Nino cycle. Some diseases currently largely confined to tropical regions can spread into the mid-latitudes under warm conditions. Malaria is an example of such disease which is spread by mosquitoes optimally under warm conditions. This disease - malaria – is the most common disease in Nigeria. Also, any change in a person's physical health or immediate environment can also have serious impacts on the individual's mental health. In particular, experiencing an extreme weather event can cause

stress and other mental health consequences, particularly when a person loses loved ones or their home. Individuals with mental illness are especially vulnerable to extreme heat; studies have found that having a pre-existing mental illness tripled the risk of death during heat waves. People taking medication for mental illness that makes it difficult to regulate their body temperature are particularly at risk. Even the perceived threat of climate change (for example from reading or watching news reports about climate change) can influence stress responses and mental health.

A report by OGADEP (Ogun state agricultural development program) shows the attendant impact of climate change on the public health of the Nigeria's citizens' farming communities.

The report is as follows:

- Respiratory diseases due to increases in the level of pollutants.
- Malaria in more widespread levels within the population (70% annually)
- Skin ailments (45% annually)
- Heat stroke (4% annually)
- Loss of productivity (40% annually)
- Possible water shortages due to floods or salt water intrusion (60% annually)¹⁷

3. Increase in Ozone: Scientists project that warmer temperatures from climate change will increase the frequency of days with unhealthy levels of ground-level ozone, a harmful air pollutant, and a component in smog. People exposed to higher levels of ground-level ozone are at greater risk of dying

¹⁷OGADEP, "Report of the National Fish Frame Catch Assessment Survey in Ogun State (2004-2008)", Ogun State Agricultural Development Programme (OGADEP), Abeokuta, Nigeria as cited in A.A Idowu et al., *op.cit.*

prematurely or being admitted to the hospital for respiratory problems. Ground-level ozone can damage lung tissue, reduce lung function, and inflame airways. This can aggravate asthma or other lung diseases. Children, older adults, outdoor workers, and those with asthma and other chronic lung diseases in Nigeria are particularly at risk.¹⁸

- 4. Population Displacements:** Climate change impacts on the farming communities can lead to farm abandonment and hence farm occupation decline. Because of increased drought, Fulani herdsmen do not find enough grass in the north for their cows to graze on; this in turn leads them to the southern part of the Nigeria. The danger of this is that most times there are clashes between the herdsmen and the farmers. The resultant effect is that farmers are now afraid to go to farm because of the fear of the herdsmen.

On Environment

It is pertinent to note also that there are some negative effects of climate change on the environment. These effects are discussed briefly below:

- 1. Frequent Wild Fires:** As a result of increased temperatures, the tendency for uncontrolled fires to spark upon basin forests is highly aggravated. Although wildfires are a natural occurrence, with the added carbon dioxide in the air, and hotter weather conditions, the evidence speaks for itself. More frequent wildfires continue to surface in vast amounts each year. The rate at which they burn is longer than the last, and with the release of carbon dioxide into the air, not only are people's lives in danger, but wildlife severely suffers. Each

¹⁸Environmental Protection Agency, "Impacts of climate change", <https://epa.gov/climate-impacts/climate-impacts-human-health/>, (Accessed: 29.11.2019)

time a wildfire burns, the less oxygen there is to combat the dangerous amounts of carbon dioxide being released into the atmosphere. In most villages in Nigeria, this is seen during the harmattan and dry season when fires set nearby are carried by the wind to the forest and this often leads to great loss of food and properties.

- 2. Droughts:** Climate change affects evapotranspiration — the movement of water into the atmosphere from land and water surfaces and plants due to evaporation and transpiration — which is expected to lead to increased drought in dry areas. In drier regions, evapotranspiration may produce periods of drought — defined as below-normal levels of rivers, lakes, and groundwater, and lack of enough soil moisture in agricultural areas. Precipitation has declined in the tropics and subtropics since 1970. Southern Africa, the Sahel region of Africa, southern Asia, the Mediterranean, and the U.S. Southwest, for example, are getting drier. Even areas that remain relatively wet can experience long, dry conditions between extreme precipitation events.

Also, the Sahara Desert is observed to be expanding in all directions trying to engulf the Sahelian region of Africa with annual expansion of 1-10km. Also, Nigerian north is under severe threat of desert encroachment and sand dunes. This is seen in states like Yobe, Borno, Sokoto, Jigawa and Katsina. The sand dunes have buried large portions of arable lands, thus reducing agricultural productions.¹⁹ This also leads to migration and migration can result to increasing spate of communal clashes among herdsmen and farmers and one of such clash in 1998 resulted in the death of 186 people in six

¹⁹P. Akpodiogaga and A Ovuoyovwiroye Odjugo, *General Overview of the Climate Change Impacts in Nigeria*, (department of geography and regional planning, University of Benin),

northern states of Nigeria.²⁰

- 3. Flood and Ocean Surges:** Flood and ocean surges occur because of sea transgressions and because of periodic spilling and plunging sea waves extremes that rapidly inundate the seashores. This causes road tracks inundation, house losses, public health hazards, erosion, farmland, landslides (250-750 m/year), mud-accumulation, livestock mortalities and damage to general soil fertility.²¹ It is pertinent to note that the coastal inundations and erosion with their resultant population displacement are currently major environmental problems in Nembe, Eket, and other coastal settlements in Bayelsa, some parts of Anambra, Delta, Cross River, Rivers, and Lagos states of Nigeria. It is also estimated that a metre rise in sea level will displace about 14 million people from the coastal regions of Nigeria.²²
- 4. Energy:** Hydroelectric power generation which is the source of our energy can be affected by climate change. This energy source is sensitive to the amount, timing and geographical pattern of precipitation as well as temperature.²³ For example, high temperatures and low rainfall reduce its transmission capabilities and excessive drought leads to high evapo-transpiration which in turn affects water volume and the reduction in hydroelectric power generating capacities²⁴ and this will in turn lead to low energy distribution across the nation.

On Economy:

The negative effects of climate change are not felt directly on the

²⁰ *Ibid.*,

²¹ A.A Idowu, *op.cit.*, p.148

²² P. Akpodiogaga, *op.cit.*,

²³ *Ibid.*, p.150

²⁴ *Ibid.*,

human person and his environment but also on the economic development of the particular nation or geographical area.

- 1. Agriculture:** Climate change affects agriculture and food security negatively especially in tropical and subtropical regions because greenhouse gas emissions would increase the risk of hunger by 80 million people by 20280 in Africa and southern Asia.²⁵ A study by Odjugo shows that climate change has led to a change in the type of crops cultivated in Northern Nigeria. For example, in 1978, the preferred crops by farmers were guinea corn followed by groundnut and maize, but due to the increasing temperature and decreasing rainfall amount and duration occasioned by climate change, the farmers as a means of adaptation in 2007 shifted to the production of millet followed by maize and beans.²⁶ Environmental disasters caused as a result of climate change like flood and drought destroy crops and eventually lead to a low income yield. The resultant effect is that there is scarcity of food items leading to fluctuations in the price of food items.
- 2. Industrialisation:** When the effects of climate change have become so obvious and drastic, the resultant effect is that there will be universal clamour to shut down industries whose manufacturing processes lead to the release of greenhouse gases which in the long run cause climate change. The reduction of industrial activities reduces the productions, which affects the economy of a given state.
- 3. Unemployment:** This is a consequent result of reduction of industrial activities. In order for the few available industries to manage their affairs well, there will be need to retrench some

²⁵*Ibid.*,

²⁶*Ibid.*,

workers, thus contributing to unemployment problem.

Concluding Reflections: Towards Combating the Impacts of Climate Change

So far, we have taken a look at the notion of climate change, causes of climate change and also its effects. The pertinent question now is: What do we do to either eradicate or minimize the negative effects of climate change on Africa in general and Nigeria in particular? Against this backdrop, the following recommendations are presented:

- **Afforestation and Reforestation:** Afforestation is the establishment of a forest or stand of trees in areas where there was no previous tree cover or the conversion of bare land into forests. Reforestation on the other hand is the planting of trees where they existed before but for one reason or the other had been cut down. The planting of these trees serve as a form of natural sink for absorbing excess carbon dioxide in the atmosphere. This is because the trees take in carbon dioxide for their respiration and give out oxygen which is beneficial to man.
- **BAN ON DEFORESTATION:** The government of Nigeria should make laws banning deforestation as an unlawful act so as to deter people from the indiscriminate burning and cutting down of trees. This is because trees are very necessary for the control of excess carbon dioxide in the atmosphere.
- **Enlightenment Campaigns and Creation Of Awareness:** One of the reasons why people do things that contribute to climate change is that they are unaware of the messy situation at hand. Government, religious institutions, NGO's should embark on massive enlightenment campaigns so as to educate people on the state of affairs as regards global warming, enlighten them on some of their actions that can contribute to

global warming and then teach them some ways of curbing this ugly menace.

- **Inclusion in Curriculum:** According to Francis Bacon, knowledge is power. The issue of climate change should be inserted into school curriculum beginning from the primary level to at least the secondary level. Better results will be achieved if from childhood, humans are well skilled in the intricacies of climate change. It will make us more at home with it and better equipped to fight it or manage climate change.
- **Green Transportation:** The transportation sector's emissions have increased at a faster rate than any other energy-using sector over the past decade. A variety of solutions are at hand, including improving efficiency (miles per gallon) in all modes of transport, switching to low-carbon fuels, and reducing vehicle miles travelled through smart growth and more efficient mass transportation systems. In recent times we have seen countries like France and Germany planning to phase out petrol or gasoline automobiles by the year 2040, and to start making use of rechargeable electrical cars. Nigerian government should imitate them and begin to think in that same direction.
- **Phasing out Fossil Fuel Electricity and Revving Renewable Sources of Energy:** Generating energy through the burning of fossil fuels is one of the greatest contributors to the menace of climate change. Dramatically reducing our use of fossil fuels—especially carbon-intensive coal—is essential to tackling climate change. There are many ways to begin this process. Key action steps include: not building any new coal-

burning power plants, initiating a phased shutdown of coal plants starting with the oldest and dirtiest, and capturing and storing carbon emissions from power plants. While it may sound like science fiction, the technology exists to store carbon emissions underground. The technology has not been deployed on a large scale or proven to be safe and permanent, but it has been demonstrated in other contexts such as oil and natural gas recovery. Demonstration projects to test the viability and costs of this technology for power plant emissions are worth pursuing. Renewable energy sources such as solar, wind, geothermal and bioenergy are available around the world. Multiple studies have shown that renewable energy has the technical potential to meet the vast majority of our energy needs. Renewable technologies can be deployed quickly, are increasingly cost-effective, and create jobs while reducing pollution.

- **Scientific Efforts:** Technology should not only be a contributor to this ugly trend but it should be developed and channelled into solving the problem too. In recent times there have been improvements in this regards example the development of the process of carbon sequestration which is capturing the carbon dioxide emitted from fossil fuels and storing it underground. Thus in the same manner, scientific researches should go on exploring and finding new and better ways of ameliorating the problem of global warming.
- **Government Control of Pollution:** As one of the ways of reducing climate change, government should place limits on amount of carbon that polluters are allowed to emit and offenders should be strictly punished.
- **Common Action:** Since climate change is a universal threat. International organisations such as the United Nations, should come together and enact decrees binding on member nations,

and aimed at controlling human activities which contribute to climate change. Strict sanctions should also be put in place for member nations who will fail to adhere to the directives of the accord.

- **Installation of Green Roofs:** A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. This is a new trend gradually gaining grounds in the western world. Just as reforestation, it is also a wonderful of reducing greenhouse gases by absorbing excess carbon dioxide in the atmosphere. Nigerians should imitate this good trend and construct this green roofs in their own houses. Government should also encourage this.

Finally, the issue of climate change is a source of great concern to human beings all over the world. Its effects cut across all nations of Africa including Nigeria. The probing question is whether this existential phenomenon can be tackled? The answer is in the affirmative if the solutions presented in this study are adhered to and properly executed. This study finally submits that there is urgent need for a change of attitude in the way we handle nature. Nature should be respected and loved and not only exploited. If we all put our hands in this fight, this threat will be combated.

9

Climate Change and the African Environment¹*Omojola Immaculata Olu, (SSMA), Ph.D*²*Kanu, Ikechukwu Anthony***Abstract**

This paper discusses climate change and environment, with special focus on how regular changes in weather can affect the atmosphere in such areas like, health, displacement of people, food/drinks and school environment. The writer established the fact that issues under consecration must be given adequate attention and awareness should be created among people living in developing countries about how climate change can be detrimental to their health and general well-being.

Introduction

It is quite impressive that human beings can easily adapt to a changing environment. The adaptive capacity of humans has made them to survive climate change through tick and tin. This is not to say that they have always been lucky. When experiencing climate change, it will be noticeably seen that sea levels are rising, glaciers are melting and precipitation patterns are changing. Extreme weather events are becoming more intense and frequent. It should be kept in mind that all populations will be affected by climate change, but some are more vulnerable than others. People living in small island developing

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countries and other coastal regions, megacities, and mountainous and polar regions are particularly vulnerable. Children of poor parents in poor countries are among the most vulnerable. It will be more severe for elderly people and people with infirmities especially those already afflicted with malaria, malnutrition, and diarrhea; they tend to be most vulnerable to heat-related illnesses. Crop declines could lead to undernutrition, hunger and higher food prices. Therefore, Anderson (2011) is of the opinion that Climate change is a key cause of increased heat waves, flooding, droughts, intense tropical cyclones, rising sea levels, and loss of biodiversity. These hazards increase vulnerability to disasters and result in widespread human, material, economic, and environmental losses, including to education systems.

In connection with the above, Beyani (2014) states that Climate change can affect human beings and their environment through an increase in hunger and water crises, especially in developing countries, health risks through rising air temperatures and heatwaves, increasing spread of pests and pathogens, loss of biodiversity due to limited adaptability and adaptability speed of flora and fauna, ocean acidification due to increased HCO₃ concentrations in the water as a consequence of increased CO₂ concentrations and the need for adaptation in all areas for example, agriculture, forestry, energy, infrastructure and tourism. Therefore, there will be difficulty in having access to food, good medical care, better accommodation and education.

Climate Change and Environment

Climate change and environment in this paper is therefore discussed under the following headings-health, displacement of people, food /drinks and school environment. Climate change has great effect on people's health ranging from the water we drink that may be polluted

through erosion, especially where people still use erosion as incinerators. Also, in the air we breathe that regular vehicle fumes, unplanned incinerator that in some cases, refused are being packed and accumulated by the road sides, stinks from dirty drainages and poultries that are close to homes are some of the ways that the environment is being fetid. All these contribute a lot to the health situation of those around who constantly inhale them. Their effects on human health can result in any sickness on individuals and community in general. Some may have diarrhea through drinking of dirty water, and the air emitting from dirty environment can result in accumulation of toxins in the body and other air bone diseases. "Air pollution gets worse as temperatures rise, stressing both the heart and lungs. The fossil fuel pollution that causes the climate crisis also is linked with increased hospitalizations and deaths from cardiovascular disease, and it is connected with more asthma attacks and other breathing problems." Pachauri and Meyer (2014). They are also of the mind that fossil fuel pollution can increase the risk of stroke. Coal combustion also produces mercury a neurotoxin for fetuses. Diseases spread by mosquitoes and ticks increase the chance of neurological problems. Extreme heat is also linked with cerebrovascular disease, a disorder that affects blood supply to the brain.

Gamble (2018) opines that changing water temperatures mean that waterborne *Vibrio* bacteria and harmful algal toxins will be present in the water or in seafood at different times of the year or in places where they were not previously threats. Runoff and flooding resulting from increases in extreme precipitation, hurricane rainfall, and storm surge will increasingly contaminate water bodies used for recreation (such as lakes and beaches), shellfish harvesting waters, and sources of drinking water. He went further to say that people can become ill if exposed to contaminated drinking or recreational water. Climate change increases

the risk of illness through increasing temperature, more frequent heavy rains and runoff, and the effects of storms. Health impacts may include gastrointestinal illness like diarrhea, effects on the bodies nervous and respiratory systems, or liver and kidney damage.

In the same vein, Balbus (2016) is of the opinion that hotter days, more rain, and higher humidity will produce more ticks, which spread infectious diseases like Lyme disease. Occupational hazards such as risk of heatstroke will rise, especially among farmers and construction workers. During this period, diseases carrying insects are out. Trauma from floods, droughts, and heat waves can lead to mental health issues like anxiety, depression, and suicide.

Discussing climate change and its impacts on health further, concentrating on indoor air quality as a priority, Potera (2011) is of the opinion that attention must be paid to the following: caulking and sealing leaks in buildings may alter airflow and concentrate indoor pollutants such as tobacco smoke, radon, and chemical emissions from building materials. He added that when generators are not used properly or when they are too close to homes or living rooms, people end up in inhaling fumes that are dangerous to health. Supporting this, Holden (2019) says that as temperatures increase, plants produce more pollen for longer periods of time, intensifying the allergy seasons. Increased concentrations of carbon dioxide in the atmosphere can make plants grow more and cause more grass pollen, which causes allergies in about 20% of people. Carbon dioxide can also increase the allergy-causing effects of pollen. Although Ridley (2013) argued against this, he feels climate change has some benefits to the environment in this assertion. "The greatest benefit from climate change comes not from temperature change but from carbon dioxide itself. It is not pollution, but the raw material from which plants make

carbohydrates and thence proteins and fats. As it is an extremely rare trace gas in the air less than 0.04 per cent of the air on average plants struggles to absorb enough of it. On a windless, sunny day, a field of corn can suck half the carbon dioxide out of the air. Commercial greenhouse operators therefore pump carbon dioxide into their greenhouses to raise plant growth rates.”

Although, World Health Organization notified in 2018 that over the last 50 years, human activities particularly the burning of fossil fuels have released sufficient quantities of carbon dioxide and other greenhouse gases to trap additional heat in the lower atmosphere and affect the global climate. In another version of WHO report, the opinion is that “global warming may bring some localized benefits, such as fewer winter deaths in temperate climates and increased food production in certain areas, the overall health effects of a changing climate are likely to be overwhelmingly negative.

Climate change affects social and environmental determinants of health clean air, safe drinking water, sufficient food and secure shelter.” In 2019 then, World Health Organization affirms that Climate change can affect human health directly for example, impacts of thermal stress, death and injury in floods and storms. It can also affect indirectly through changes in the ranges of disease vectors for example, mosquitoes, water-borne diseases, water quality, air quality, and food availability and quality.

In summarizing the ideas of Pachauri and Meyer (2014) on how climate change affects human health, they assert that much hotter days make it harder to stay hydrated. They are linked with electrolyte imbalances, kidney stones and kidney failure. Higher temperatures and the depletion of the ozone layer increase the risk of skin cancer. Heat is linked with higher risks for salmonella and campylobacter

outbreaks. Extreme rains can contaminate drinking water. Harmful algae blooms that thrive in higher temperatures can cause gastrointestinal problems.

Considering displacement of people, climate change in relation to too much rain and heavy erosion can destroy houses and even farm lands. We have seen cases where floods have destroyed property and left the people homeless. In some cases too, floods demolish buildings and even break bridges therefore making accessibility to good roads impossible for people and transportation of farm produce becomes tight making life expensive for the masses. Reflecting on people becoming homeless soon due to climate change, Ashton (2007) says emphatically that the developing world will be particularly badly hit, with many people left homeless in their own countries and deprived of all their rights. To him, the number of people forced to move could be more than all those who ended up as refugees after the Second World War. "While many climate refugees would cross national borders - becoming an international problem - many millions more would be unable to leave their countries and would remain largely invisible to outsiders. Climate change could even cause forced migration he added; because it is the most urgent threat facing poor people in the developing world." Therefore, extreme weather events, including hurricanes, floods and wildfires, often cause physical injuries. Extreme heat is also linked with aggression and violence, and the climate crisis globally is connected with violent conflict and forced migration.

Internally displaced persons (IDPs) are not leaving in a favorable environment while new ones are adding. In line with this, Beyani (2014) asserts that over the past five years, an average of nearly 27 million people have been displaced annually by natural hazard-related disasters. It has long been recognized that the effects of climate change

will displace people and that most of this displacement will be within national borders. This may even lead to death as World Health Organization (WHO) predicted in 2018 “Between 2030 and 2050, climate change is expected to cause approximately 250 000 additional deaths per year, from malnutrition, malaria, diarrhea and heat stress.”

Looking at closely at the effect of climate change on food and drinks, if farm harvests are not regular, may be through too much rain or harsh weather, we may experience famine. Famine is a problem on its own when considering climate change. It results easily in massive deaths and illness. Changes in temperature can also affect fruits appearance, size and taste and, ultimately, render them less valuable to farmers trying to sell them. “Our warming planet is making coffee more difficult to grow in traditional coffee-producing regions as well as putting many different types of wild coffee at risk of extinction. Additionally, rising temperatures have caused an invasive fungus that renders coffee plants inedible and harvests poor.” Bethany (2019).

Carbon dioxide emissions can lower the nutritional density of food crops, reducing plant levels of protein, zinc and iron and leading to more nutritional deficiencies. Food supplies are also disrupted by drought, societal instability and inequity linked with climate change. However, Food and drink companies are calling for action on climate change, warning that rising temperatures threaten global food supplies. The research of Beament (2015) on Companies Calling for Climate Change Action; environment- revealed this assertion. "By 2050, it is estimated that the world's population will exceed nine billion, with two-thirds of all people living in urban areas. This increase in population and urbanization will require more water, energy and food, all of which are compromised by warming temperatures." In the same vein, Schlesinger (2019) advises that more than ever, investors need to

pay attention to what was once considered a niche segment of investing. They should view investments through an environmental, social and governance (ESG) lens and ask advisers about these investment options. If not, their money will be more at risk. “While environmental risk is top of mind for many investors, all three considerations are deeply connected, because what is good for society and corporate governance is now often equally so for the planet.”

Climate change in school environment may not be related to changes in weather. It comes in relation to school pattern, school heads, and quality of teachers, population of students and other school activities. In the mind of Slade (2014), stories like bullying both within school walls and on the Internet, violence, and harassment in schools, coupled with school personnel combating low morale and increased stress levels affect school climate. He defines school climate as “the quality and character of school life” and acknowledged four critical elements to school climate: engagement, empowerment and autonomy, inclusivity and equity and environment. By implication, school climate is based on patterns of students', parents,' and school personnel's experience of school life and reflects norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures.

Effects of good or positive school climate change fosters youth development and learning necessary for a productive, contributing, and satisfying life in a democratic society. This climate includes Norms, values, and expectations that support people feeling socially, emotionally, and physically safe. People are engaged and respected. Students, families, and educators work together to develop, live, and contribute to a shared school vision. Slade (2014). However, for a school climate to be pleasing, it must be supportive, protective,

nurturing, and conducive to effective teaching and learning. Students' art and writing samples that tell creative stories must be welcoming and make schools a place where both students and teachers including parents would like to go. Classrooms must be well ventilated and have bright electricity with open doors and students interacting with their teachers. Although, every school has a climate; it is either developed, planned with intent or it is adopted by proxy. The major responsibility of School in relation to climate change is to include in their curriculum the awareness that climate change is real and to teach the ways and manner of adapting into a situation like this. Meanwhile, Anderson (2011) opines that this is already in practice in some schools. "Despite being threatened by climate change, the education sector offers an untapped opportunity to reduce disaster risk and combat climate change. There is a clear education agenda in adopting strategies to deal with global warming. Such strategies include learning new knowledge and skills, and changing behaviors to reduce greenhouse gas emissions through sustainable consumption patterns in lifestyles, livelihoods, economies, and social structures." Other schools that are yet to inculcate this can borrow this idea and make it their practice.

Conclusion

Climate change is one of the greatest challenges we face today. Identifying complex public health issues that connect global climate change and indoor air environments can lead to sound policy decisions that could save lives. If attention is shifted from this, Climate change will result in large scale movements of people and that developing countries will bear the greatest costs. Rising sea levels and increasingly extreme weather events will destroy homes, medical facilities and other essential services. Even though the interactions among school stakeholders are important, the environment itself, that is, the physical

and social-emotional environment also plays a part.

Finally, climate change has consequences on people and its environment from time to time. These effects comes in form of trauma, infections, nutrition and others, that occur in demoralized and displaced populations in the wake of climate-induced situations.

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