

REVIEW

# Low Adaptive Capacity in Africa and Climate Change Crises

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ABSTRACT

The changing climate is unequivocal, and it is generally recognised as a threat to the terrestrial environment due to its cross-sectoral and irreversible impacts. Since the inception of industrial revolution (1750), the concentration of greenhouse gases (carbon dioxide, methane and nitrous oxide) in the atmosphere has been compromised. Until the past two centuries, the quantity of carbon dioxide and methane in the atmosphere had never surpassed about 280 part per million (ppm) and 790 part per billion (ppb), respectively. Rise in greenhouse gases (GHGs) has impacted almost every biotic component on the surface of the earth, and regions which have low adaptive capacity and greatly depend on agriculture and biodiversity for livelihood are hard hit. This phenomenon has resulted in global warming, extinction of some flora and fauna species, precipitation variability, extreme weather conditions, migration of biotic creatures from one geographical area to another, melting of icecap, sea level rise, coral breach and so on during the last century.

The contribution of emission of greenhouse gases of Africa is insignificant, however, the repercussion of the changing climate is crucial in the region due to the presence of other stressors such as poverty, corruption, diseases, geographical position of the continent, low adaptive capacity, rain-fed agriculture etc., and this has led to conflict over resources usage, food insecurity, forced migration, ill-health and many more.

## 1. Introduction

One of the greatest challenges giving headache to the entire globe is the changing climate. It is projected that <sup>[1]</sup>, 50 years to come, global warming will exacerbate to the detriment of humanity. Extremities of weather conditions such as cyclones, tsunami, droughts, flooding etc. will take place more frequently and forcefully, triggering insecure livelihood conditions, shortage of food, forced migration, water inadequacy and conflict.

It is worthy to note that anthropogenic climate change

is already altering weather trends and worsening conditions of weather. Previously, short-term conditions namely droughts, cyclones and flooding are currently longer, more regular and intensified with long-felt socio-economic impacts <sup>[1]</sup>.

The Secretary General of United Nations, in March, 2018, christened climate change as ‘the most systemic threat to humankind’ <sup>[2]</sup>. Anthropogenic activities have warmed the lower atmosphere (troposphere) by approximately 1°C above the pre-industrial level, and it is really causing havoc to the survival of living creatures. Carbon

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dioxide (CO<sub>2</sub>), which is the major component of greenhouse gases (GHGs) accountable for the continuous warming of the earth atmosphere, was incomparable in some million years ago<sup>[3]</sup>. Humankind has emitted CO<sub>2</sub> 14,000 times faster than nature itself has, over the past 600,000 years, released<sup>[4]</sup>. In effect, the social environment and physical system of earth are experiencing fundamental alteration of which many are irrevocable<sup>[5]</sup>.

According to records<sup>[6]</sup>, the three decades have realised consecutively warmer air temperatures than any other since 1850. Both troposphere and oceans are heating up, icecap are incessantly melting and sea level is rising, and it (sea) is more acidic than it has been for the last 300 million years<sup>[3]</sup>. Normal trend in climate is fast disappearing. Globally, the negative repercussion of changing climate is felt by all biotic phenomena and natural catastrophes have become almost permanent.

It is believed that global warming would persist and changing climate impacts will get worse over the near future as a result of past emission inertia in the climate system<sup>[7]</sup>. However, scale of effects beyond 2050, relies on the degree of which GHGs emissions are collectively and immediately reduced. Failure of the world leaders to cut emission of GHGs, warming of 4°C above the pre-industrial level would occur by 2100<sup>[3]</sup>. As a matter of fact, in a world of 4°C, the threshold for adaptation of humankind are likely to be superseded in several regions globally, whereas the limits for natural system adaptation will greatly be surpassed worldwide<sup>[8]</sup>.

## **2. Climate of Africa: Past and Present**

It is perceptible that mean atmospheric temperatures have become warmer than usual over the surface of the Earth. According to National Oceanic Atmospheric Administration<sup>[9]</sup>, these changes became explicit in Africa beginning in somewhere 1975. Since then temperatures within lower atmosphere have risen at a constant rate of approximately 0.03°C annually. As it has been recorded in some parts of Africa where data is available, considerable number of them have on records that extreme temperatures are on the rise including prolong heat waves<sup>[10]</sup>. Repeatedly, climatic records are being broken all the time. In sub-Saharan Africa, 19 of the past 20 years have realised warmer than any earlier year on record. The current atmospheric temperatures are really hotter than ever felt in the past record. Historic rainfall trends indicate that sub-Saharan Africa is persistently drying up<sup>[11]</sup>. Western and Southern parts of Africa, notably Zambia and Zimbabwe show swift and statistically substantial fall in rainfall. Research has it that rainfall in the transitional ecological zone of Ghana (middle belt) is characterised by intermit-

tent rainfall coupled with merging of major (March – July) and minor (September and October) seasons<sup>[12,13]</sup>. The paper further argued that there had been late commencement of major season and early cessation of minor season.

However, Southern Africa, some regions of East and North Africa have witnessed a rise in precipitation. In the same vein, rise in air temperatures leading to higher rates of evapotranspiration, which result in drier soil conditions<sup>[14]</sup> have been reported. It is on record that between 2001 and 2017, Zambia has experienced constant rise in evaporative stress. Amidst rising rainfall, there is possibility of occurrence of soil aridity. From 1961 to 2000, a rise in incidence of dry spells was occasioned by an increase in the intensification of daily precipitation in southern Africa which impacts on runoff<sup>[15]</sup>.

Undoubtedly, the most susceptible regions and societies to the changing climate repercussions according to the various assessment made are found in sub Saharan Africa<sup>[1]</sup>. With regards to last century, an increase in global atmospheric temperatures of about 1°C was estimated on the continent of Africa, greater than the terrestrial average. Unambiguously, warming up of the entire globe is occurring with negative effects felt disproportionately. It is sad to note that Africa is particularly defenceless to insignificant changes in precipitation and temperature as its inhabitants could probably adjust to only minor range of climate changeability. The Intergovernmental Panel on Climate Change (IPCC) has recognised ecological and environmental elements that are particularly susceptible to changing climate and to an increase in general temperatures, as most of them are found on African continent<sup>[1]</sup>.

One geographical area of which the changing climate has hard hit is the Horn of Africa, where severe drought as a result of scanty rainfall eventually caused hunger in the year 2011<sup>[1]</sup>. It is difficult to prove if it was caused by climate change however, IPCC, scientists and international bodies in the region argue that conditions in weather in the sub-region consistently are being characterised with irregular precipitation and life-threatening events. Whereas IPCC projections forestall wetter climatic conditions for the region, current studies anticipate the contrary and otherwise could occur to be the case, as the area has gone through both intense droughts and flooding in the contemporary past<sup>[16]</sup>.

## **3. Future Anticipated Climate Model for Africa**

General Circulation Models (GCMs) offer the most up-front and scientifically recognised way of projecting future conditions of climate. Nevertheless, the only possible simulations of climate change carried out with GCMs

are at coarse resolutions (typically 50-100km grid cells) that are not detailed enough to evaluate regional and national effects. The Coupled Model Inter-comparison Project Phase 5 (CMIP5), which is known to be the current GCMs available, suggests that air temperatures increase for Africa with contemporary emission pathway is 1.7°C by the 2030s, 2.7°C by the 2050s, and 4.5°C by the 2080s. Even under the lowest GHGs emission scenario, climate average, by 2030, is anticipated to be generally different from what has been witnessed historically<sup>[17]</sup>. What is difficult to project perfectly is future rainfall<sup>[18,19]</sup>.

Again, by 2050, the median CMIP5 models state under the higher emission scenario (RCP 8.5) that much of eastern and central Africa would experience rise in annual rainfall whereas reduction would characterise other regions of the continent such as southern, western and northern. It is projected that there will be an increase of precipitation of more than 200mm and over 25 percent yearly are noticed in some regions, as well as decreases of over 100mm and over 20 percent in other areas. As a matter of fact, not all climate models subscribe on the amount or even direction of variation<sup>[17]</sup>. However, according to Niang *et al.*<sup>[20]</sup>, there are some areas with significant harmony with regards to climate models: more than 80% of the climate models are in agreement with reduction in precipitation in future projection for some regions of northern and southern Africa.

According to Vizy and Cook<sup>[21]</sup>, north-western Sahara of North Africa experienced 40 wave days per year during the 1989-2009 time scale. There is a projected rise in heat wave with regards to number of days over the 21st century<sup>[22]</sup>. Based on CMIP3, GCMs projection over West Africa, there is low to medium confidence changes of heavy precipitation by the end of the 21st century<sup>[10]</sup>. Regional model studies estimate rise in the number of extreme precipitation days over western part of Africa including the Sahel during the months of May and July<sup>[21]</sup> however, the inverse is true in the Guinea Highlands and Cameroun mountains as the region would experience more intense and regular events of rainfall extremities<sup>[23,24]</sup>.

#### 4. Anticipated Changes in Temperature for African Sub-region

Estimated warming is somewhat less robust than that of the global land region which is overall characteristic of the Southern Hemisphere. With regards to the low-emission scenario RCP 2.6 (representing a 2°C world), the summer air temperatures of Africa rises until 2050 at approximately 1.5°C beyond the 1951 – 1980 baseline and be kept steadily at the same rate until the end of the century<sup>[25]</sup>. With respect to the high-emission scenario of RCP8.5

(representing a 4°C world), terrestrial warming on the African continent persists till the end of the century, with an expected 5°C monthly summer atmospheric temperatures above the 1951 – 1980 baseline by 2100. As a matter of fact, this warming is evenly distributed geographically, even though regions of inland in the sub-tropics warm the fastest. It is projected that under a low-emission scenario (RCP 2.6), only few areas in western tropical Africa will experience significant normalised warming of up to somewhere four standard variations<sup>[25]</sup>.

#### 5. Expected Changes in Precipitation for African Sub-region

With regards to low-emission scenario, the precipitation models are not in agreement with direction of change over vast regions. However, the percentage change, under the high-emission climate models, becomes larger everywhere. The model, because of this stronger signal, disagrees between places getting wetter and regions getting drier. The projection is limited to south-eastern areas and some places in the tropical western Africa for some months such as June, July and August, and to the south-eastern areas for the months of December, January, and February<sup>[25]</sup>. There is an anticipation of wetting of the Horn of Africa which is part of rainfall extremities captured by the full Coupled Model Inter-comparison Project Phase 5 model ensemble<sup>[18]</sup>. The paper<sup>[18]</sup> again made an estimated changes of 5 to 15% comprehensive wet-day rainfall for West African sub-region with a lot of doubts, particularly with regards to monsoon dependent coast of Guinea. Appreciable wet events are projected to occur by 50-100% in eastern tropical Africa and by 30-70 percent in the westerns part of tropical Africa. Again, precipitation for southern Africa suggests that the entire wet-day rainfall forecasted to reduce by percentage between 15-45 (15-45%) and appreciable wet events of rainfall to rise by approximately 20-30 percent over some places of the sub-region. Nevertheless, some localised areas stretching along the coastal belt of southern Africa are anticipated to experience reduction in wet days rising to about 30%. Furthermore, it is on records that persistent rise in dry days with reduction in heavy rainfall showing an intense dry conditions in the region is imminent<sup>[18]</sup>.

Rainfall is forecasted to experience a significant change in different months with regards to its arrival, duration and cessation of the cropping season. For instance, in Tanzania, rainfall is estimated to rise appreciably during rainy season (November-May) and reduce somewhere in the wet season's commencement (September-October) and end in May – June<sup>[17]</sup>. Generally, rainfall is anticipated to augment, however, the change would be a short-

lived showing both reduction of wet season and ample of rainfall extremities. According to the study, even places witnessing a rise in rainfall regime, there is a probability that worsening water stress would impact crop system negatively neutralising the gains achieved<sup>[17]</sup>. The amount of the temperature increase, and the changes in cloud cover, depending on timing of rainfall, larger areas are likely to experience water availability both in streams and in the soil, but high air temperatures, however, would lead to water loss in the soil through vegetation in the process of evaporation<sup>[14]</sup>. Atmospheric temperatures and rainfall alteration have significant repercussion on food system and security on the African sub-region<sup>[26,27]</sup>. It is quite interesting that rainfall suitability of several food crops is estimated to shift as the warming of the lower atmosphere continues unabated<sup>[28]</sup>. According to Ramirez-Villegas and Thornton<sup>[29]</sup>, some identified food crops such as maize and beans are expected to experience stern reduction in suitability in several regions on the continent. Persistent rise in the concentration of CO<sub>2</sub> is likely to impact on the content of plants' nutrients leading to substantial disruption of protein and micro-nutrient of these plants in some places in SSA<sup>[30,31]</sup>.

## **6. Climate Change and Poverty on African Continent**

The negative effects of the changing climate and variability strike the poor the hardest due to their low adaptive capacity and exposure. Majority of the populace of sub-Saharan Africa derive their livelihood from natural resources and rain-fed agriculture, and they are unable to adjust well with the attendant ills of anthropogenic climate change such as droughts, flooding, soil erosion and other natural catastrophes<sup>[32]</sup>. Citizens are entangled in the web of poverty therefore, they would find it extremely difficult to disentangle themselves if changing climate and variability continues to soar. Others who have escaped this episode can also slip back into poverty if people do not see any change with their fragile adaptive capacity. For instance, according to the report of<sup>[32]</sup>, in East Africa, pastoralists who planned to embark on a migration to increase their chance of survival of their animals and themselves from drought-prone environment witnessed livestock diseases, conflict for piece of land for grazing and other such conditions that were likely to push them back into poverty.

Research has it that majority of the population in African sub-region are very poor and the number surpasses 490 million according to World Bank definition of extreme poverty as earning less than US\$1.90 per day<sup>[7]</sup>. Basically, people who have low adaptive capacity to mitigate the ramifications of anthropogenic climate-related crises be-

come extremely vulnerable. The United Nations and other intergovernmental organisations are alarmingly whistling the danger on the extent climate change can compromise strategies meant to curtail poverty. The IPCC has emphatically stated that changing climate would aggravate and further concretise poverty<sup>[21]</sup> and per World Bank calculation, geophysical and climate-related disasters put an extra 26 million population into poverty worldwide annually<sup>[35]</sup>.

Africa's extremely poor population is estimated to increase for another third time, peaking at 590 million by 2040, before dropping to about 390 million by 2063. These projections ignore those who are likely to slip back into poverty as a result of natural calamities, increasing air temperatures and conflict<sup>[7]</sup>. This huge number of people in poverty is found in the African sub-region. East and West Africa are the region of the myriad of this large population stricken by extreme poverty. Their combined extremely poor populations (projected 310 million people in 2018) are more than double the number of extremely poor people in the rest of the continent (an estimated of 150 million people in 2018)<sup>[7]</sup>.

## **7. Agriculture and Food Security**

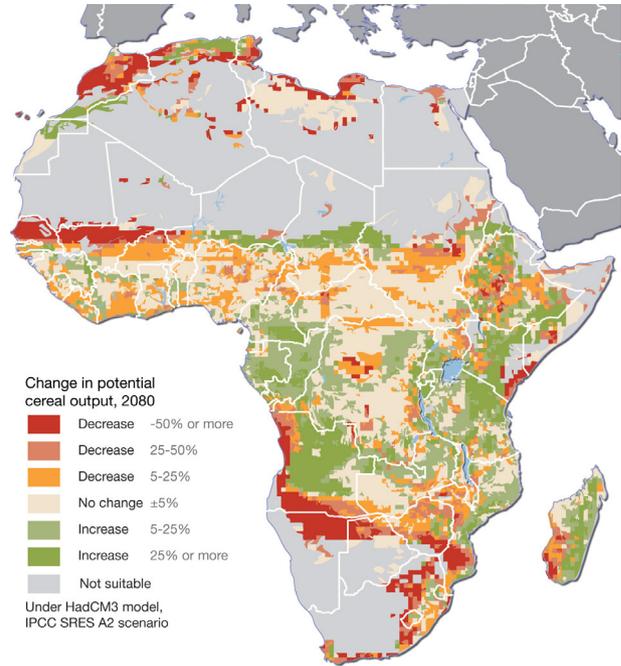
Agriculture offers a source of livelihood to approximately three-quarters of people in the sub-region (SSA), but the sector is predominantly rain-fed. Some phenomena such as flooding, severe and persistent droughts, loss of fertile lands due to desertification, salinisation and soil erosion etc. are decreasing productivity of agricultural produce, but augmenting crop disappointment, loss of livestock to rural populace etc. According to the report of Centre for International Governance Innovation<sup>[34]</sup>, the Horn of Africa's pastoralist region around Ethiopia-Kenya-Somalia border has been sternly hit by recurrent droughts; livestock losses have plunged approximately 11 million people dependent on livestock of their livelihoods into a crisis and generated mass movement of pastoralists out of drought-stricken regions. Again, Northern Africa would not be spared either per the various projections made. The region is already food import-dependent to feed its teeming populace and most agriculture is rain-fed as this characterises the entire Africa. Projected decline in rainfall and rise in average atmospheric temperatures will decrease agricultural production and threaten source of livelihoods of citizens. A study has it that Tunisia, for instance, can anticipate 10-50% reduction in wheat production at 2°C of warming<sup>[36]</sup>. With regards to Western Africa, studies have shown that transitional ecological zone of Ghana has been battling with incessant erratic rainfall and this has affected maize production especially during the minor season (September- October)<sup>[37]</sup>. This, according to

the study, has emerged as the cropping system of farmers is mainly rain-fed, and this has pushed majority of the local farmers into cashew production [37,38].

Changing climate is contributing to oceanic acidification and a rise in surface water temperatures across the continent of Africa, inversely impacting on fish stocks and threatening the livelihood of coastal and small-scale fishing communities. The repercussions of climate change and variability on agriculture and other key economic sectors in the food crop production and supply chain such as forestry and energy, threaten food security across the region [39].

According to Food and Agriculture Organisation [37], approximately 923 million citizens are chronically hungry worldwide. The Millennium Development Goals (MDGs) of reducing the malnourished population by half by 2015 became extremely challenging to realise. The food security situation in Africa is very worrying. Approximately, 36 countries globally are facing food insecurity in recent times, 21 of these countries are found in Africa according to the report of [40]. The paper further stated that over 300 million people in Africa are chronically hungry, almost one-third of the population of the region. Out of this figure (300 million), at least, 235 million are in SSA [39] making it the geographical area on the globe with the topmost percentage of chronically hungry persons. The poorest category is the hardest hit on the continent, and this group comprises the landless, female-headed households and urban poor [39]. In addition, most rural and urban households on the African continent depend on food purchases and are likely to lose from exorbitant food prices as they become more susceptible. Real income is reduced by high food prices on the market and this would trigger an increase in the occurrence of food insecurity and undernourishment among the vulnerable who are mostly the poor, marginalised and landless.

According to CIGI [34], the food insecurity in Africa was aggravated by the global financial crunch. Nonetheless, food insecurity remains headache to the leaders of the continent. Prices of basic foodstuffs remain high, and the structural dynamics that supported the crisis are yet to be dealt with. The 2008 crisis according to the paper [34], nevertheless, was a wake-up call for the leaders of Africa. The leaders of the region including her donors need to realise the urgency of solving problems with food crisis as climate change has come to dwell with humankind.



**Figure 1.** Projected changes in cereal productivity in Africa as a result of climate change – current climate to 2080  
Source: Fischer et al. (2005)

The above figure shows clearly the cereal crops are not spared either by climate change and variability. The most affected region is indicated by red up to green colour.

## 8. Health Challenges

It is undisputable that changing climate is seldom, but tends to be facilitated by already contextual factors to generate effects for human existence [5]. Climate change impacts on human health and facilities, and causes unspeakable injuries due to weather extremity occurrences such as landslides or floods as a result of heavy downpour [41,42]. According to Welborn [7], historic flooding in Nigeria in 2012 took the lives of about 400 people and displaced another 2 million citizens. Flooding in Nigeria has since led to hundreds of deaths and caused for evacuation of hundreds of thousands of people, with almost 200 being put to death by flooding just in a single year (2018).

Extreme heat events can equally lead to heat cramps, collapsing, heat exhaustion, heat stroke, and death, and compromise outdoor events [43]. A study by Azongo *et al.* [44] has it that there are correlations being identified between high atmospheric temperatures and increased all-cause mortality in Ghana and Kenya, with children and the elderly being vulnerable. For instance, cerebrospinal meningitis (CSM) has been reported to be rampant in some parts of Ghana mostly in the northern belt (Sudan Savanna) where the environmental temperature is occasionally high

during dry seasons (November to April) <sup>[45]</sup>. Drought and flooding conditions affect availability and quality of water leading to illness such as diarrhoea, scabies, trachoma and conjunctivitis <sup>[46]</sup>. Another phenomena that have bedevilled the continent are malnutrition and under nutrition, and the presence of changing climate would worsen the situation. Whereas the levels of under nutrition and malnutrition are already high across the length and the breadth of sub-Saharan Africa, projections show that with warming of 1.2 – 1.7°C by 2050, the proportion of the population that is malnourished will rise by 25-90% compared to the current <sup>[47]</sup>. According to WHO <sup>[42]</sup>, under nutrition places individuals at risk of secondary or indirect health implications by amplifying vulnerability to other ailment. It is worthy to note that the repercussions of climate change on agriculture are projected to exacerbate human health conditions by affecting the affordability and accessibility of nutritious food. Outbreak of communicable diseases are likely to happen following extremities of weather events such as floods. The spread of some vector-borne diseases is anticipated to shift. For instance, it seems that malaria incidence has been disseminating into the places of high elevation in Ethiopia, Kenya, Rwanda and Burundi, where formerly it was not known IPCC <sup>[5]</sup>.

Caminade *et al.* <sup>[48]</sup> argue that with regards to Sahel region, the northern periphery of the malaria prevalent strip is anticipated to swing southward by 1°C-2°C with a warming of 1.7°C by 2031-2050 as a result of an estimated fall in the duration of precipitation days in the summer. It is estimated that there is an overall rise in the incidence of malaria projection for eastern, central and southern Africa; for eastern Africa, estimations of extra population at risk under 2°C warming range from approximately 40 – 80 million and 70 – 170 million under 4°C <sup>[49]</sup>. Nevertheless, there is considerable doubt according to Chaves and Koenraadt <sup>[50]</sup> in forestalling changes in the spread of malaria due to the complexity of climate and non-climatic factors involved, with regards to air temperatures and malaria transmission fluctuating from one geographical area to another.

## 9. Forced Migration on the Continent of Africa

Changing climate worsens levels of poverty and unemployment as the livelihood of most people on the African continent revolve around agriculture which is predominantly rain-fed. Hertel *et al.* <sup>[51]</sup> state that urban poor are among the most susceptible to the shocks of food production that leads to jumps in food prices. According to IPCC <sup>[5]</sup>, there is a projection of a rise in displacement of people under continued climate change. Tacoli <sup>[52]</sup> argues that there is complexity in factors leading to migration and

such drivers comprises cultural, economic and political dynamics as well as non-climatic environmental stressors such as desertification.

The region of SSA is anticipated to be mainly impacted by movement associated with climate change-related drivers such as rise in sea-level and diminishing availability of resources as a result of shifts in climatic conditions or extremities of weather events <sup>[53]</sup>. Whereas mass population movement particularly cannot be assumed, as a matter of fact, as an adaptive response to local environmental pressures <sup>[52]</sup>, it can lead to a whole set of other hazards; not only for the migrants in question but also for the populace already at the receiving region. Repercussion at the receiving site can emerge from pressures between ethnic groups, political and legal restrictions and competition for limited resources such as land <sup>[52]</sup>. Condition of livelihood in the new area of residence can place citizens at risk of different environmental hazards to those being left at home, particularly when migrants arrive to live in perilous circumstances. In a situation where sufficient sanitation and water drainage infrastructure are deficient, people might turn to rely on water supplies that can easily become contaminated and this can endanger the lives of the citizens <sup>[54]</sup>.

## 10. Water Quality and Quantity amidst Climate Change in Africa

Majority of African citizens (290 million) are living without access to potable water as a result of inadequate physical water infrastructure, due to bad governance <sup>[7]</sup> and greedy. This implies that approximately half of world population who depend on unhygienic water for drinking are on African continent. With regards to the present trajectory, the number to persons without access to potable water is estimated to increase for the next 5 to 10 years in Africa with the exception of Northern Africa, even though the region would face rising water scarcity and likely worsening water quality too <sup>[53]</sup>.

According to Welborn <sup>[7]</sup> water quality in Africa is expected to improve in some years to come, but not fast enough. The present path has it that majority of people (270 million) will lack access to quality water by 2030 and about 80 million by mid-century. Eastern part of Africa for instance is critically worrying with respects to inadequate water infrastructure. Even though climate change is anticipated to deteriorate water scarcity in the semi-arid regions of Northern and Southern Africa, Eastern Africa harbours about 112 million people (30%) of the continent's populace without access to potable water. People in Eastern Africa who lack access to drinkable water is estimated to rise to about half of population in Africa without

access to hygienic water by 2060. It is worth noting that Africa's insufficient resources invested to improved water supply also constrains development and renders adjusting to changing climate more difficult than in states with sufficient capacity<sup>[56]</sup>.

## 11. Cost of Adaptation

Africa is at a dilemma and only crucial and speedy pragmatic actions would make it possible to effect the future repercussions of climate change and global warming. A report from World Bank suggests that it would cause third world countries a huge sum of money between US\$ 75.00 and US\$ 100 billion per year before such countries can adapt well to temperature change on about 2°C by 2050<sup>[57]</sup>. The study further stated that it would cost sub-Saharan Africa about US\$ 14-17 billion, equivalent to roughly half the amount of Official Development Assistance provided for all of Africa in 2010. A report from Organisation for Economic Cooperation and Development (OECD) opines that in 2010, about US\$29.3 billion was given to Africa. Some economist envisaged that in order to realise 'climate resilient' Millennium Development Goals in the sub-region, Africa will need about US\$ 100 billion annually in the 2010-2020 period with about US\$ 82 billion needed for standard development assistance, and an extra US\$ 11-21 billion for climate change adaptation.

## 12. Conclusions and Recommendation

All hope is not lost for Africa. For Africa to adapt well to repercussions of climate change mishap, leaders on the continent need to improve the capacity of their citizens and put a stop to taking loans to buy expensive mansions and cars. The region is at the mercy of climate change and no one can rescue the sinking vessel of Africans as it is one of the regions which is hard hit by the impacts of climate change and variability. It is sad that the majority of the populace rely on rain-fed agriculture, and this is characterised by 'no rain no farming'. There should be diversification with regards to citizens' livelihood. Governments should subsidise agricultural inputs, irrigate arable lands, offer 'soft' loans to businessmen and women in informal sector, protect infant industries and make corruption expensive to practise. Also, there is the need for African leaders to strongly protect and, at best, expand the green vegetation on the continent. Water bodies too are to be preserved and utilised wisely as they are an endangered resource.

It is worthy to note that even if the globe decides to cut emission of greenhouse gases to zero percent (no emission), it is expected that the current concentration in

the atmosphere would take not less than 100 years before it would dissipate from the atmosphere hence capacity building (adaptation) is the best option for now.

## Author's Contribution

Victor Adjei contributes to conception, design, acquisition of data, analysis and interpretation of data.

Elijah F. Amaning contributes in drafting the article and reviewing it critically for significant intellectual content and gives final approval of the version to be submitted.

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