

## **Strategies for Public Awareness of Climate Change for Sustainable Livelihood**

**Ugwuda S. O.**

Department of Social Science Education,  
University of Nigeria, Nsukka

and

**Ogbonnaya E. K.**

Department of Home Science, Food and Nutrition  
University of Nigeria Nsukka

### **Abstract**

Climate is a common concern of human kind. The impact of climate change on the health and well being of people globally has attracted the attention of the member countries of the United Nations which recently included the issues of climate change in its 17 sustainable development goals. Climate change education is considered important in this paper because climate change is certainly the most important environment challenge of the present age. The role of climate change education in enhancing the capacity of citizens in mitigating the impact of climate change for sustainable family well-being cannot be over emphasized. This paper recommends the inclusion of climate change education in the school curriculum at all levels of our education; and the initiation of action on public education or awareness on the need for the use of renewable energy both in the homes, farmlands and industries among others.

**Key words:** Climate, Change, Environment, Sustainability, Family, Education.

### **Introduction**

Climate action happens to be one of the seventeen set of goals of the sustainable development goals adopted by countries of the United Nations on September, 25<sup>th</sup>, 2015. The goals were aimed at ending poverty, protecting the planet and ensuring prosperity for all

inhabitants of the earth over the next fifteen years (year2030). The 17 Sustainable Development Goals are:

1. No poverty
2. Zero Hunger
3. Good Health and Wellbeing
4. Quality Education
5. Gender Equity
6. Clean Water and Sanitation
7. Affordable and Clean energy
8. Decent Work and economic growth

9. Industry, Innovation and Infrastructure 10. Reduced Inequalities 11. Sustainable Cities and Communities 12. Responsible consumption and production 13. Climate change action 14. Life below water 15. Life on Land 16. Peace, justice and strong institutions, and 17. Partnership for the goals (United Nations, 2015).

The climate action which is listed as goal number thirteen requires that urgent action must be taken to combat climate change and its impact on societies. According to the United Nations (2009:56), climate change is any long term significant change in the average weather that a given region experiences. Climate change is more than just a change in weather; but refers to seasonal changes over a long period of time. The National Aeronautics and Space Administration (NASA) (2015) defined climate change as any long-term change in the Earth's climate or in the climate of a region or city. Some short-term climate variation is normal, but longer term trends indicate a changing climate. Global warming is pre-cursor to climate change. Global warming refers to the long term increase in earth's average temperature. Sometimes global warming is regarded as being synonymous with climate change. Climate change may therefore be referred to as a change in the usual

weather found in a place, while climate is the aggregate weather condition of a place over a longer period of time.

Climate patterns play fundamental role in shaping natural ecosystems, and the human economies, bio-resources and cultural practices that are dependent on it are affected as the climate changes. Stillman (2015) observed that a change in climate can affect many related aspects of where and how people, plants and animals live, such as food production, availability and use of water, and health risks. Climate change affects every country on every continent. It affects family well-being by depleting available natural resources such as water quality, agricultural produce and health of the population. It causes excessive rainfall in other places while in some others it causes drought and famine or starvation of humans and other animals. Climate change simply renders the earth ecosystem unsustainable for human habitation.

Sustainability issue had become a major focus of the United Nations since it nurtured the Millennium Development Goals (MDGs) in the year 2000. According to Oriflame (2017), the World Commission on Environment and Development (WCED) conceived sustainable development as a process that meets present needs without compromising the ability of future generations to meet their own needs.

Howarth (2012) suggests that a sustainable future will come into being if the biophysical and social conditions needed to support economic activity and flourishing are maintained from each generation to the next. The realization of the objectives of a bounteous population full of life and enjoyment would depend on public awareness of the causes and effects of climate change on the environment. Without a climate-literate population the remediation measures adopted by various governments to address the problem of climate change may not yield meaningful results.

Climate Change Education (CCE) is the education geared towards acquiring knowledge, changing attitudes, decision-making processes, and behaviors about climate change and its effects (Leiserowitz and Smith, 2012). It is the training of the population or citizens on climate change issues. In developing nations information about climate change appear scanty, while some nations seem unprepared or unwilling to respond effectively to climate change due partly to a general lack of public understanding of climate issues and opportunities for effective responses. It is in the light of the observed knowledge gap about climate change, that this paper discusses the concepts of climate change and global warming, impact of climate change, climate change education, challenges

and prospects of climate change education and strategies for the realization of its goals.

### **Meaning of Climate Change**

Climate change is a long-term alteration in global weather patterns, especially due to increase in temperature and storm activity, widely regarded as potential consequences of the greenhouse effect. The increase in temperature of the Earth's atmosphere is known as global warming. According to Mastrandrea and Schneider (2009), global warming is measurable increases in the average temperature of Earth's atmospheric, oceans, and landmass. It is believed that the earth currently is facing a period of rapid warming brought on it by rising levels of heat-trapping gases known as greenhouse gases in the atmosphere. The gases prevent the escaping heat (terrestrial radiation) from the surface of the earth like a blanket thereby increasing the atmospheric temperature.

The greenhouse gases are water vapour, carbon-dioxide (CO<sub>2</sub>) Methane, Nitrous Oxide (NO<sub>3</sub>), Ozone (O<sub>3</sub>), Synthetic chemicals and Aerosols. Some of these gases occur naturally in the environment while others result for human activities in our homes, industries and farming activities.

**Aerosols:** Aerosols are suspended solid or liquid particles in a gaseous

medium. Aerosols such as soot are black substances produced by diesel engines, generators and burning tyres. They absorb the sun's energy and therefore contribute to warming of the atmosphere. Fuel combustion and to a less extent industrial processes produce the greenhouse gases and also the tiny solid and liquid particles called aerosol. The aerosols remain suspended in the atmosphere for a long-time where they absorb the solar energy and increase warming.

**Carbon-dioxide (CO<sub>2</sub>):** Carbon-dioxide is a greenhouse gas that occurs naturally in the environment. It is the second most abundant greenhouse gas after water vapour. Carbon-dioxide is released into the atmosphere through volcanic eruptions and the burning of fossil fuels such as coal, petrol, gasoline, kerosene, aviation fuel and firewood.

Apart from water vapour and carbon-dioxide (CO<sub>2</sub>) other important greenhouse gases produced through human activities include: Methane (CH<sub>4</sub>), Nitrous Oxide (N<sub>2</sub>O), Hydrofluro Carbons (HFCs), Per Fluorocarbons (PFCs), Sulphur hexafluoride (SF<sub>6</sub>) and Chlorofluorocarbons (CFC). The gases trap the escaping heat from the earth surface within the lower atmosphere and increase the temperature between

the earth and the atmosphere. This phenomenon is called global warming.

### **Global Warming and Climate Change**

Global warming is the increase in atmosphere temperature of the planet earth. The planet heats and changes the climate patterns. Climate change implies more extreme and unpredictable weather across the globe. Many places will be hotter than usual, some wetter and others drier than they use to be.

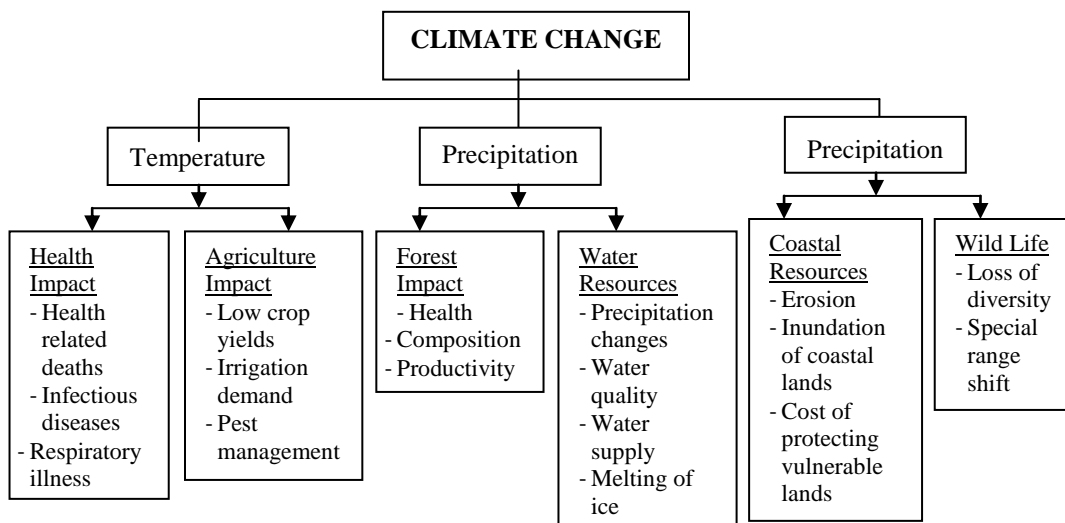
Researchers have observed a warming trend beginning around the late 1800s. But the most rapid warming has occurred in recent decades. Most of this recent warming has been attributed to human activities. Human activities continue to release greenhouse gases and the greenhouse gases trap heat. The continuous release of greenhouse gases continues to increase average temperatures around the globe. The increase in global temperature triggers the change in earth's climate in ways that have significant long-term effects on people and the environment (Intergovernmental Panel on Climate Change (IPCC), 2007).

Actually the term climate change is often used as if it means the same thing as the term global warming. Global warming is the average increase in temperatures in the lower layers of the atmosphere called *troposphere*. Troposphere is about 3.5 kilometers in

thickness from the surface of the earth into the atmosphere. It is the increase in temperature in troposphere of the earth's atmosphere that contributes to changes in the global climatic patterns. Global change on the other hand is a broad term that refers to changes in the global environment, including climate change, ozone depletion and Land use change.

### Impact of Climate Change

Impacts of climate change are noticeable in several aspects of our natural resources. Climate change impacts negatively on the well-being of the families especially those in rural communities (IPCC, 2017). The impact of climate change on the natural environment is summarized in a concept map as follows:



Source: Intergovernmental Panel on Climate Change (IPCC) (2007).

**1. Coastal Area:** Climate change leads to rise in sea level due to increased precipitation and melting of ice/glacier. There is also an increase in storm intensity such as hurricane activities. Other impacts on coastal areas include; coastal erosion, coastal flooding (Tsunami), loss of coastal wetlands and increased risk of property

loss along beaches from storm and wave surges.

**2. Water Resources:** The increase in earth's temperature could lead to dryness and prolonged drought in some place such as the desert fringes. While some parts of the earth experience exceptionally heavy rainfall

and floods (Stillman, 2015). The two events affect water shortages in the sub-Saharan regions leading to higher demand of water for irrigation purposes. Increase in water availability in some places could lead to flooding which damages farmlands, residential homes and pollute available water for drinking. These cause outbreak of diseases in families and communities especially- in the river-rine areas.

**3.Agriculture and Forestry:** Increase in temperature due to global warming with increase in carbon-dioxide (CO<sub>2</sub>) may benefit certain crops, plants and forests depending on the availability of water resources. But much increase in temperature affects crops and vegetation adversely in the Sahel regions leading to desert encroachment and over grazing since the grasses become scarce (Surabi and Mamtha, 2013). Scarcity of grasses for forage leads to the frequent conflict between farmers and herds men. In this way many families suffer various degrees of loses.

**4.Health of Citizens:** Climate change arising from a more intense heat wave could result to more heat-related deaths or illness. It leads to decline in air quality and respiratory tract infections (UNESCO, 2014a) Climate change affects the' health of young, the elderly and those with respiratory

problems. Cost of medication for climate change related illnesses reduce available funds for feeding the families and increase hunger. Climate change however reduces the period of winter cold, which is a welcome development for countries in the high latitudes or temperate regions.

**5.Wild Life:** Forests and grasslands constitute the primary habitats of animals in the wild. Vegetation is also the primary producer of food energy in the ecosystem. Unfortunately changes in the climate elements such as temperature and rainfall affect vegetation most. These two elements single handedly determine the time for leaves shedding, flowering and fruiting of trees in the forest where the animals live and feed on (Howarth, 2012). Climate change has caused drought, desertification, and flooding which destroy the natural habitats. Many wild animals will have to either migrate or die, leading to extinction of both plants and animals.

#### **Consequences of Climate Change on the Economy of Developing Nations**

Developing countries in the sub-Saharan region are more at the receiving end of the negative effects of global warming on their ecosystems. Many of the developing countries occupy warmer regions, where different species of crops and

domesticated animals live at the upper limit of their natural temperature tolerances. Higher temperature leads to widespread livestock declines and crop failure (Apata, Agboola, Kehinde and Sanusi, 2011). Moreover, unlike the industrialized world, most developing nations lack the capital and infrastructure to develop new varieties of heat-tolerant crops and animals. With low technology and weak institutions, citizens of these countries are helplessly at the mercy of climate change.

Global warming results in the melting of ice sheets in the fringes of the arctic regions, and ice caps on mountains such as Himalayas, Alps, Atlas, Rockies and Mountain Everest. The melting of the frozen water releases much liquid water into the oceans and seas and underground water, leading to large scale coastal flooding as experienced in recent times. Unfortunately, most developing countries lack the infrastructure to build flood control systems and deploy disaster relief when needed. Increased rainfall, severity of droughts and water scarcity among others are experienced in different parts of the earth, but developing countries suffer from these natural disasters more than the developed or advanced countries.

Indirectly, the campaign for global emission reduction targets hurt the economy of developing nations.

Emission reduction interferes with their plans for economic development which is anchored on fossil fuel production and consumption (Biesbroek, Termeer, Klostermann and Kabat, 2013). Any legislation on emission reduction invariably also reduces the global use of fossil fuel which adversely affect especially Nigeria's mono economy that is based on crude oil (fossil fuel) export. The implication of the campaign against greenhouse emissions is less demand for crude oil and reduced income for petroleum exporting countries. In this regard, the Nigerian government cannot pay salaries and families go hungry.

#### **Climate Change Education**

One of the key measures for addressing the problem of global warming is reduction in the emission of atmospheric greenhouse gases through education and awareness of citizens. Change in attitude is the best option and attitudinal change comes through education and awareness. It is on this premise that the concept of climate change education emanates. Climate Change Education (CCE) is the education that equip the citizen with knowledge towards changing attitudes, decision-making processes, and behaviors about climate change and its effects. The goals of CCE include; an understanding of the process of science; empowering informed decision making

and motivating changes in behavior (Forrest and Feder, 2011), the core programme objectives for climate change education (CCE) for sustainable development are:

1. To strengthen the capacity of member states to provide quality climate change education for sustainable development at primary and secondary school level through:

- Improved education policy, analysis, research and planning.
- Teacher education and training of education planners.
- Training on curriculum review/reform.

2. To encourage and enhance innovative teaching approaches to integrate quality climate change education for sustainable development in school through:

- Interdisciplinary practices
- Science Education
- Whole school approaches
- Technical and Vocational Education and Training (TVET)
- Disaster Risk Education (DRE).

3. To raise awareness about climate change and enhancement of Non-formal education programme, through media, networking and partnerships.

One of the measures for strengthening adaptation to climate change is access to high quality information. This is possible only through the right type of education.

Education and awareness raising enable decision making, play an essential role in increasing adaptation and mitigation of communities and empower them to adopt sustainable lifestyles (UNESCO, 2014a).

The training of a climate literate population should be the ultimate goal of every developing nation's informed decision making and actions. The United States Climate Change Science Programme (2009) defines a climate literate person as "someone who understands the essential principals of earth's climate and climate change in a meaningful way and makes informed and responsible decision with regard to actions that may affect climate".

The role of teacher education in mitigating the impacts of global warming/climate change falls within the broader agenda of social capital development. According to Smylie (2009), in education, social capita refers to the networks, resources and relationship among adults and children that contribute to child's learning and development. Social capital exists in schools and extends beyond schools to families and communities. The enhancement of teacher's knowledge, skills and disposition on climate change would play a key role in the development of environment education and awareness.



### **Challenges and Prospects of Climate Change Education**

At the global level, first serious efforts in tackling the problem of climate change was in December 1997 at the summit on global warming held in Kyoto, Japan. The summit included representatives from the United State, the European Union (EU) and many developing countries who reached an agreement for reducing emissions of green house gases that may scientists believe may lead to global warming.

Acceding to the UN-sponsored Intergovernmental Panel on climate change (IPCC) (2007), somewhere between 50 percent and 75 percent of projected future emissions produced by burning fossil fuels must be eliminated by 2050 to prevent a doubling or even tripling of atmospheric greenhouse gases late in the next century. This, according to Gordon, Morton, and Hobbs (2013) means that research, development and deployment programs for new clean energy technologies and education must be established in the coming decades. This is where climate change education has an important role to play in terms of enlightening of the population on greenhouse gases emission reduction.

Unfortunately, education hardly appears in national climate policies even though it is an obligation for states to implement. One reason for this could be that the national climate

policy documents, for most part, target industries and not the general public. Thus, the challenge is given over to ministries of education to develop and integrate climate change into education policies, programmes and action plans.

In terms of pedagogy, climate change education could be implemented using a holistic approach, pedagogical approach and techniques in the school environment. Teachers can develop the capacities to facilitate climate change mitigation, adaptation and disaster risk reduction learning. Such disasters include, flooding, storms, landslide and soil erosion.

According to UNESCO (2014b) quality teachers are key to sustainable development and their training, recruitment, retention, status and working conditions are top priorities. Teachers are in fact the single most influential and powerful force for equity, access and quality in education. Hence, any programme for climate change education should start with teacher education who eventually will take the message to the pupil in the classroom.

A major challenge in the implementation of the Climate Change Education (CCE) in the teacher education programme is how to integrate CCE and how it should be infused into the existing curriculum without compromising the already overstretched programmes of study. To

address this issue, this paper is of the view CCE should be infused into the existing subject areas such as science, citizenship education, social studies, geography, human rights education, and population education at least for now.

### **Recommendations**

Climate change is an issue that requires solutions such as:

1. Public education or enlightenment on the need for use of renewable energy, both in homes and offices. In the families, the use of clean energy such as: electric cooker and solar panels should be encouraged. The use of generators is fast becoming obsolete.
2. Countries, especially developing countries should be encouraged by the developed ones to move from fossil fuel economy to a low-carbon economy. This can be achieved through development of the technology of the less developed countries.
3. Climate change education should be included in the school curriculum at all levels of our education. This will help to present the issues of global warming/climate change and other environmental problems that threaten family well-being at the early stage of child education.
4. Government should partner with industries and Non-governmental organizations to adopt clean energy production processes to reduce atmospheric temperatures and emissions.
5. The adoption- of new technologies and positive changes in behavior would limit the increase in global mean temperature and stem Climate Change.
6. Government at all levels should explore ways of enhancing the implementation of training, public awareness, public participation and public access to information so as to enhance understanding of the issues of climate change.
7. This paper therefore recommends strongly that climate change education be included in the teacher education programme as a compulsory course in the various departments. Through CCE families will come to terms on what, why and how carbon- dioxide emissions reduction in homes, farmlands and industries could be achieved.

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