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IMPACT OF CLIMATE CHANGE AND ENVIRONMENTAL ADULT EDUCATION IN NIGERIA

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Abstract
The paper discussed the impact of climate change and environmental adult education in Nigeria. Climate change is an adverse environmental phenomenon that is causing enormous concern all over the world. It refers to some anomalies in the climate system that is result of human activities. Nigeria is one of the world's most densely populated countries with a population of 180 million people, half of which are considered to be object poverty. Nigeria is recognized as being vulnerable to climate change. Environmental adult education is a unique area of concern in the field of adult education which deals with awareness creation, skill acquisition, knowledge and attitudinal change, and thus need to be strengthening with climate change. The integration of climate change in the teaching and learning of adult education will go a long way to enhance positive skills development for environmental sustainability as well as learners achieving their goals. This paper, therefore, examined the concepts such as climate change, causes of climate change, mitigation and adaptation to climate change, environmental adult education objectives of environmental adult education.

Keywords
climate change, environmental, adult education, mitigation, adaptation.

Introduction
Climate change is one of the most critical environmental issues facing the world today. Climate change refers to some observable variations in the climate systems that are attributable to human (anthropogenic) activities, especially those that alter the atmospheric composition of the earth and ultimately lead to global warming. Global warming is closely associated with climate change especially as a co-traveler in the interplay of the equilibrium between the natural and man-made components of the green house gases that have been eminently adjudged globally as the culprit for the warming of the earth's atmosphere and ocean (Idowu, Ayoola, Opele & Ikenweiwe, 2011). The climate influences human lives on the earth, through crop productivity, disease, water scarcity or availability, and vulnerability to hazards (Sachs, 2015). Thus, a de-synchronization of the climate poses danger to the earth and its inhabitants. Of the many problems generated by man's economic and industrial progress, climate change is one that dominates and has serious effect on man and his environment. Human activity is the most important factor determining our future. The rapid growth of population and materialistic ways of living have given rise to what many refers to as global warming that resulted to climate change. Combating climate change requires critical analysis of the reality and a reflection of the roots of the problem, requiring

systemic thinking including human nature interdependency and individualism. Apart from ecological, societal and cultural aspects, there is a need to address the issue of social change through education. Climate change education supports building societies that are characterized by flexible, creative, adaptable, well-informed and inventive sustainable well-being communities (Lehtonen, Salonen, & Cantell, 2019). Every small change in our lifestyle and behaviour can help mitigation and adaptation efforts, thus the need to create an informed global citizenry, a knowledgeable workforce, and enlightened government officials on their roles in climate change mitigation and adaptation.

Concept of climate change V The state of the atmosphere, describing the degree to which it is hot or cold, wet or dry calm or stormy, clear or cloudy and the day-to-day temperature and precipitation activity constitute what is called weather. (Youmatter, 2019). Weather is driven by air pressure, temperature and moisture differences between one place and another. Although many factors combine to influence weather, the four main ones are solar radiation, the amount of which changes with earth's tilt, orbital distance from the sun and latitude, temperature, air pressure and the abundance of water. These differences can occur due to the sun's angle at any particular spot, which varies with latitude. The strong temperature contrast between polar and tropical air gives rise to the largest scale of atmospheric circulations. The main components, or parts, of weather are temperature, atmospheric pressure, wind, humidity, precipitation, and cloudiness (UNESCO, 2013). These components describe the weather at any given time. Factors that combine to influence weather are solar radiation, the amount of which changes with Earth's: tilt, orbital distance from the sun and latitude, temperature, air pressure and the abundance of water.

Climate is the term for the averaging of atmospheric conditions over longer periods of time. It is the prevailing weather conditions of a region, as temperature, air pressure, humidity, precipitation, sunshine, cloudiness, and winds constantly over time throughout the year, average over a series of years (Owede, 2020). Climate refers to the kind of weather that is typically expected in a region. This includes describing the range of conditions that are possible. Global climates are often divided into five types, namely tropical, dry, temperate, cold and polar. These climate divisions take a variety of factors into consideration, including altitude, pressure, wind patterns, and geographical characteristics, such as mountains and oceans (Intergovernmental Panel on Climate Change, 2018).

Climate is sometimes mistaken for weather. But climate is different from weather because it is measured over a long period of time, whereas weather can change from day to day, or from year to year. The climate of an area includes seasonal temperature and rainfall averages, and wind patterns. Different places have different climates. A desert, for example, is referred to as an arid climate because of little water falls, as rain or snow, during the year. Other types of climate include tropical climates, which are hot and humid, and temperate climates, which have warm summers and cooler winters. Whereas weather refers to short-term changes in the atmosphere, climate describes what the weather is like over a long period of time in a specific area. (British Geological Society, 2019).

However, when the weather condition is consistently maintained for a long time, then it is described as climate change. Climate change is the long-term alteration of temperature and typical weather patterns in a place (Unimtiang, 2019). Climate change could refers to a particular location or the planet as a whole. Climate change may cause weather patterns to be less predictable. These

unexpected weather patterns can make it difficult to maintain and grow crops in regions that rely on farming because expected temperature and rainfall levels can no longer be relied on. Climate change has also connected with other damaging weather events such as more frequent and more intense hurricanes, floods, downpours and winter storms (Owede, 2020). Although the earth's climate has been on regular slow change but because of human activities, it is now changing faster than it has in the recent years.

Climate change refers to the average conditions a place experiences over many years, such as the rise in average surface temperatures on earth, mostly due to the burning of fossri fuels (Owede 2020). It is also the variability to natural changes through which the conditions differ from the long-term average. This can include periodic changes in rainfall linked to monsoons or to the natural events called “El Nino” and “La Nina” through which ocean currents affect rainfall (UNESCO, 2013). When scientists and policymakers talk, about “Climate change” today they tend to mean the portion of climate change that human activities cause. It has affected all of our lives and nearly every aspect of society, from our health and food supplies to business and national economies. Climate change is the catch-all term for the shift in worldwide weather phenomena associated with an increase in global average temperature (UNESCO, 2013). Global warming refers only to the earth's rising surface temperature, while climate change includes warming and the “side effects” of warming like melting glaciers, heavier rainstorms, or more frequent drought. Thus, global warming is one symptom of the much larger problem of human caused climate change.

Causes and effects of climate change

Over the years there have been a number of large variations in Earth's climate. These have been caused by both human and natural factors, including changes in the sun emissions from volcanoes, variations in Earth's orbit and levels of carbon dioxide. Global climate change has typically occurred very slowly over thousands or millions of years. However, research shows that the current climate is changing more rapidly than shown in geological records (British Geological Society (BGS), 2019). Climate change is cause by factors that include oceanic process (such as oceanic circulation), biotic processes (e.g., plants), variation in solar radiation received by Earth, plate tectonics and volcanic eruptions, and human-induced alterations of the nature world. BGS (2018) identify the major cause of climate change to include.

Strength of the Sun: Almost all of the energy that affects the climate on Earth originates from the sun. The sun's energy passes through space until it hits the Earth's atmosphere. Not all of this energy passes through to reach the earth's surface. The rest of the energy is reflected back into space or absorbed by the atmosphere. The energy output of the Sun is not constant, it varies over time and this has an impact on our climate.

Changes in the earth orbit, axial tilt and precession: These three changes of eccentricity, axial tilt and precession in the Earth's orbit around the Sun, refers to as a Milankovitch cycles combine to affect the amount of solar heat that reaches the earth's surface and subsequently influences climate patterns, including period of glaciations (ice ages).

The Earth's orbit around the Sun is an ellipse, but it does change shape. Sometimes, it is almost circular with approximately the same distance from the Sun throughout its orbit which other time closer to the sun leading to a warmer climate which affects the length of the season. While the tilt in the axis of the Earth called obliquity is the angle the earth makes with the sun and changes with time. When the angle increases the summers become warmer and the winters become colder. Also, the earth precession refers to how the Earth wobbles on its axis, caused by the gravitational pull of the Moon and the Sun

upon the earth.

Quantity of greenhouse gases in the atmosphere: These are gases that absorbs infrared radiation in the form of heat, which is circulated in the atmosphere. Greenhouse gases also increase the rate at which the atmosphere can absorb short wave radiation from the sun. these gases trap solar radiation in the Earth's atmosphere, making the climate warmer(Owede, 2020). They include carbon dioxide, water vapour, methane, nitrous oxide, ozone and Chiorofluorocarbons' (CFCs). The level of availability of these gases affects the climate.

Ocean current and carbon dioxide (CO_2) content: Ocean currents carry heat around the Earth. As the oceans absorb more heat from the atmosphere, sea surface temperature increases and the ocean circulation patterns that transport warm and cold water around the globe change. The direction of these currents can shift so that different areas become warmer or cooler. As oceans store a large amount of heat, even small changes in ocean currents can have e large effect on global climate. In particular, increases in sea surface temperature an increase the amount of atmospheric water vapour over the oceans, increasing the quantity of greenhouse gas. If the oceans are warmer, they can't absorb as much carbon dioxide from the atmosphere. The oceans also contain more CO_2 in total than the atmosphere and exchanges in CO_2 occur between the oceans and the atmosphere. CO_2 absorbed in ocean water does not trap heat as it does in the atmosphere. The world's oceans absorb about a quarter of the CO2 that is release into the atmosphere every year. As atmosphere CO2 levels increase so do the ocean's CO2 levels and this affects the level of heat in the atmosphere and oceans (Owede, 2020).

Plate tectonics and volcanic eruptions: This refers to the movement of Earth's solid outer crust (lithosphere) over the asthenosphere making different continents to be placed in different positions on the earth. This movement of the plates cause volcanoes and mountains to form thus contributing to a change in climate. Large mountain chains influence the circulation of air around the globe, and consequently influence the climate. For example, warm air maybe defected to cooler regions by mountains. While volcanic eruptions, which is the release of gases and particles may cool or warm the Earth's surface. Major explosive volcanic eruptions, releases large amounts of volcanic gas, aerosol droplets and ash. As falls rapidly,, over periods of days and weeks, and has little long-term impact on climate change. However, volcanic gases that are ejected into the stratosphere stay there for much longer periods. Volcanic gases such assuiphur dioxide can cause global cooling, but carbon dioxide has the potential to cause global warning (Unimtiang, 2019).

Changes in land cover: Patterns of vegetation and climate are closely correlated. Vegetation absorbs CO2 and this can buffer some of the effects of global warming. On the other hand, desertification amplifies global warming through the release of CO2 linked with the decrease in vegetation cover. This decrease in vegetation cover, via deforestation for example, tends to increase local albedo, leading to surface cooling. Albedo refers to much light a surface reflects rather than absorbs. Generally, dark surfaces have a low albedo and light surfaces have a high albedo. Ice with snow has a high albedo and reflects around 90 percent of incoming solar radiation. Land covered with dark-coloured vegetation is likely to have a low albedo and will absorb most of the radiation (Owede, 2020).

Meteorite impact: Meteors which are small bodies in space can collide with the Earth leading to release of dust and aerosols into the atmosphere that prevent sunlight from reaching the Earth. These materials insulate the Earth from solar radiation and cause global temperatures to fall. After the dust and aerosols fall back to Earth, the greenhouse gases

(carbon dioxide, water and methane), caused by the interaction of the impactor and 'target rock', remain in the atmosphere and can cause global temperatures to increase; the effects can last decades (UNESCO, 2013).

All the factors stated above contributes to changes in the Earth's climate, however the way they interact with each other makes it more complicated. A change in any one of these can lead to additional and enhanced or reduced changes in the others. For example, we understand that the oceans can take carbon dioxide out of the atmosphere: when the quantity of CO2 in the atmosphere increases, the temperature of the Earth rises. This in turn would contribute to a warming of the oceans. Warm oceans are less able to absorb CO2 than cold ones, so as the temperature rises, the oceans release more CO2 in the atmosphere, which in turn cause the temperature to rise again. This process is called feedback. A positive feedback accelerate a temperature rise, whereas a negative feedback slows it down (Owede, 2020). Global warming that results to climate change occurs when carbon dioxide (CO2) and other air pollutants (greenhouse gases) collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface (UNESCO, 2013). Normally, this radiation would escape into space but these greenhouse gasses, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. That's what's known as the greenhouse effect that the resultant effect of climate change. The greenhouse gases that cause rise in temperature are carbon dioxide 64% methane 17%, Nitrous Oxide 6% and fluorinated gases. The activities that leads to emission of these gases into the atmosphere are burning of coal, oil and gas and nitrous oxide. Cutting down forest (deforestation) which reduces the absorption of C02, increasing livestock farming (cows and sheep produce large amounts of methane when they digest their food), and use of fertilizers containing nitrogen that produce nitrous oxide emissions. Fluorinated gases produce a very strong warming effect, up to 23000 times greater than CO2 (IPCC, 2018).

Life on Earth is dependent on an atmospheric “greenhouse” a layer of gasses, primary water. vapour, in the lower atmosphere that trap heat from the sun as it's reflected back from the Earth, radiating it back and keeping our planet at a temperature capable of supporting life. A couple of natural and human activities is currently generating an excess of long-live greenhouse gasses that unlike water vapour don't dissipate in response to temperature increases, resulting in a continuing build-up of heat leading to global warming (Owede, 2020).

The effects of global warming includes rising sea levels, regional changes in precipitation, more frequent extreme weather events such as heat waves, and expansion of deserts and ocean acidification. Climate change destabilizes and alters the earth's temperature equilibrium thereby causing far-reaching effects on human beings and the environment.

These effects can be classified into direct. The direct consequences of climate change according to (Intergovernmental Panel on Climate Change, IPCC 2018) include: rising maximum and minimum temperatures, rising sea levels leading to flooding, higher ocean temperatures, an increase in heavy precipitation (heavy rain and hail), shrinking glaciers and thawing permafrost, while the indirect consequences of climate change, which directly affect us human and our environment, include:

1. An increase in hunger and water crises, especially in developing countries
2. Health risk through rising air temperatures and heat waves.
3. Increased global economic inequality
4. Economic implications of dealing with secondary damage related to climate change
5. Increasing spread of pests and pathogens
6. Loss of biodiversity due to limited adaptability

speed of flora and fauna

7. Ocean acidification due to increased l-1C03 concentrations in the water as a consequence of increased CO2 concentrations

8. The need for adaptation in all area (e.g agriculture, forestry, energy infrastructure, tourism, etc.) (United Nations Framework Convention on Climate Change, UNFCC in Owede, 2020).

Humans and wild animal face new challenges for survival because of climate change. More frequent and intense drought, storm, heat waves, rising sea levels, melting glaciers and warming oceans can directly harm animals, destroy the places they live, and wreak havoc on people's livelihoods and communities.

Climate change adaptation and mitigation

Climate change adaptation is the adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities. It means altering our behavior, system, and ways of life of protect our families, our economies, and the environment in which we live from the impact of climate change (World Wildlife Fun, 2019). The more we reduce emissions right now, the easier it will be to adapt to the changes we can no longer avoid. Adaptation is anticipating of the adverse effects of climate change and taking appropriate action to prevent or minimize the damage it can cause, or taking advantage of opportunities that may arise. It is generally based on reducing the vulnerability to the effects of climate change.

Climate change mitigation means avoiding and reducing emissions of heat-trapping greenhouse gases into the atmosphere to prevent the planet from warming to more extremes temperatures.

Mitigation, therefore attends to the causes of climate change, while adaptation addresses its impacts. Mitigation measures are those actions that are taken to reduce and can greengouse gas emissions. The World Resources Institute (WRI, 2020) recommends the strategies for both mitigation and adaptation of climate change which are to protect coastal wetlands, promote sustainable agroforestry, decentralize energy distribution. Secure indigenous people land and improve mass transit. Generally, mitigation activities targets reducing the overall concentration of greenhouse gases in the atmosphere. This includes efforts to switch from fossil fuel to renewable energy sources such as wind and solar, or to improve energy efficiency in also includes effect to plant trees and protect forests, or to farm land in ways that prevent greenhouse gases from entering the atmosphere. Adaptation activities make people, ecosystems and infrastructure less vulnerable to the impacts of climate change. This Includes things like building defenses to protect coastal areas from rising seas, switching to drought or flood resistant crop varieties, and improving systems to warm of heat-values, disease outbreaks, droughts and floods.

Environmental adult education

According to Eheazu (2016) environmental adult education is a process of developing in adults by (whatever criteria they are identified) certain attitudes, skills and knowledge that will enable them to successfully. interact and live in harmony with the forces and element that surround them, as they engage in their daily activities for survival. He explained that environmental adult education is a product of the blend of the principles and goals of environmental education with those of adult education. In this view, Summer (2003) described environmental adult education as a 'hybrid outgrowth of the environmental movement, and adult education, which combine ecological orientation with a learning paradigm to provide a vigorous educational approach to environmental concern. Environmental adult education refers to efforts in teaching and learning of environmental problems and issues and how individuals and businesses can manage or change their lifestyles and

their ecosystems in order to achieve sustainable existence. In support of the view, Mbalisi & Nwoye (2016) asserted that environmental adult education is therefore the application of the theories, principles, programmes, methodologies, approaches and resources (human and material) of adult education in educating adults about the environment and its associated resources with the conscious intention of developing in them knowledge, skills and attitudes required to generate a sense of responsibility and commitment toward solving present environmental problems and preventing future ones. Therefore, this implies that environmental adult education as a discipline depends on the guiding principles of adult education. Environmental adult education has been acknowledge as an effective means for resolving and confronting environment challenges. Environmental adult education is critical for bringing transformation and change by creating awareness, enhancing value, changing attitude, improving skills for the actualisation of environmental sustainability (United Nations Environmental Programme UNEP, 2017).

On the other hand, Okorie in Ifoni (2013) stated that environmental adult education is that type of education, which is geared towards the teaching of environmental issues and how individuals and groups could change and manage their lifestyles toward environmental sustainability.. Moreso, environmental adult education is concerned and practice as the sharing of knowledge and information, the generation of skills, ideas, and competencies that could raise awareness and then mobilize the adults and youths in ther various communities in solving environmental issues (Sabo and Mpofu 2016). Essien, Anthony, Obibessong & Ndifon (2017) explained that environmental adult education is that type of education that creates a relationship between the adults and their environment to enable them understand the problem which occur within their environment and at the same time develop skills and knowledge in solving such problems.

Moreso, Oyebamiyi, Olumati and Nwogu in Fortner (2001) and Henegar (2005) identified three aspects of environmental adult education, namely: formal, non-formal and informal environmental adult education. The authors explained that, the formal environmental adult education is commonly found in schools or certified environmental education centres where specific guidelines and curriculum are included. While the non-formal environmental adult education serves formal, homogenous groups and those that assembled themselves for reasons other than learning. It occurs in special places for learning where there are no classrooms but have opportunities for learning. This include adult education institutes, camps, non-profit environmental organization, museums, parks, natural sites, zoos and other environmental groups that aimed at educating activity outside the established formal system. The informal environmental adult education emphasizes hie long process whereby every individual acquires attitudes, values, skills and knowledge from daily experiences and the educative influences and resources in his environment. This could be acquired through the mass media, parents, friends and personal experience. The different contributions to the definition of environmental adult education, shows that, there is a degree of commonality, in that the definition emphases on skill acquisition and attitudinal change for environmental sustainability.

Objectives of environmental adult education

Eheazu in Essien and Anthony (2018) clearly states the objectives of environmental education which are consistent with objectives of environmental adult education as contained in TibiHsi declaration of 1977.These objectives include;

a. To develop knowledge and understanding of the environment, the forces that contribute to

its deterioration and how it quality could be mentioned.

b. To identify specific chemical, biological, physical and psychological and how its quality could be maintained and psychological and socio-cultural characteristics of the environment that constitutes potential hazards to life and health.
c. To develop skills for solving environmental problems and improving environmental quality.
d. To develop appropriate curricular for environmental education and train personnel for the management of natural resources.
e. To develop aesthetic values that will encourage a culture of environmental beautification and maintenance.
f. To plan appropriate action programs and mobilize citizens to actively participate in the protection and restoration of the quality of our environment.
g. To promote among adults the practice of sustainable development to ensure a continuity of resource base.
h. To develop appropriate attitude and sense of responsibility to enable harmonious relationship with the environment.

The above objective clearly shows that adult learning is a relevant instrument in raising environmental awareness and promoting environmental sustainability. Thus, awareness creation about the environment can also be achieved through climate change.

Conclusion

In conclusion, it is possible to promote and actualize the strategies for limiting and adapting to the impacts of climate change in Nigeria and globally provided cost-effective and sustainable collaboration between governments, development partners and stakeholders can be assured for mitigating the consequences of incessant climate change on the environment and the livelihoods of all.

Suggestions

1. The government and relevant agencies should from time to time, organise sensitization programmes aimed at informing and educating on the causes and effects of climate change in our environment.
2. There should be collaboration among ministry of education information and environment on the need to people informed on climate change and environment issues.
3. Public campaigns/rallies, workshops, community base meetings, mass media and social media plateform should be oraganised to address a common problems prevalent within a particular area.

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