

Review Article

# Environmental Security: The Conceptual Issues in Climate Change, Global Warming and the Nigerian Environment

Eseosa Osadiakemwen Enobakhare<sup>1,\*</sup> , Eguonor Jennifer Oleabhiele<sup>1</sup> ,  
Oghosa Erhahon<sup>2</sup> , Kiprop Evans<sup>3</sup> 

<sup>1</sup>Department of Sociology and Anthropology, Benson Idahosa University, Benin City, Nigeria

<sup>2</sup>Co-Founder, Lagos Climate Network, Lagos, Nigeria

<sup>3</sup>Tum and Associates Advocates, Nairobi, Kenya

## Abstract

The intersection of climate change, global warming, and environmental sustainability presents a range of conceptual challenges, when it is examined within the context of low-income countries of the world like Nigeria and ultimately a worrisome phenomenon because of the adverse effects the issues pose to Nigeria and other African countries if not properly addressed. This work examines the global issues of climate change, global warming and how it impacts on the Nigerian environment. The work used relevant literature to examine climate change and its impact in Nigeria. This work relies extensively on journal articles, books, conference proceedings, technical and annual reports and observations to elucidate on the issues of climate change and global warming in the context of the Nigerian environment. The work reveals the types of climate and climate zones identified in the works by prominent climatologists. It also identifies the meaning of climate change, causes of climate change such as the greenhouse effect and the human activities found to induce climate change. This work further outlines some of the key indicators of global warming, the effects of climate change in the Nigerian environment and outlines some of the strategic way forward to combat climate change in Nigeria. The work identified the National Policies aimed at significantly reducing drought and desertification, drought readiness plan, erosion and flood control, forest protection plans and biodiversity preservation strategies. Primarily, this study advocates for implementable indigenous frameworks in order to mitigate the harsh effects of climate change in Nigeria.

## Keywords

Climate, Environment, Global Warming, Policy & Action

## 1. Introduction

Climate change has become a global issue. The effects are ravaging both developed and developing countries of the world. Since it became a global phenomenon, the United Nations members have made an undivided agreement to take

deliberate actions to curtail its further widespread [19]. Nigeria is one of the most populated countries in Africa and experiencing the scourge of climate change till date. Climate change is gradually becoming a prevalent problem in the

\*Corresponding author: [eenobakhare@biu.edu.ng](mailto:eenobakhare@biu.edu.ng) (Eseosa Osadiakemwen Enobakhare)

Received: 1 May 2025; Accepted: 15 May 2025; Published: 19 June 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

country as it has been recorded that mean temperatures have perpetually increased with a change of 1.01 °C (0.52 to 1.5 °C) in the linear warming for the period of 1951-2005 [15]. The prevalent speed of global warming has been perceived to be the cause for several environmental problems. For example, drought and heat waves across the East and Sahel regions of Africa respectively. This has necessitated the expedition of several measures to significantly reduce the impacts of climate change around the world. It has also been observed that a large number of low-income countries are already exposed to shortages of clean drinking water and poor sanitation, and often occupy high-risk areas such as floodplains and coastal zones [1]. No doubt the effects of climate change necessitate the expedition of several measures to significantly reduce the impacts of climate change around the world. This work is geared towards examining the meaning of climate change, types of climate and climate zones, global warming with emphasis on the Nigerian environment.

## 2. Types of Climate and Climate Zones

It is important to identify what climate is and give an out-

lined typology to climate and climate zones. The term climate originates from the Greek language which means the angle of inclination of the sun [18]. This highlights that when there is a change in the inclination of the sun, it has great adverse effects on the conditions of the earth. No doubt, in the different parts of the world, there exists different climate zones which is mainly due to the fact that the sun's heat is distributed unevenly over the Earth's surface. However, the nearness of the sea, atmospheric circulation, patterns of precipitation and other so-called 'climate-forming factors' play a major role in ascertaining climate conditions [15].

The widely known classification of climates is attributed to the Russian climatologist Wladimir Kppen in 1884. According to the Russian climatologist, there are five main types of climate, which included; tropical, dry, temperate, continental and polar and alpine. In a much later classification on climate zones, Russian scientist Boris Alisov in the 1950s outlined five main climate zones. The major zones are; equatorial, tropical, temperate, and polar (Arctic in the Northern Hemisphere and Antarctic in the Southern Hemisphere) [18].

**Table 1.** Shows Russian scientist Boris Alisov's 1950s tabular classification of climate zones, a pioneering effort in understanding global climate variability and categorization.

Climate zone	Climate type	Average temperature		Time and amount of atmospheric precipitation	Circulation of the atmosphere and predominant winds	Territory
		Winter	Summer			
Equatorial	Equatorial	+26°C	+26 °c	Throughout the year. 2000 mm	Warm. moist equatorial air masses are formed in a region of low atmospheric pressure	Equatorial regions of Africa. South America and Oceania
Sub-equatorial	Tropical monsoon	+20°C	+30°C	Mainly during the monsoon. 2000 mm	Monsoon	Southern and South-East Asia. West and Central Africa. Northern Australia
Tropical	Tropical dry	+12 °c	+35°C	Throughout the year. 200 mm	Trade winds	North Africa Central Australia
Sub-tropical	Mediterranean	+7°C	+22°C	Mainly at the cold time of the year. 500 mm	In summer. anticyclones with high atmospheric pressure; in winter. cyclones	Mediterranean, South Africa. South-West Australia. Western California
	Sub-tropical dry		+40°C	Throughout the year. 120 mm	Dry continental air	Interior of continents between 30 to 45 ° north and south of the equator
Temperate	Temperate maritime	+20°C		Throughout the year. 1000 mm	West winds	Western parts of Eurasia and North America

Climate zone	Climate type	Average temperature		Time and amount of atmospheric precipitation	Circulation of the atmosphere and predominant winds	Territory
		Winter	Summer			
	Temperate continental	-150C	+200C	Throughout the year. 400 mm	West winds	Interior of continents from 40—45° latitude to the polar circles

Source: (Alisov, 1954) cited in [18].

### 3. Defining Climate Change

Climate change according to the Intergovernmental Panel on Climate Change (IPCC) is the change in the condition of the climate that could be detected through statistical tests which implies a change in the mean and/ or the variability of its properties, and it lasts for lengthy period of time [12]. However, the United Nations Framework Convention on Climate Change offers a slightly different definition to climate change. The (UNFCCC) defined climate change as the phenomenon that has direct or indirect link to human activities which in turn changes the composition of the global atmosphere and its natural variability over a significant period [19]. [1] identified climate change to be the visible changes in the climate system linked to human activities that ultimately lead to global warming. From the foregoing, it can be deduced that, climate change is typified by the changes in the makeup of the atmosphere which are usually created by human activities and which overtime become manifested in the form of global warming. These manifestations are seen to be in the form of extreme heat particularly in tropical regions, increased rainfall, changes in the availability of food and fresh water, rising sea levels, and loss of biodiversity and nature. The aforementioned will be examined in detail in the latter section of this work.

## 4. Causes of Climate Change

The section of this work examines some of the factors responsible for climate change around the world and in Nigeria.

### 4.1. Greenhouse effect

Olaniyi accounted that the process by which radiative energy leaving a planetary surface is absorbed by some atmospheric gases, is called greenhouse gases [8]. The solar energy is absorbed by the earth's surface and then reflected to the atmosphere as heat. Then as the heat goes out to space, greenhouse gases absorb a part of the heat. After that, they radiate the heat back to the earth's surface, to another green-

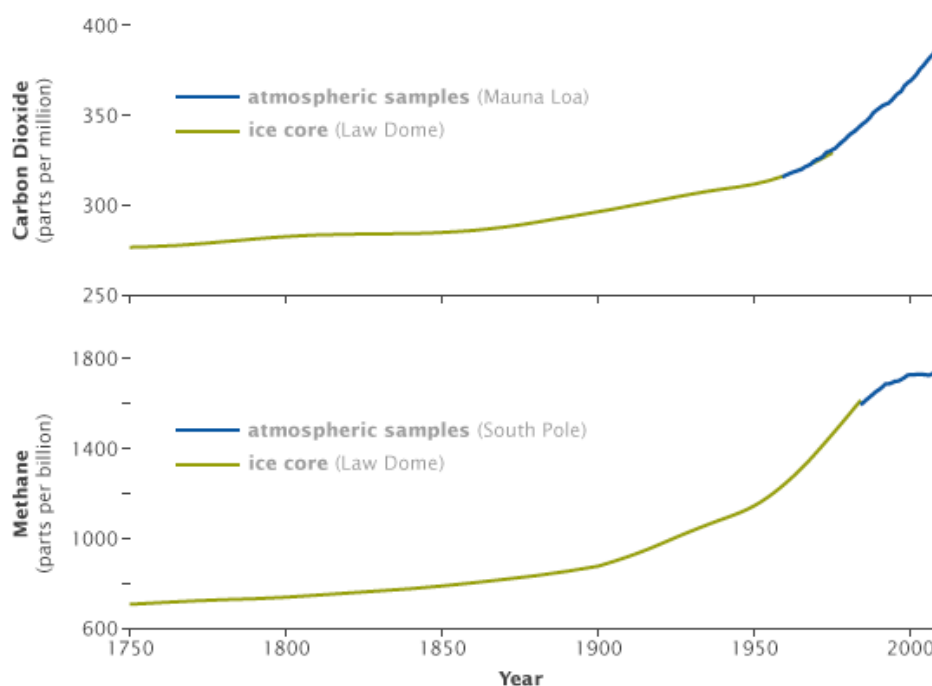
house gas molecule, or to space [9]. As this radiation travels towards the earth, about 25 percent of the radiated energy is absorbed by the atmosphere and about 25 percent is reflected by the clouds and other gases back into space [1].

### 4.2. The Earth's Natural Gases

The major natural greenhouse gases are: water vapour which causes 36%-70% of greenhouse effect; carbon dioxide, CO<sub>2</sub>, 9%- 26%; methane CH<sub>4</sub> 4%-9% and ozone with 3%-7% [8]. It is believed that in the state of natural occurrence, the earth's greenhouse gases do not pose any threat to our environment. However, the impacts derived from the transmission of energy to the surface of the earth and lower atmosphere, so that the temperature is relatively greater and radiation were the only warming mechanism that greatly affect man and his environment [1].

### 4.3. Human Causes

It is also important to highlight that although we have identified two primary causes of climate change around the world primarily the emissions of Greenhouse Gases (GhG). In quest for industrialization, research has revealed that human activities also contribute to the increasing climate change. Scientists attest that humans' activities bring about climate change because we depend on fossil fuels for our energy needs [9]. The emission of greenhouse gases has increased dramatically from the industrial revolution, mostly from the burning of fossil fuels for energy, agriculture, industrial process, and transportation [9]. The heavy dependence on fossil fuels for energy such as that used for electricity is one of the leading human activities that cause climate change. Humans make use of fossil energy to manufacture certain products which could be used for making cements, electronics, plastics and many more. It has also been recognised that indiscriminate cutting down of trees i.e deforestation that helps replenish the earth (as one of the several carbon sinks) is also one of the major human activities causing climate change in Nigeria. The graph shown below attempts to gauge the extent to which the prominent GhG: CO<sub>2</sub> and methane increased in the last 250 years across Global activities.



Source: ("Climate Change" graph done by Robert Simmon Cited in [9])

**Figure 1.** Shows the graph illustrating the significant rise in greenhouse gases (GHGs) – CO<sub>2</sub> and methane – over the past 250 years, highlighting the impact of global activities such as industrialisation, agriculture, and energy consumption.

The graph above shows that carbon dioxide levels have increased by nearly 38 percent from 1750 - 2009 and that methane levels increased by 148 percent [16].

## 5. Gendered Perspective of Climate Change

The gendered climate change concept focuses largely on men and women activities in relation to climate change action. The concept is valuable in capturing the extent to which human activities both intended and unintended are causing destruction and harm to the environment. In terms of consideration of organisations and institutions in Africa and globally, with the most culpability for environmental harm and extractivism, they tend to be highly masculinised. This is observable in how activities such as driving, flying and sailing are mostly associated with masculinity and male anthropocentric. From an anthropocentric point of view, women are majorly impacted by environmental crimes and other marginalised groups [3] and men are key perpetrators of climate change. Bigger, faster and more polluting vehicles are effective symbols of hegemonic status. Climate change is a good example and as described by [10] as "slow" violence- gradual, incremental, seemingly invisible, but causing widespread destruction to many people and men predominantly hold responsibility for this environmental violence. The lack of women in delegate representations at Annual Union United Nations Climate Change Conferences provides an illustration how they are worst-hit groups have been excluded from

making critical decisions on climate change [11].

## 6. Indicators of Global Warming

Global warming has been methodically shown to increase "global temperature" which affects directly on human life and the natural environment [8]. There is scientific evidence to show that some of the indicators of global warming include the rising of sea levels, changes in climate patterns, change in the amount of precipitation, accompanied with heavy storms in tropical regions, droughts, heat waves and expanse of the subtropical desert regions [8]. Whilst other features that global warming has taken course include arctic reduction, loss of rainforest, which is vital for nature and earth, sharp increase in weather temperature, drastic changes in the products from agricultural activities. Countries across the world as witnessed are currently struggling with natural disasters such as floods, wildfires, earthquakes, drought which global warming has been found as one of the major contributing factors. Nigeria is facing some of these indicators as at today, this means that urgent steps are profoundly needed to deescalate the impacts of global warming in the country.

## 7. Effects of Climate Change in the Nigerian Environment

Climate change is a matter of utmost seriousness. The effects are perceived to be devastating if the contributing factors are not properly managed. In this section, we examine some of

the consequences that appear from the enhanced anthropogenic emission of greenhouse gases and other factors as projected earlier in this work. Since the early 80s and 90s and early 20s, Nigeria has been among the countries celebrated in Africa for an impressive Gross Domestic Product (GDP) which was largely helped by its agricultural sector. Recently, there is evidence to show that the reality of climate change in the country is greatly affecting the agricultural sector in a manner that production levels have significantly dropped [1]. The consequences of climate change on the agricultural sector could be mirrored in the areas of crop production and livestock production. Rainfall is a major determinant for many cash crops such as cashew, mango, coconut rubber, cotton, and other fruit crops like pineapple, guava, pawpaw, etc. However, since one of the climate change aftermaths is a significant reduction in rainy season or change of rain patterns, there is a respective impact on the growth of such crops which further implies that the produce from such crops would drastically reduce. Outside crop production, there is also a significant impact of climate change on the area of livestock. The economy of Nigeria is also largely depended on livestock production whereby animals are raised for consumption and the production of raw materials. It is observed that the change in the weather has brought about a significant reduction in rainfalls across the country. This implies that the normal levels of rainfalls that help grasses grow are now reduced because of the change in climate. For example, the herdsmen in Nigeria that usually herd cattle across the country now find it difficult to feed their cattle as a result of the reduction in rainfalls. This leads to a major reduction in the outcome of livestock production in Nigeria. Another sensitive area that climate change has impacted on Nigeria and her environment is that of health and biodiversity. It is believed that climate change brings about the depletion of the ozone layer. The ozone is perceived to be in three atoms of oxygen which exist in the stratosphere 15-40 km above the surface of the earth. The ozone which helps to protect the earth from the dangerous impacts of ultraviolet radiation from the sun is now depleted as a result of climate change. In Nigeria, the dangers of the depletion of the ozone layer have been linked to cause skin cancer, damage to genetic materials, weakened immune system of man- this leads to widespread of diseases in man, damage to lower organism and terrestrial plants. There is evidence to show that climate change results in the increase of waterborne diseases, such as cholera, diarrhoea and malaria [17].

Climate change has also been identified to impact on the energy sector. The supply of energy entails the generation, transmission, and distribution of energy, notably electricity. Nigeria has an abundant supply of energy sources as it is endowed with thermal, hydro, solar, oil resources, and yet still described as an energy poor country. The climate change has induced the drop in the generation of energy around the world and also in Nigeria. Whilst renewable sources of energy like hydro-power plants have the potential to increase access to

energy in the coming years, this might be significantly challenged if climate change is not promptly addressed. [4] accounts that the hydropower generation is most likely to experience a significant drop due to the pattern of precipitation and temperature. Climate change has also been found to slow down urbanisation and development of communities in Nigeria. It is evidenced that the continuous wave of climate change in Nigeria despite its economic effects has in turn created a lean purse for the country. As the country continues to combat the earlier mentioned effects of climate change, there is little or nothing for the government to use in order to invest in infrastructural development and improve quality of life. Many Nigerians and the Nigerian environment could remain impoverished as the battle to reduce the exponential growth of climate change continues.

Housing will become scarce because lands to build on will be less available and ultimately expensive. It is clear as well that in the wake of climate change in Nigeria, the environmental issues such as chronic degradation and flooding could soar beyond the control of government and other stakeholders. There is a high possibility also that continuous flooding will lead to the displacement of people in Nigeria and forced migration as the issue persists. Many Nigerians are at high risk of forcefully relocating their place of residence due to flooding. Statistics show that about 2.4 million people became homeless and were forced to take shelter in main shift internally displaced people (IDP) camps [17].

## 8. Tackling Climate Change in Nigeria

Climate change is not just a global issue, it is very much a Nigerian one. Since the harsh realities of the problem are here with us, it is important that the government, non- governmental organisations, stakeholders and the entire public should take urgent actions to reduce the impact of climate change. It is relevant to highlight that the Nigerian government has introduced certain climate relevant policies in order to combat climate change in the country. Some of the climate relevant policies are entrenched in the National Environmental Policy introduced in the year 1989 which was subsequently revised in the year 1999 in an attempt to satisfy the immediate environmental needs [1]. The goal of the policy was to ensure that sustainable use of natural resources is upheld, there is adequate maintenance of the ecosystem and ecological processes and the preservation of biodiversity. The Climate Change Act was introduced in the year 2021 under the administration of President Muhammadu Buhari. The Climate Change Act in the year 2021 led to the creation of the National Council on Climate Change which has the responsibility of deciding on anything that bothers on climate change in Nigeria. In the area of gas flaring, the gas flaring legislation and sanction in Nigeria stipulate that the petroleum exploration operator (producer) must apply to the minister of petroleum resources before carrying out gas flaring activities in the country. By the Regulations, for every 10,000 barrels of pe-



troleum produced per day, the producer shall be liable for a flare payment of \$2 per 28.317 standard cubic meters (SCM) of gas flares. The National Gas Policy in the year 2017, has been one of the initiatives introduced by the Nigerian government to address Nigeria's gas policy problems. However, great efforts have been made through National Policies to significantly reduce drought and desertification through drought readiness plan, erosion and flood control, forest protection plans and biodiversity preservation strategies. In the year 2015, Nigeria committed to the African Union's Great Green Wall of the Sahara Region Initiative. This led to the setup of the National Agency for the Great Green Wall (NAGGW). The mission of the NAGGW is to halt and reverse land degradation, prevent depletion of biological diversity by the year 2025. Some of the possible urgent actions are described hereafter under two central strategies.

### 8.1. Mitigation

This means that deliberate measures must be undertaken by various countries like Nigeria in order to stop the expansion of climate change on a global scale. [14] reported that the strategy of mitigation is expected to include the adequate decrease in the burning of fossil fuels as well as the greenhouse gases that come from the energy sector. It further stated that the strategy incorporates the significant reduction in cutting down of trees, increase in planting of trees, the utilisation of appropriate agricultural practices and standard laws against the emission of greenhouse gases. Whilst some other mitigation choices are seen to be- geo-engineering to reverse the effect of global warming by creating cooling effects which will offset greenhouse heating; and conceiving the development of technology for clean the greenhouse gases from the atmosphere [8]. Sustainable development goals SDG 13 focuses on climate action to combat climate change and its potential effects. Targets of SDG 13 include strength resilience and adaptive capacity to climate related hazards, integrating climate change measures into national policies and improving on education awareness on climate change mitigation [6].

### 8.2. Adaptation

The other strategy is that of adaptation and a key pillar of climate action adaptation. [14] recommends that countries like Nigeria should take conscientious efforts towards reducing the severe effects of climate change on man and the environment. Considering the realities of climate change around the world, governments are expected to map out ideal plans that factor ways in which the effects of climate change are not severely impacting on lives, nature and the environment. The measures that are available include: changing the cropping patterns; stopping further development on wetlands, flood plains, strengthening public health and environmental engineering defence against diseases; designing and building

new water projects for flood control and drought management; construction of dykes and storm surge barrier against sea level rise [7]. Various frameworks have been developed to assist policy makers and scientists to identify barriers that could delay adaptation to climate change [20]. Despite evidential progress, adaptation gaps exist in ways of ephemeral benefits, fragmentation, inequality, and systemic barriers [13]. Previous research on climate change shows that Africa negative climate change is a result of external causes which result in externalization of costs and assistance, payments can be a reasonable way to compensate Africa for the negative climate change impacts [2]. To identify synergies in the built environment between climate change adaptation and environmental crime prevention, [5] assessed potential risks associated with climate change such as heat, wildfires and flooding.

## 9. Conclusion

Climate change is no longer new and the harsh realities are with us today. Nigeria is currently grappling with some of those harsh realities, such as the rising of sea levels, changes in climate patterns, and change in the amount of precipitation, accompanied with heavy storms in tropical regions, droughts, heat waves and expanse of the subtropical desert regions. However, despite the fact that the Nigerian government has introduced certain strategic policies to reduce the devastating effects nationwide- such as to reduce drought and desertification, drought readiness plan, erosion and flood control, forest protection plans and biodiversity preservation strategies, more painstaking efforts are needed to fully tackle the issue at the level of international acceptable practice.

## Abbreviations

IPCC	Intergovernmental Panel on Climate Change
UNFCCC	United Nations Framework Convention on Climate Change
GhG	Greenhouse Gases
GDP	Gross Domestic Product
IDP	Internally Displaced People
SCM	Standard Cubic Meters
NAGGW	National Agency for Great Green Wall
SDG	Sustainable Development Goals

## Acknowledgments

The authors would like to sincerely thank the reviewers for dedicating their time and effort to reading and evaluating our manuscript.

## Authors Contributions

**Eseosa Osadiakemwen Enobakhare:** Conceptualisation, Resources, Data curation, Formal analysis and Writing orig-

inal draft

**Eguonor Jennifer Oleabhiele:** Formal analysis and Writing original draft

**Oghosa Erhahon:** Formal analysis and Writing review

**Kiprop Evans:** Data curation, Validation, Writing review and editing

## Funding

The study did not receive any funding.

## Conflicts of Interest

The authors declare no conflicts of interest.

## References

- [1] Ajayi, I. B., Oleabhiele, E. J., and Enobakhare, E. (2021). The environment, climate change, and underdevelopment of Nigerian cities. In E. O. Ekhator, S. Miller, & I. Etinosa, *Implementing the Sustainable Development Goals in Nigeria: Barriers, Prospects, and Strategies* (p. 260). London: Routledge.
- [2] Bassey, C. E. 2007. Nigeria Climate Change. <http://www.oneworld.net/guides>
- [3] Bahar, H. L. (2023). The green road project and womens green victimisation in Turkey. In E. Milne, P. Davies, J. Heydon, K. Peggs,& Wyatt (Eds.), *Gendering green criminology* (pp. 187-204). Bristol University Press.
- [4] Building Nigeria's Response to Climate Change (BNRCC). (2011). National adaptation strategy and plan of action on climate change for Nigeria (NASPA-CCN). Prepared for the Federal Ministry of Environment Special Climate Change Unit. <http://csdevnet.org/wpcontent/uploads/NATIONAL-ADAPTATION-STRATEGY-AND-PLAN-OF-ACTION.pdf>
- [5] Charmard, S. (2024) Finding synergies in the built environment between climate change adaptation and crime prevention. Crime Prevention and Community Safety. <https://doi.org/10.1057/s41300-024-00206-7>
- [6] Ceccato, V. Newton, A. (2024) Systems thinking for sustainable crime prevention. Planning for Risky Places. <https://lnkd.in/e9nT4p3N>
- [7] Holdren, J. P. (2010). Climate-change science and policy: What do we know? What should we do? Keynote Address, Kalvi Prize Science Forum, International.
- [8] Olaniyi, O. A., Funmilayo, O. A., & Olutimehin, I. O. (2014). Review of climate change and its effect on Nigeria ecosystem. *International Journal of Environment and Pollution Research*, 2(3), 70-81.
- [9] Kaddo, Jameel R., (2016). Climate change: Causes, effects, and solutions. A with Honors Projects. 164. Retrieved from <http://spark.parkland.edu/ah/164>
- [10] Nixon, R. (2011). *Slow violence and the environmentalism of the poor*. Harvard University Press.
- [11] Pearse, R. (2017). Gender and climate change. *Wiley Interdisciplinary Reviews: Climate Change*, 8(2), e451. <https://doi.org/10.1002/wcc.451>
- [12] Intergovernmental Panel on Climate Change (IPCC) (2014). Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri RK, Meyer LA (eds.)] p. 151. 2014. Geneva, Switzerland.
- [13] Intergovernmental Panel on Climate Change (IPCC) (2023). Synthesis Report. Contribution of Working Groups I, II and III to the sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)] p. 35-115, 2014. Geneva, Switzerland.
- [14] Orlove B. (2022). The concept of adaptation. *Annual Review of Environment and Resources*, 47(1), 535-581.
- [15] Federal Ministry of Environment (2021). National climate policy change for Nigeria. Retrieved from <https://climatechange.gov.ng/wp-content/uploads/2021/08/NC-CP-NIGERIA-REVISED-2JUNE-2021.pdf>
- [16] Riebeek, H. (2016). Global Warming. Global Warming: Feature Articles. NASA, 3 June 2010. Web. 06 May 2016.
- [17] United Nations Children's Fund (2022). Nigeria emergency flood response. Retrieved from <https://www.unicef.org/nigeria/reports/nigeria-emergency-flood-response>
- [18] United Nations Development Programme (2023). About climate box. Retrieved from <https://climate-box.com/textbooks/the-problem-of-climate-change/2-2-effects-on-plants-and-animals/>
- [19] United Nations Framework Convention on Climate Change (2011). The canun agreements: Outcome of the work of the Ad Hoc Working Group on longterm cooperative action under the convention. decision 1/CP.16.
- [20] United Nations Framework Convention on Climate Change (UNFCC). 21 March 1994. Internet: <http://unfcccint/essential>