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## **CLIMATE CHANGE AND ECONOMIC OPPORTUNITIES IN NIGERIA**

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### **ABSTRACT**

Climate change is a threat to human well-being and the health of the planet. Any further delay in concerted global action will miss the brief, rapidly closing window to secure a sustainable future. But in as much as it is a threat, it could also create economic opportunities. This paper examined how climate change will also promote economic opportunities. The paper conceptualized climate change and highlighted ways major ways climate change affects Nigerians. Some of these include low crop yield and food security, reduced livestock production, loss of income, public health crisis, decreased hydroelectric power supply, etc. The paper further evaluated the economic opportunities from climate change in Nigeria and it was revealed that tackling climate change is necessary to create a resilient and sustainable future as well as more opportunities for a growing market for renewable energy, eco-friendly construction, clean energy, resilience and energy efficiency. The paper so concluded that climate change is the broader range of changes that are causing income divergence across individuals, sectors, and regions, an adjustment in energy markets, increased inflation variability, financial markets stress, intensified innovation, increased migration, and rising public debt in Nigeria. The Nigerian government also realize the concern over regulatory risk and its responsibility to proactively manage the transition to a low-carbon economy through supportive planning of the economic and environmental strategies as well as investment in efficient and clean infrastructure which is also resilient to climate change impact and give room for economic opportunities for Nigeria. The paper suggested among others that government should formulate supportive economic policies that would encourage the use of effective carbon pricing policies that can maintain competitiveness, create jobs, encourage innovation, and deliver meaningful emissions.

**Keywords:** Climate Change, Economic Opportunities, Renewable Energy, Eco-Friendly Construction.

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## INTRODUCTION

Nigeria, an African country on the Gulf of Guinea, has many natural landmarks and wildlife reserves with an increasing population of Nigeria is 221,588,161 (Worldometer Elaboration of the latest United Nations Data, 2023) that directly depends on climate-sensitive economic and development sectors (agriculture and fisheries) mineral resources (crude oil, natural gas, coal, tin, and columbite) and natural resources (such as water, biodiversity, and grassland) for their sustenance and livelihoods (Nigeria's First National Communication, in Onuoha, 2009). Climate change is a serious threat to poverty reduction and sustainable development all over the world especially among developing countries (Nigeria inclusive). Following its threat to the Nigerian economy and its citizens, in 2012, Nigeria adopted its Climate Change Policy Response and Strategy (CCPRS) to ensure an effective national response to the multi-faceted impacts of climate change. The main goals of the CCPRS include implementation of mitigation measures that will promote low carbon as well as sustainable and high economic growth; enhancement of national capacity to adapt to climate change; raising climate change-related science, technology and research and development to a new level that will enable the country to better participate in international scientific and technological cooperation on climate change; significantly increase public awareness and involve private sector participation in addressing the challenges of climate change; strengthen national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance.

The National Adaptation Strategy and Plan of Action for Climate Change Nigeria (NASPA-CCN) described the adaptation priorities, bringing together existing initiatives and priorities for future action (Ogbuabor & Egwuchukwu, 2017). NASPA-CCN's vision is to make climate change an integral part of sustainable development in Nigeria, reducing risk and seizing opportunities arising from climate change while increasing the ability of all industries and all people to adapt to the adverse effects of climate change. These changes also affect the forest due to erosion and storms, leading to a decrease in forest products such as wood and caterpillars. While many farmers in the south need rain to grow, many farmers in the north do not. Extreme rains and droughts caused by climate change have affected crop distribution in Nigeria, resulting in reduced crops to meet the needs of the population. While extreme weather conditions can weaken the economy by damaging investment and production, the productivity of the economy will also drop as the global economy adapts to higher temperatures.

Inflation tripled in 2023 to 22.04%. He added that deforestation and loss of non-timber forest products in Nigeria were 120 billion naira per year 5 years ago, equal to 3% of inflation in 2022 Gross Domestic Product (PIB). Climate change threatens national productivity as well as agricultural productivity in particular (Ogbuabor & Egwuchukwu, 2017). Therefore, climate change is generally defined as a change that has existed for a decade or more. It includes changes in the frequency and intensity of certain weather events and a slow but steady increase in global average temperatures (Intergovernmental Panel on Climate Change [IPCC], 2001). The German Advisory Committee on Climate Change states that climate change is a threat that already has a major impact on humans and natural ecosystems in both developed and developing countries (German Advisory Committee on Global Change WBGU, 2003).

The benefits of climate change for developing countries are thought to be less due to technological innovations, advanced technology, agricultural machinery and wealth. These conditions lead to high economic pressure to mitigate the negative effects of climate change. For developing countries like Nigeria, the impact of climate change is particularly significant due to

extreme temperatures, lack of adaptation and lack of early warning. In addition, climate change also affects the economy, whose economic activities have a positive effect on natural resources such as agriculture. Thus, while climate change may increase productivity in countries with average annual temperatures, temperatures are increasing in productivity in countries already experiencing climate change. Integrating climate change measures into economic policies will benefit economic growth in the medium and long term. In this context, this study examines how the threat of climate change shapes the economy of the Nigerian state.

## **CONCEPTUAL CLARIFICATION**

### **Climate Change**

The global climate is changing and will continue to change throughout this century and beyond. The severity of climate change over the next decade will depend on the rate of worldwide greenhouse gas (hot water) emissions and the uncertainty in the global climate perspective for emissions (Wuebbles, 2018). With the reduction in greenhouse gas (GHG) emissions, the increase in global average annual temperature can be limited to below 2°C. However, if emissions do not decrease, the average global annual temperature could rise by 5°C. At the end of the century or more compared to the pre-industrial era. The global climate continues to change faster than the rate of climate change in Earth's history. Global trends mean climate change, sea level rise, sea level rise, melting of ground glaciers, the Arctic Ocean, the depth of summer permafrost melting, and other factors.

Climate change provides consistent evidence of global warming. A Climate refers to the long-term regional or global average of temperature, humidity, and precipitation patterns over a season, year, or several years. While the weather can change in a matter of hours, climate change happens over much longer time periods (Tsitsiragos, 2016). Climate change refers to significant changes in the average climate that cause warming, wetting or drying over decades or more (Halofsky et al., 2020). Climate change is distinguished from climate change by long-term change. The Intergovernmental Panel on Climate Change (IPCC, 2007) defines climate change as significant changes over time (usually decades or more). It includes changes in the frequency and intensity of certain weather events, as well as a slow and sustained increase in global average temperatures. The scientific community recognizes that unrelenting carbon monoxide will warm the earth by at least a few degrees Celsius by 2100, with high local risks, regional and global impacts on human life and natural ecosystems.

These changes are caused by additional heat produced by the climate due to the addition of greenhouse gases to the atmosphere. These additional greenhouse gases are mainly caused by human activities such as burning fossil fuels (coal, oil and natural gas), deforestation, agriculture and land use. These activities increase the "heat-trapping" greenhouse gases in the atmosphere. The observed patterns of climate change are consistent with the intensity of the greenhouse effect. Other climate effects such as volcanic, solar and natural changes cannot explain the timing and magnitude of these changes (Romm, 2022). Global climate change has already had a significant impact in all parts of the world and around the world various sectors of the economy. The effects of climate change are occurring throughout the region and in many areas of humanitarian importance such as human health, agriculture and food security, water, transport, energy, biodiversity and ecosystems; the effect should change over the next few years damage increase. The frequency and intensity of hot weather and precipitation events is believed to have

increased significantly in continental regions of the world. This pattern is consistent with the body's desired response to warmer air.

The frequency and intensity of extreme heat events will likely increase in the future as global temperatures rise. There is confidence that the frequency and severity of precipitation events will continue to increase in many parts of the world. Observing and predicting events in other extreme weather events such as floods, droughts and severe storms have different regional characteristics. Climate change is one of the biggest environmental problems of our time, with a huge impact on nature and people already. - The business environment should be strong in the coming years (Cramer et al., 2018). These impacts include various activities and show changes in regional type and size due to climate change and regional activities. It shows that climate change is an important environmental problem affecting people by causing destruction of natural ecosystems and economic losses in general.

### **Climate Change Impact on the Economic**

Climate change has the potential to wreak havoc on the economy, and concerns are at the tail end. This is the outside world where emissions in one country increase the amount of heat in the earth's atmosphere affecting all countries (Hansen, 2022). Climate change processes will have significant economic impacts on many countries, and many low-income countries will be at risk. Macroeconomic policy in these countries should be adjusted for frequent weather shocks, creating policy space to respond to shocks. Infrastructure needs to be updated to build business resilience. Elsewhere, climate change can pose a serious risk to macrofinancial stability. Non-financial companies face risks from assets that cannot be financed by carbon prices, such as climate damage and coal resources, and the impact can affect the company's balance sheet (Daumas, 2023).

The consequences of extreme weather conditions due to hot weather are so serious that the government and the people of the country have expressed their concerns about them. Climate and climate change have had many devastating effects and impacts across the country. These include floods, desertification, erosion, drought, sea level rise, drought, disease and disease, poor precipitation patterns, and land degradation. Visible effects include less agriculture, food insecurity, water stress, low income, poverty, unemployment, conflict, environmental degradation, starvation and starvation, health problems, violence and ultimately death. All these events negatively affected the Nigerian economy. Sun (2022) highlighted the key ways climate change is affecting Nigerians:

**Low Crop Yield and Food Security:** Crop yield in Nigeria is dependent on location and weather. Crops that need rain grow more in the south, and crops that don't need rain grow in the north. Extreme rainfall and drought associated with climate change have affected the distribution of crops in Nigeria and led to a reduction in their production to meet the needs of the population. Therefore, climate change may affect the growth of some crops grown in northern Nigeria because they cannot grow in soils flooded with heavy rainfall. Similarly, some crops grown in southern Nigeria can dry out during drought because crops need rain to grow. Food shortages are the result of poor harvests and poor weather conditions that result in poor crop quality and quantity. Therefore, it is difficult to distribute food crops to other geographical regions where the crop does not grow. For example, tomatoes are produced in large quantities in the north, and if production falls due to bad weather, supply in other parts of Nigeria will also decrease.

**Reduced Livestock Production:** Animals such as goats and cows are raised on pasture, and if these animals are not fed well, their products such as cattle and milk will be damaged. Bad weather destroys the grass that these animals eat. Also, floods encourage pests that attack livestock and lower their overall market value.

**Loss of Income:** Agriculture is one of the biggest contributors to the Nigerian economy and is a source of income for many Nigerians. These people are either rural people, that is, full-time farmers, or urban people, that is, part-time farmers. Climate change is destroying soil and destroying national and individual agricultural and livestock incomes.

**Public Health Crisis:** Climate change is increasing the burden of disease, particularly malaria, in Nigeria. Mosquitoes constantly breed in water and can spread through their bites, causing fever. According to the World Health Organization, the life-threatening problems of malaria are especially common in children under the age of 5. This can be difficult to treat. Also, fires and storms occur during the dry season, and these environmental disasters cause many respiratory diseases. If left unchecked, climate change will increase the epidemic and preventable deaths of Nigerians.

**Decreased Hydroelectric Power Supply:** Hydroelectric power stations in Nigeria generate a lot of electricity. Climate change is causing erratic rainfall and weather conditions by lowering or raising water levels at Kainji and other dams. During a drought, hydropower generation drops and affects electricity distribution across the country. This affects business activities that depend on a constant supply of electricity to run the office. Also, an increase like this year's could cause severe flooding in neighboring communities.

**Loss of Shelter, Road Networks:** Most areas (urban and rural) are currently suffering from floods. Houses collapsed in some rural communities during the devastating floods. Also, people in rural areas cannot walk because water overflows the roads during floods. For example, experts have described the 2022 flood as Nigeria's worst flood since 2012, destroying more than half a million hectares of crops for thousands of small business owners and businesses across the country (Tshav, 2022).

**Impacts on livelihoods:** Nigeria's livelihoods will be threatened by the severe effects of climate change. Due to the decrease in crops and animal husbandry, the income of the farmers will decrease and it will be difficult for them to meet the needs of the family (food, nutrition, fiber, rest, income, etc.). Ocean acidification and increase in surface water temperature, especially in coastal waters, will affect fish stocks and threaten the lives of small fishing communities in the region.

**Impacts on employment:** There is no doubt that the dangers of climate change will cause unemployment. This will lead to extreme unemployment in Nigeria. First, businesses that rely on agricultural products, fisheries and livestock for raw materials will be hit first. In the short term, they will have to lay off workers to meet the reduced workload. If steps are not taken to reverse this situation in the long run, these businesses will go bankrupt. Likewise, closing businesses that contribute to global warming will put more people out of work. Additionally, climate change will

result in less water flow, resulting in less power generation, negatively impacting production and costing some factories to relocate. This will have an impact on employment and income (Nnamchi & Ozor, 2009).

## **Economic Opportunities from Climate Change in Nigeria**

Addressing climate change is necessary to build a sustainable and prosperous future. There will be many opportunities for clean energy, green buildings and energy efficiency. Hybrid and electric car production and the electric public transport sector must grow. The green infrastructure and construction of office spaces on the waterfront has the potential to create many new jobs. Capture and storage and carbon dioxide use have now caught on, especially in light of the new federal tax 45th quarter. It also provides new financial opportunities to create green job growth. Rubin (2017) identified some financial opportunities including but not limited to:

**A Growing Market for Renewable Energy:** Renewable energy often tops the list of changes the world can use to avoid the negative effects of global warming. This is because renewable energy sources such as solar and wind do not release carbon dioxide and other greenhouse gases that cause global warming. There is more to clean energy than just being "green". Replacing fossil fuel-dependent power plants with renewable energy sources such as wind and solar is an important part of sustaining climate change and achieving net zero carbon emissions. Therefore, using fossil fuels to produce energy that does not produce greenhouse gases and reduces some pollution, diversifying energy sources and reducing reliance on imported oil presents an economic opportunity for individuals, groups or national governments. Renewable energy is energy that can be renewed continuously throughout human life. Renewable energy is often referred to as sustainable energy.

The main renewable energy sources are solar, wind, hydroelectric, tidal, geo-thermal and biomass and waste from burning plants or animals (Rahman et al., 2022). Replacing our reliance on fossil fuels with renewable energy sources that produce fewer or no greenhouse gas emissions is critical to solving the climate crisis. By doing so, renewable energy will create jobs across the board, increase Nigeria's energy independence and increase affordability as many types of renewable energy are expensive – in competition with conventional energy.

**Opportunities in Eco-Friendly Construction:** As eco-consumer rates increase in Nigeria and globally; industries and individuals now search for pollution reduction methods to shift towards sustainable development (Pontieri et al., 2022). This is because it established a goal of reducing society's greenhouse gas emissions and preserving the planet with the creation of independent regulations as well as improved conservation efforts following its high atmospheric and surface-level pollution production. The tangible benefits may not be easily recognizable to tenants or visitors, but through sustainable design, construction and operations green buildings are reducing carbon emissions, energy and waste; conserving water; prioritizing safer materials; and lowering our exposure to toxins. Green buildings: use less energy and water; rely more on recycled and renewable materials; cost less to operate; produce less construction waste; and provide a healthier indoor environment (Meena et al., 2022).

Typical green building guidelines require that at least 50 per cent of construction waste be recycled or reused which is an economic opportunity. Investing in climate, and investing in growth shows that bringing together the growth and climate agendas, rather than treating climate as a separate issue, could add 1% to the average economic output in Nigeria by 2021 and lift 2050 output by up to 2.8%. If the economic benefits of avoiding climate change impact such as coastal flooding or storm damage are factored in, the net increase to 2050 GDP would be nearly 5%.

**Increased Research and Development:** High economic growth leads to increased profitability for firms, enabling more spending on research and development. This can lead to technological breakthroughs, such as improved medicine and greener technology (Habib et al., 2019). Also, sustained economic growth increases confidence and encourages firms to take risks and innovate

**Improved Public Services:** Higher economic growth leads to higher tax revenues and this enables the government can spend more on public services, such as health care and education etc. (Shelton, 2007). This can enable higher living standards, such as increased life expectancy, higher rates of literacy and a greater understanding of civic and political issues. This can be achieved through policy making with the place of fines to protect and also checkmate the activities of greenhouse emission. Transitioning to a zero-carbon society will also lead to new economic and industrial opportunities. As bringing down greenhouse gas emissions becomes the norm, businesses will compete to offer new, low-carbon technologies, goods and services such as offshore wind power, high-capacity batteries and advisory services for low-emissions urban planning. Companies that are successful in establishing this advantage early on, can access the new market opportunities that come from the need to reduce emissions in other sectors or other countries. This can bring new benefits to the economy (Romm, 2022).

Investments in zero-carbon infrastructure also present new opportunities for economic development and growth. With the costs of renewable energy technologies, such as solar panels and wind turbines, rapidly falling and global demand growing, if Nigeria invests in zero-carbon infrastructure, it will benefit from the expansion of new markets across the country and the world at large (Ansar et al., 2016; Kuralbayeva & Yongyang Cai, 2018)). Investment in zero-carbon infrastructure forms the structures Nigeria need to create a low-carbon economy, such as new transport systems that are designed for electric or hydrogen-powered vehicles. While this is not expected to be costlier than fossil-fuel-based infrastructure in the long run, large upfront investments are required. Such investments also have larger benefits, beyond helping to avoid the impacts of climate change. Smart, clean and modern power networks reduce air pollution and waste and upgrading industrial processes to zero-carbon alternatives can increase efficiency and lower production costs (New Climate Economy, 2018).

Lastly, there are great opportunities for climate-smart financial solutions. These run the gamut from green bonds issued by governments and international institutions to micro-loans for entrepreneurs. Well, borrowers will need to invest at least \$700 billion annually in infrastructure, clean energy, resource efficiency, and green construction between now and 2030, according to estimates.

Interestingly, Nigeria can enjoy economic opportunities of climate by applying an economic model. An economic model is a simplified version of reality that allows us to observe, understand, and make predictions about economic behaviour (Baden-Fuller & Morgan, 2010). The purpose of a model is to take a complex, real-world situation and pare it down to the

essentials. If designed well, a model can give the analyst a better understanding of the situation and any related problems. A good model is simple enough to be understood while complex enough to capture key information. Sometimes economists use the term theory instead of the model. Strictly speaking, a theory is a more abstract representation, while a model is a more applied or empirical representation. Often, models are used to test theories. In this course, however, we will use the terms interchangeably. For this paper, an economic committee in Nigeria need to use models as the primary tool for explaining or making predictions about economic issues and problems (Lehdonvirta et al., 2019) because they are insightful, competent predictors, and also capture an accurate generalization of the Nigerian economy.

Economic models help us analyse pathways to a zero-carbon future. They are used to test how the economy could respond to different future circumstances, and how existing or possible future technologies could help meet targets to reduce greenhouse gas emissions in different sectors (Liu et al., 2022). This helps us compare the costs of different policies to reduce emissions and the risks and uncertainties that come with each option. However, economic models also have limitations which are important to keep in mind when interpreting their results. Economic models currently are sometimes used to guide policy decisions about climate change. The most common type used is Integrated Assessment Models; these attempts to capture how economic and societal choices, and technological developments, could interact with the climate system and natural world (Jafino et al., 2021). However, because models often predict the future based on knowledge about the past, calculations of what it could cost to reduce emissions are always just one version of a possible future, based on very specific assumptions.

## **CONCLUSION**

This paper concluded that climate change is the broader range of changes that are happening to our planet, including rising sea levels; shrinking mountain glaciers; accelerating ice melt in Greenland, Antarctica and the Arctic; and shifts in flower/plant blooming times that impact the Nigerian economy, health, well-being, security, and quality of life by causing income divergence across individuals, sectors, and regions, an adjustment in energy markets, increased inflation variability, financial markets stress, intensified innovation, increased migration, and rising public debt. While climate change may reduce economic output in Nigeria, this effect is measured against the counterfactual of the state without climate change; other factors could outweigh the impact of climate change so that the net effect remains one of ongoing economic progress. The Nigerian government also realizes the concern over regulatory risk and its responsibility to proactively manage the transition to a low-carbon economy through supportive planning of the economic and environmental strategies as well as investment in efficient and clean infrastructure which is also resilient to climate change impact and give room for economic opportunities for Nigeria.

## **Suggestions**

After a critical evaluation of the paper, the following suggestions were made among others:

- Government should formulate supportive economic policies that would encourage the use of effective carbon pricing policies that can maintain competitiveness, create jobs, encourage innovation, and deliver meaningful emissions,



- Government should throw their support for progressive climate action to reduce greenhouse gas emissions and strengthen resilience and adaptive capacity to climate-induced impacts, including climate-related hazards in all states, integrating climate change measures into national policies, strategies and planning,
- Government and private individuals should encourage Climate-Smart Agriculture (CSA) to help guide actions to transform agri-food systems towards green and climate-resilient practices,
- Government should avoid corruption and excessive red tape to stifle investments in renewable energy and other climate-friendly projects,
- The private sector should push for reforms, which have the potential to unlock billions of naira worth of investment opportunities. It is time for the private sector to seize this opportunity by developing business strategies fit for a future without carbon.

## REFERENCES

- Ansar, A., Flyvbjerg, B., Budzier, A., & Lunn, D. (2016). Does infrastructure investment lead to economic growth or economic fragility? Evidence from China. *Oxford Review of Economic Policy*, 32(3), 360-390.
- Baden-Fuller, C., & Morgan, M. S. (2010). Business models as models. *Long Range Planning*, 43(2-3), 156-171.
- Cramer, W., Guiot, J., Fader, M., Garrabou, J., Gattuso, J. P., Iglesias, A., ... & Xoplaki, E. (2018). Climate change and interconnected risks to sustainable development in the Mediterranean. *Nature Climate Change*, 8(11), 972-980.
- Daumas, L. (2023). Financial stability, stranded assets and the low-carbon transition—A critical review of the theoretical and applied literature. *Journal of Economic Surveys*.
- Habib, M., Abbas, J., & Noman, R. (2019). Are human capital, intellectual property rights, and research and development expenditures really important for total factor productivity? An empirical analysis. *International Journal of Social Economics*, 46(6), 756-774.
- Halofsky, J. E., Peterson, D. L., & Harvey, B. J. (2020). Changing wildfire, changing forests: the effects of climate change on fire regimes and vegetation in the Pacific Northwest, USA. *Fire Ecology*, 16(1), 1-26.
- Hansen, L. P. (2022). Central banking challenges posed by uncertain climate change and natural disasters. *Journal of Monetary Economics*, 125, 1-15.
- IPCC (2007). Impact, adaptation and vulnerability. *Contribution of Working Group I of the Intergovernmental Panel on Climate Change to the Third Assessment Report of IPCC*. Cambridge University Press.
- Jafino, B. A., Kwakkel, J. H., & Taebi, B. (2021). Enabling assessment of distributive justice through models for climate change planning: A review of recent advances and a research agenda. *Wiley Interdisciplinary Reviews: Climate Change*, 12(4), e721.
- Kuralbayeva, E. B., & Yongyang Cai, K. (2018). To build or not to build? Capital stocks and climate policy (No. 290). *Grantham Research Institute on Climate Change and the Environment*.
- Lehdonvirta, V., Kässi, O., Hjorth, I., Barnard, H., & Graham, M. (2019). The global platform economy: A new offshoring institution enabling emerging-economy micro providers. *Journal of Management*, 45(2), 567-599.

- Liu, L., Tang, Y., & Liu, D. (2022). Investigation of future low-carbon and zero-carbon fuels for marine engines from the view of thermal efficiency. *Energy Reports*, 8, 6150-6160.
- Meena, C. S., Kumar, A., Jain, S., Rehman, A. U., Mishra, S., Sharma, N. K., ... & Eldin, E. T. (2022). Innovation in the green building sector for a sustainable future. *Energies*, 15(18), 6631.
- New Climate Economy (NCE) (2018). *Unlocking the inclusive growth story of the 21st Century: Accelerating climate action in urgent times*. The Global Commission on the Economy and the Climate
- Nnamchi, H. C., & Ozor, N. (2009). Climate change and the uncertainties facing farming communities in the Middle Belt Region of West Africa. *Paper presented at the 7<sup>th</sup> International Science Conference on the Human Dimensions of Global Environmental Change* (IHDP Open Meeting 2009) held at the United Nations University, Bonn, Germany between 26 April and 1 May.
- Ogbuabor, J. E., & Egwuchukwu, E. I. (2017). The impact of climate change on the Nigerian economy. *International Journal of Energy Economics and Policy*, 7(2), 217-223.
- Onuoha, C. M. (2009). Climate change and sustainable development in Nigeria: The mitigating role of green wall Sahara Nigeria programme. <https://afriheritage.org/pdf/policy/Polycypaper10.pdf#page=34>
- Pontieri, P., Mennini, F. S., Magni, D., Fiano, F., Scuotto, V., Papa, A., ... & Del Giudice, L. (2022). Sustainable open innovation for the agri-food system: Sorghum as healthy food to deal with environmental challenges. *British Food Journal*, 124(9), 2649-2672.
- Rahman, A., Farrok, O., & Haque, M. M. (2022). Environmental impact of renewable energy source-based electrical power plants: Solar, wind, hydroelectric, biomass, geothermal, tidal, ocean, and osmotic. *Renewable and Sustainable Energy Reviews*, 161, 112279.
- Romm, J. J. (2022). *Climate change: What everyone needs to know*. Oxford University Press.
- Rubin, J. (2017). *Economic opportunities from a changing climate*. Carol Bonnett. Centre for International Governance Innovation.
- Shelton, C. A. (2007). The size and composition of government expenditure. *Journal of Public Economics*, 91(11-12), 2230-2260.
- Sun. (2022). Seven major ways climate change affects Nigerians. *Trust Radio Live*. <https://dailytrust.com/seven-major-ways-climate-change-affects-nigerians/>
- Tsitsiragos, D. (2016). Climate change is a threat and an opportunity for the private sector. *Capital Finance International Magazine*.
- Wuebbles, D. J. (2018). Climate change in the 21st century: Looking beyond the Paris Agreement. *Climate Change and Its Impacts: Risks and Inequalities*, 15-38.