



SUSTAINABLE FOREST MANAGEMENT PRACTICES: A VIABLE PANACEA TO THE CHALLENGES OF CLIMATE CHANGE IN NIGERIA

*Gbadebo, O.V., Oyewole, A.L. and Adegbayi, O.R.

Federal College of Forestry, Jericho, Ibadan, Oyo State, Nigeria

Corresponding author email: adeayomi19@gmail.com

Phone Number: +234 8131949595

Abstract

The numerous contributions of forest to man and the environment cannot be overemphasised as it serve as a panacea to several environmental disasters currently facing the world today. Forests are tremendously endowed to sustain the health of the environment by regulating the earth's climate. However, unsustainable forest operations and human pressure on forest resources has led to forest degradation, climate change and loss of biodiversity. This has threatened and distorted ecological balances, resource conservation and management. Climate change mitigation efforts targeted at forests focused only on trees as a means to protect and create forest carbon stocks. Forests however, are more than just trees. They can be diverse and multi-functional. This paper reviews and highlights the importance of forest and forest trees in all ramifications especially as they relate to climate change. In order to restore ecological balance and ameliorate climatic challenges, the paper then recommends the adoption of sustainable forest management and conservation practices as a vital tool in the re-creation of forest ecosystems and re-establishment of functional habitat networks for the maintenance of biodiversity.

Keywords: climate change, forest trees, environment, sustainable forest management

Introduction

Climate change is a major environmental problem threat facing sub-Saharan African countries today because of its geography, their reliance on rain-fed agriculture, high levels of poverty, low levels of human and physical capital and poor infrastructure (Ozor *et al.*, 2015). Climate change has stimulated discourses in respect to the causes, long term effects, as well as how to forestall its prolonged and frustrating impacts. Climate change according to Intergovernmental Panel on Climate Change (IPCC, 2007) refers to the state of climate that can be identified by variability in the mean of its properties (average temperature, wind and rainfall patterns) that persists for an extended period due to natural variability or as a result of human activities. On the contrary, the United Nations Framework Convention on Climate Change (UNFCCC, 2005) defines climate change as a change in climate which is attributed directly or indirectly to human activities that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. Odjugo (2010) described climate change as a gradual but systematic increase in global temperatures experienced over a long period of time. Going by the various definitions, climate change can be fundamentally summarized to be a long-term shift or alteration in global temperature, precipitation, wind patterns and other measures of climate that occurs overtime.

A forest is a land with a tree canopy cover of more than 10% on an area of more than 0.5 hectares (ha) and a minimum tree height of 5 metres (FAO, 2010). Forest ecosystems covers more than 4.1 billion hectares of the earth's surface contributing greatly to the global carbon cycle and acting as carbon sequestration reservoirs (FAO, 2020). However in Nigeria, forest encroachment and exploitation, legal and illegal felling, collection of fuel wood and industrialization etc. have rendered protected forests degraded resulting to several environmental challenges. According to a report by NCF (2018), Nigeria is one of the countries with the highest deforestation rate globally losing about 96% of its forest cover approximately 450,000-600,000 hectares as a result of human induced activities. To abate the impacts of the aforementioned, Boegelsack *et al.* (2018) considered forestry as a vital and sustainable measure for promoting sustainable forest management (SFM) and regulating the carbon storage level of managed natural and or artificial forests. Sustainable forest management is a dynamic and evolving concept that maintains and enhances the environmental, economic and social values of all types of forests ecosystems for the benefit of present and future generations (CCFM, 2008).

Forests are tremendously endowed to sustain the health of the environment by regulating climate both at regional and global levels. This unique and practicable remedy protects people and also create a basis for more sustainable economic and social development. However, this natural mechanism is often hampered by human activities which disrupts the atmospheric structure of the Earth. Climate change amelioration efforts targeted at forests focused only on trees as a means to protect and create forest carbon stocks. Forests however, are more than just trees. They can be diverse and multi-functional. Considering the aforementioned, it is imperative as envisioned by this paper to further review the importance of forests and forest conservation practices especially as they relate to climate change.

Drivers of climate change

Anthropogenic/human activities is mostly emphasized as a major driver of climate change.

Deforestation: Deforestation, through legal and illegal felling of tree species is a major cause of climate change. Cunningham and Cunningham (2002) defined deforestation as the total or partial clearance of trees for a particular purpose. According to Oloyede (2008), nearly 50% of the earth's land surface has been transformed by deforestation with significant consequences on biodiversity, soil and climate. When trees are indiscriminately felled, greenhouse gases such as carbon-dioxide are released and built up in the atmosphere distorting the natural balance and consequently contributing to climate change. Nigeria, in the last three decades has suffered greatly from rapid deforestation losing about 400 hectares of forest and woodland annually owing to the collection of fuel wood and improved standard of living which has rendered most of our forest estates degraded. This calls for urgent action considering the importance of forests in controlling the build-up of greenhouse gases.

Industrialization: The advent of industrial revolution created the modern world with the establishment of global commerce, factories, large cities, construction of roads, public and private buildings. Forest estates are infringed upon by industrial and residential development as population increases and cities extend outward. The improvement in technological breakthrough has polluted the earth and regenerative capacity of the Earth lacks the strength to repair the imbalances.

Agricultural Practices: Forests estates and vegetation cover are destroyed every day to provide land for food crops, tree plantations or grazing of cattle. These practices causes environmental degradation by increasing the pressure on forest estates via farming.

An Overview of Nigeria's Forest Estate

The total land area of Nigeria is 923,768km² with a population of over 216 million people (NPC, 2022). The country is blessed with vegetational zones cutting across the entire nation resulting into diverse range of habitats from desert zones (Arid region) in the northeast to tropical rain and swamp forests along the south coast. According to FAO (2015), Nigeria's forest estate is 7.7% of the country's land area which is far below the country's target of a minimum requirement of 25% forest estate as recommended by (FAO, 2010). The obvious reason for this steady decrease is the rapid depletion of the forest through deforestation without commensurate reforestation and afforestation. Nigeria is one of the countries with the highest deforestation rate globally losing about 450,000-600,000 hectares of its forest cover as a result of human induced activities such as urbanization, agriculture, overgrazing, bush burning, and indiscriminate logging. The overall carbon stock in forested areas is estimated to be 1,292 million metric tons (FAO, 2015). Meanwhile, investment into the forest sector by the various governments (federal and state) is minimal and the involvement of the private sector (organizations and individuals) in forest development is insignificant.

Importance of Forest

The importance of forests can be classified as follows: Ecological, Socio-economic benefits and Medicinal values.

Ecological Values

Forest trees have the capacity to capture and store large amounts of carbon that would otherwise contribute to climate change making them one of the cheapest solutions to mitigating climate change. It is noteworthy that forest trees act as environmental buffers by absorbing and inhibiting the formation of secondary pollutants in the ecosystem and keeping the ozone concentration on a level that is not hazardous to human thus, contributing to the biosphere stability. Trees contribute to the aesthetics of the environment and also provide green cover via shade which regulates the atmospheric temperature. Other ecological benefits of forest trees includes prevention of soil erosion, conservation of soil nutrient, detoxification of the environment to maintain balanced levels of oxygen and conservation of ground water (Adedayo, 2018).

Socio-economic Values

Forest products constitute an essential component of food and livelihood security to the survival of man. This improves ecosystem quality and thus confers socio-economic benefits to human society. Every component of a tree including leaves, branches, stem, bark, fruits, seeds and roots are useful. Forest outputs are broadly classified into wood and non-wood forest products. The wood products include timber, poles, pulpwood, firewood and products derived from woody climbers and shrubs (Fuwap, 2000). The non-wood products are wild plants and animal products harvested from forests such as wild fruits, nuts, edible roots, honey, palm, medicinal plants, snails, etc. (Shomkegh and Tem, 2008). Many people throughout the world make use of these products and the increase in demand for these products has enhanced rural livelihoods and enabled the expansion of domestic markets, particularly in urban areas where fuel wood and other forest resources are scarce.

Forest based rural industries in Nigeria such as wood crafts, cane furniture, and fabrication of tools handles also creates employment for a large number of people who are involved in harvesting, processing or marketing of these products. This has placed forests in the limelight as an integral part of national development.

Medicinal Values

Trees play important roles in the health of the people. Trees are the basis of a healthy life. The use of forest plants for medicinal purposes in Nigeria has long historical roots especially among the rural dwellers. According to Pierce Colfer *et al.* (2006) people living in or near forests often depend more on forest-derived medicines for a wide array of ailments. The extracts, seeds, roots, leaves and bark from trees and other plants are used to treat several diseases. Some of the forest products used for medicinal purposes in Nigeria includes: *Garcinia cola* (Bitter Kola) seed which is highly effective for the treatment of respiratory tract

diseases and other bacterial infections because of its anti-bacterial, detoxification and cleansing properties. *Parkia biglobosa* (Locust bean) bark is very effective for the treatment of hypertension, skin rash and wounds while *Khaya senegalensis* bark is used for the treatment of pile and malaria.

Climatic Amelioration through Sustainable Forest Management Practices

African ecosystem comprise of a variety of flora and fauna which constitute about 20 percent of all known species in the world (Scholes and Biggs, 2004). However, unsustainable forest operations and human pressure on forest resources has led to forest degradation, climate change and loss of biodiversity threatening and distorting ecological balance, resource conservation and management. The evidence of climate change manifests when there is an increase in ocean temperature due to excess carbon dioxide in the atmosphere, melting ice in the arctic, melting glaciers around the world; we equally experience irregular rainfall, flooding, rising sea levels, intense drought and desertification which calls for immediate action. Sustainable forest management and conservation therefore, becomes a vital tool in the re-creation of forest ecosystems and re-establishment of functional habitat networks for the maintenance of biodiversity. In order to restore ecological balance and ameliorate environmental challenges, it is essential to adopt the under listed sustainable forestry practices:

- **Plantation Establishment and Development:** There is need to balance our ecosystem, increase the forest cover and promote sustainable forest management through the establishment of forest plantations. Afforestation and reforestation of degraded lands will enhance the growth of a sustainable environment. It is noteworthy that the federal government under the National Afforestation program has embarked on massive reforestation and afforestation of several hundreds of hectares of land in the North and South of Nigeria in recent years. The program is sponsored by the Green bond initiative of the Federal Ministry of Environment. Government and relevant stakeholders still need to embark on more sustainable afforestation and reforestation programs especially at state and local government levels.
- **Ex-situ Conservation:** Ex-situ conservation involves preservation of living species or genetic materials in gene banks, botanical gardens and sites other than their natural habitats. Forest ecosystems such as forests and wetlands store vast amounts of carbon in them. When the ecosystem is threatened and destroyed, carbon escapes into the atmosphere causing global warming. Therefore, in order to protect biodiversity, ameliorate climate and achieve ecological balance, forest ecosystems must be conserved.
- **Conservation of Protected Forests:** The role of protected forests in ameliorating climate change has increasingly been recognized over the last few years. Existing forests should be conserved because they contribute to climate change mitigation by maintaining or increasing ecosystem health. They act as carbon reservoirs, protect people from sudden climate events and reduce their vulnerability to weather-induced problems such as floods and droughts. Such conservation entities includes, Man and Biosphere reserves, Strict Nature reserves, permanent sample plots, National Parks, Botanical gardens etc.
- **Conservation of Sacred Grooves:** Sacred grooves also known as fetish forests are patches of remnant natural forests dedicated for spiritual purpose and protected through social laws by the local communities. Conservation of sacred groove is of utmost importance for the survival and sustenance of mankind. They have higher tree cover that enhance carbon storage and it is one of the best practices to halt desertification and ameliorate the impact of climate change (IPCC, 2011).
- **Review of Forest Laws:** Forest management laws and policies should also be reviewed with maximum penalties to reduce environmental degradation/destruction.

Conclusion

It is evidently clear now that Nigeria has suffered greatly from the consequences of climate change with increasing discourse that it will accelerate in the years ahead with significant impacts. Nigeria as a nation is highly vulnerable to its consequences due to several human induced factors. These factors have great impact in depleting the ozone layer which causes several environmental challenges. In order to restore ecological balance and mitigate climatic challenges, it is essential to adopt sustainable forest management practices as a vital tool in the re-creation of forest ecosystems and re-establishment of functional habitat networks.

References

- Adedayo, A. G. (2018): Harnessing the potentials of NTFPs for National Development in *Nigerian Journal of Experimental Agriculture International*. 24 (4) 1 -10.
- Boegelsack, N., Withey, J., O'Sullivan, G. and McMartin, D. (2018): A Critical Examination of the Relationship between Wildfires and Climate Change with Consideration of the Human Impact. *Journal of Environmental Protection*. Vol 9, pp 461-464.
- Canadian Council of Forest Ministers. (2008). A vision for Canada's forests: 2008 and beyond. Ottawa.<http://www.ccfm.org/pdf/Vision_EN.pdf>. Accessed 11 April 2012.
- Cunningham, W.P. and Cunningham, M.A. (2002): Principle of Environmental Science Inquiry and Applications, University of Minnesota.
- Food and Agricultural Organization (2010): Global Forest Resources Assessment 2010. Main Report, FAO Forestry Paper

163, pp 378.

Food and Agricultural Organization (2015): State of the World's Forest 2015. Main Report, FAO Forestry Paper. pp. 46.

FAO and UNEP (2020): The State of the World's Forest (SOFO) 2020. Forests, biodiversity and people. Rome.

Fuwape, J. A. (2000): Wood Utilization from Cradle to the grave. Federal University of Technology, Akure. Inaugural Lecture Series, No. 25 pp 11-33.

IPCC (2007): The physical science basis in: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K. B., Tignor, M., and Miller, H. L., (Eds) Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge. P.973.

IPCC (2011): Climate Change 2011, Summary for Policymakers in: IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation: An Assessment of the Intergovernmental Panel on Climate Change, adopted by at the IPCC Plenary XXVII, Valencia, Spain, pp 52.

Nigerian Conservation Foundation (2018): How Nigeria may become desert-www.vanguard.com.

National Population Commission (2022): Nigeria Population Growth Rate 1950-2022.

Odjugo, P. A. O. (2010): Regional evidence of climate change in Nigeria. Journal of Geography and Regional Planning Vol. 3(6), pp. 142-150.

Oloyede, I. O., (2008): Afforestation and Reforestation: The Unilorin Experiment. Presentation at the High Level Technical Workshop on Afforestation and Climate Change in Africa. Organised by the Centre for Human Security of the Olusegun Obasanjo Presidential Library (OOPL) & Nigeria Tree Planters from December 15 – 17, 2008.

Ozor, N., Umunakwe, P. C., Ani, A. O. and Nnnadi, F. N. (2015): Perceived impacts of climate change among rural farmers in Imo state, Nigeria. *African Journal of Agricultural Research* 10 (14): 1756 - 1764.

Pierce Colfer, C.J., Sheil, D., and Kishi, M. (2006): Forests and human health: assessing the evidence. CIFOR Occasional Paper No. 45. Bogor, Indonesia, Center for International Forestry Research (CIFOR).

Scholes, R.J. and Biggs, R. (2004): Ecosystem Services in Southern Africa: A Regional Assessment. Council for Scientific and Industrial Research, Pretoria.

Shomkegh, S. A., and Tem, O., (2008): Ethnobotanical survey of the non-timber forest products in Markurdi Local Government Area of Benue State. Proceedings of the 32nd Annual Conference of the Forestry Association of Nigeria held in Abia State University. Pp 682-686.

UNFCCC (2005): Report of the Conference of the Parties on its eleventh session in: Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention held at Montreal, 2005. pp 1-5.

UN (2017): United Nations, Department of Economic and Social Affairs, Population Division. World population prospects: The 2017 revision, key findings and advance tables.