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Assessing the Potentials of Nature-Based Solutions to Climate Change Adaptation in Nigeria

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Abstract

One issue that threatens virtually every industry in Nigeria is climate change, which has the potential to reverse the country's years of progress in that area. Nigeria can no longer opt to adapt to climate change. Despite the nation's efforts to adapt to climate change, much work remains, particularly in examining the possibilities of nature-based climate solutions to combat climate change. This study uses a desk review approach, which was supplemented by involvement from stakeholders. The results showed that there are numerous nature-based solutions that can be used to improve the vulnerable populations' capacity for coping with climate change. These include, but are not limited to, the adoption of better soil and land management practices, the use of drought-tolerant crops, farmer-managed natural forest regeneration, agroforestry, a novel approach to insurance risk pooling, the use of early maturing cultivars, and others.

Keywords: Adaptation; Climate Change; Climate adaptation; Mitigation and Nature-Based Solutions

Introduction

Nigeria's climate has changed, as evidenced by temperature rises, uneven rainfall, rising sea levels and flooding, drought and desertification, land degradation, an increase in the frequency of extreme weather events, a decline in fresh water resources, and a loss of biodiversity [1-3]. Rainfall has become more frequent and intense, resulting in huge runoffs and flooding in several areas of Nigeria [4]. Variation in rainfall is expected to keep rising. Rising sea levels and increased precipitation in southern regions are predicted to worsen coastal land floods and submergence [2,5]. In Nigeria, droughts have also become a common occurrence and are anticipated to persist in Northern Nigeria due to a decrease in precipitation and a rise in temperature [6,7]. Other lakes in the nation, including Lake Chad, are in danger of drying up and being extinct [1,8]. Since the 1980s, the temperature has dramatically increased [4,9]. According to climate estimates, the country's temperatures will rise significantly throughout all ecological zones in the future decades [5].

The illustration provided above makes it abundantly clear that Nigeria is highly susceptible to serious adverse effects of climate change, which can be attributed to the country's economy, poor resilience, and limited capacity for adaptation [10]. The economy depends heavily on resources that are climate-sensitive. For instance, the forestry industry and the agriculture sector, which together employ up to 70% of the labor force and account for around 22% of the rebased

GDP, are highly climate-sensitive industries.

The Necessity of Climate Change Adaptation in Nigeria

In order to adapt to climate change, one must also prepare for the occurrence of more frequent and severe natural hazards. Climate change will affect Nigeria. According to the A2 Scenario of the IPCC's Emissions Report (National Adaptation Strategy and Plan of Action on Climate Change for Nigeria [11], it is anticipated that Nigeria will experience an annual temperature increase of 0.04°C from approximately 1981/2000 until the 2046/2065 period, increasing to 0.08°C after 2050 [12]. The scenario also predicts that conditions will be drier in the north and wetter in the south of the country.

The north-eastern region of the country is predicted to see the worst dry weather. Rainfall is expected to rise by an average of 15 cm3 per year in the south between 2046 and 2065. But in the north, it will decline on average at a rate of 7.5 cm3 per year [11]. According to DFID [13], if no adaptation measures are taken, climate change could cause Nigeria's GDP to decrease by between 2% and 11% by 2020 and between 6% and 30% by 2050. Between NGN 15 trillion (USD 100 billion) and NGN 69 trillion (USD 460 billion) are the amounts that this loss is comparable to (Department for International Development [13].

As the century goes on, the effects of climate change could become much more severe if significant interventions, such as adaptation, are not made. This makes it essential for Nigeria to concentrate on those initiatives and plans that would increase its capability for resilience and adaptability in terms of socioeconomic development and efficient ecological management [14,15]. As a result, Nigeria must now adapt to climate change in order to prevent the worst-case scenario from occurring, rather than just wishing to. The 2012 Nigerian flood crisis cost the nation NGN 69 trillion (USD 460 billion) [13]. The 2022 flood is said to be more adversely impactful than the 2012 flood. The damages caused by the 2022 flood are better imagined than described. Nature-based climate solution comes in handy here.

Understanding Adaptation and Nature-based Solutions

"Adjustment in natural or human systems in response to present or anticipated climatic stimuli or their effects, which moderates harm or exploits advantageous chances" is the definition of adaptation [16]. To adapt to climate change is to take the necessary steps to avoid or minimize harm and to seize any opportunities brought about by the change. It is adjusting to living in a climate-change situation. It entails making adjustments to the current or predicted climate. It entails alterations to procedures, customs, and organizational frameworks in order to reduce possible harm or take advantage of opportunities brought on by climate change. Depending on the particular circumstances of a community, business, organization, region, or country, effective climate change adaptation methods can take many different forms.

Building flood barriers, setting up early warning systems, switching to crops resistant to drought, altering communication systems, corporate operations, and governmental regulations are just a few examples of adaptation methods. On the other hand, a natural climate solution is a relatively recent idea in environmental studies and is quickly being adopted in the policy arena [17].

It was initially defined as "conservation, restoration, and enhanced land management practices that increase carbon storage and/or minimize greenhouse gas emissions across global forests, wetlands, grasslands, and agricultural areas" in a report published in 2017 [18]. A subsequent study found that a significant distinction between NCS and NbS was that the former placed a strong emphasis on climate mitigation while the latter also included adaptation and non-climate aims [19].

Natural climate solutions are among our strongest possibilities for combating climate change when combined with developments in clean energy and other initiatives to decarbonize the world's economies. Natural climate solutions are essential to ensure that we reach our ultimate goal of full decarbonization and that they can simultaneously create jobs and safeguard people in both developed and developing nations.

Conservation, restoration, and enhanced land management practices that boost carbon storage or reduce greenhouse gas emissions in wetlands and landscapes around the world are examples of natural climate solutions. The broad idea of "nature-based solutions" (NbS) includes "natural climate solutions" (NCS) [17]. NbS are described as "activities to protect, sustainably manage, and restore natural or modified ecosystems that solve societal concerns efficiently and adaptively, giving human wellbeing and biodiversity benefits" by the International Union for Conservation of Nature [20].

The European Commission provides a second definition of NbS as "solutions inspired and supported by nature, designed to address societal challenges, which are cost-

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effective, simultaneously deliver environmental, social, and economic benefits, and help create resilience" [21,22]. NbS also incorporates additional "nature-based" strategies like ecosystem-based adaptation (EbA) and mitigation, green building, and eco-disaster risk reduction [23].

The adaptation to climate change in Nigeria has come a long way. The National Adaptation Strategy and Plan of Action for Climate Change in Nigeria [11], the National Agricultural Resilience Framework (NARF, 2014), the Nigeria's National Adaptation Plan (NAP) 2020, the National Agricultural Transformation and Innovation Plan (NATIP, 2021), Nigeria's updated Nationally Determined Contributions (NDC, 2021), and the Climate Change Act (2021) are just a few of the documents that have been produced at the Federal level.

According to an examination of these policy documents, the government is well aware of the significant advantages that natural climate solutions have for achieving its goals for climate change adaptation and meeting its target for greenhouse gas (GHG) emission reduction. However, due to a number of limitations, rural communities have yet to implement many of the nature-based remedies. The use of natural adaption strategies to combat climate change in Nigeria has great promise once the obstacles are removed. This study emphasizes the possibility for natural climate solutions to Nigeria's effort to adapt to climate change against this background.

Methodology

A desk-based analysis of current climate change data, information, and pertinent national policies, legislation, and plans was used in the study, along with interactions with stakeholders in both public and commercial entities. The National Climate Change Policy Response and Strategy (NCCPRS), the National Climate Change Adaptation Strategy (NCCAS), the Nigeria's Nationally Determined Contributions (NDCs) (2015), and the 2021 updated are among the important documents on climate change in Nigeria that are thoroughly examined in the first segment.

The potential for implementing natural climate solutions in Nigeria was discussed in interviews with key players. This includes key personnel at federal ministries, divisions, and agencies (MDAs) that cover the priority sectors of the NDC, such as agriculture, forestry, energy, water, waste, and transportation. Organizations from the civil society and nongovernmental sectors that are engaged in the fight against climate change were also questioned. Additionally, individuals working in the energy and agricultural sectors of the corporate sector as well as development partners (donors) were contacted. The data was analyzed using descriptive statistics and content-based analysis.

Results and Discussion

Policy framework on climate change adaptation and adaptation priorities in Nigeria

Nigeria's National Adaptation Plan (NAP) 2020

The National Adaptation Plan (NAP) is a framework to make it easier to handle the nation's long- and medium-term adaptation demands in a coordinated and cogent way. In order to fulfill its commitment under the UNFCCC and strengthen the resilience of the nation's economic, social, and ecological systems, the government will use adaptation to climate change, according to the National Adaptation Plan (NAP) policy. The NAP procedure in Nigeria will be in line with the NDC's adaptation provisions. The necessity for alignment is highlighted by the fact that the NDC's selection of adaption alternatives significantly overlaps with those of NCCPRS and NASPA-CCN.

Nigerian Climate Change Adaptation Priorities

For the nation to manage the escalating challenges of climate change, the development, comprehensive adoption, and implementation of climate change adaptation are essential.

Nigeria has identified its adaptation priorities, which include disaster risk reduction, improved health, social protection mechanisms, infrastructure resilience, sustainable land use and water resource management that leads to food security, appropriate urban development, preservation of its biodiversity and ecosystem services, and appropriate urban development [24].

All of these can be accomplished by effectively implementing the choice for a climate solution based on nature. Nigeria's adaptation priorities are outlined in the National Adaptation Strategy and Plan of Action for Climate Change in Nigeria [11], which brings together current activities and priorities for future action. This includes a collection of thirteen recognized sector-specific initiatives, policies, programs, and measures. The National Agricultural Resilience Framework (NARF, 2014) also establishes the available policy alternatives for this significant area of the nation's economy.

The Nigerian National Development Plan (NDP) also includes a component on adaptation, which is based on the need to prevent risks, including major losses that could occur from industries like agriculture and energy if no adaptation is planned [13,25]. The nation's NDC is already assisting in delivering suitable answers in relation to issues like erosive soil erosion, pollution, and sustainable livestock and crop production, among others.

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Numerous initiatives in the fields of study, planning, and implementation for Nigeria's adaptation to climate change are presently underway (or have just been finished).

There is currently a wealth of knowledge accessible on the country's climate change scenarios for the now and the future, as well as on the potential repercussions of climate change and its adaptation implications [26-29].

Additionally, a large number of MDAs in Nigeria have access to and comprehension of pertinent national policy papers that may be used to directly or indirectly guide adaptation activities.

Numerous non-governmental organizations (NGOs), civil society organizations (CSOs), and academics have participated in or are currently active in various ways in climate change and development efforts that support the NAP process.

There are already climate desks or climate change divisions in many of the MDAs at the federal level, including the Ministries of Science and Technology, Budgets and Planning, Health, and Water Resources. In addition, there is growing encouragement and support for all other MDAs to establish specific climate desks [30]. There is a growing attempt to bring climate change programs and activities closer to the grassroots at the subnational level [31].

As an illustration, the DCC now frequently consults with municipal and state governments on climate change issues.

Additionally, because forests are given the status of community-owned resources, state and local governments are inextricably involved in the execution of the UN-REDD initiative (Reducing Emissions from Deforestation and Forest Degradation [REDD]) in Nigeria. All of these are bringing climate response efforts closer to the general public on a grassroots level. A natural participant in national efforts to adapt to climate change is the private sector. A number of businesses in the corporate sector, NGOs, and outside financial sources are already involved in climate change adaptation. OXFAM International, a non-governmental organization that supports the private sector through the Livelihoods and Nutrition Empowerment Project in the northeastern portion of Nigeria, is one of these (Oxfam, n.d.).

The results of this study show that the majority of the nation's national policies, especially those put in place after the turn of the century, were influenced by global goals. The majority of these climate policy documents were either created as a requirement for the Conference of the Parties (COP) of the Paris Agreement and Convention or as a result of the UNFCCC and IPCC conferences. In actuality, international donor organizations and development partners sponsored or provided funding for the majority of the policy documents. In order to promote "low-carbon, high growth economic development route and constructing a climate-resilient society," the document elaborates on adaptation and mitigation policies in accordance with Article 4 of UNFCCC [32]. It intends to offer a framework for addressing difficulties brought on by climate change in the nation.

Key Adaptation Strategies in Nigeria

The right actions must be taken to mitigate the effects of climate change by implementing the necessary modifications and improvements. Utilizing the advantageous effects of climate change may also be a part of it. The overall goal of the country's adaptation policy is to lessen people's vulnerabilities and increase community and ecosystem resilience to the effects of climate change, all the while making sure that women, girls, and other vulnerable groups are involved in the planning and execution of long-term climate change adaptation interventions. Several of the nation's ongoing major adaption strategies include;

- Afforestation - one of the Projects funded with Nigeria's First Sovereign Green Bond was Afforestation program to increase forest coverage through the plantation of seedlings to cover 131,000 hectares of land [33].
- Introduction of drought-tolerant crops, increase access to drought resistant crops and livestock feeds.
- Furthermore, Nigeria through its partnership with the African Risk Capacity (ARC) has adopted an innovative insurance risk pooling approach towards climate risk financing and disaster risk management in the agricultural sector [34].
- Additionally, pledges have been made to put ideas for better resource management into action, such as increasing the use of irrigation technologies that consume little water, catching more rainwater, and sustainable ground water harvesting for agricultural use.
- Additionally, this entails developing and improving irrigation infrastructure, with private sector businesses taking the lead on procurement possibilities and national investment plans
- Intensify crop and livestock production in place of slash and burn practices [35].
- Use of early maturing crop varieties.
- Improved agricultural systems for both crops and livestock, this includes: diversify livestock and improve range management practices.
- Increasing and upgrading the country's storage facilities to reduce loss and increase the country's food security.
- Providing agricultural insurance and enhancing the country's agricultural extension services and promoting alternatives to livestock production [36].
- Adopt better soil management practices; and
- Provide early warning/meteorological forecasts and

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related information.

- Increase planting of native vegetation cover and promotion of re-greening efforts.

Ecosystem-Based Adaptation (EBA) Approach in NAP

The Convention on Biological Diversity (CBD) defined ecosystem-based adaptation as "the use of biodiversity and ecosystem services.... to help people adapt to the adverse effects of climate change." This may include sustainable management, conservation, and restoration of ecosystems as part of an overall adaptation strategy that takes into account the multiple social, ecological, and economic factors [37]. With the UNDP-sponsored Ecosystem-Based Adaptation for Food Security Assembly, EBA is already being implemented in Nigeria (EBAFOSA). Through the Agriculture and Environment pillar of Nigeria's development plan, EBAFOSA was incorporated into the 2015/2016 budget [38].

The objective is to apply the EBAFOSA policy framework to advance Agenda 2030's SDGs 2 (Zero Hunger), 8 (Decent Work and Economic Growth), 13 (Climate Action), 15 (Life on Land), and 17 (Partnership to Achieve the Goal) as well as SDGs on climate change adaptation and food security (United Nations Environment Programme, 2018). With regard to adaptation, the EBA model has promising implications in various sectors and should pique interest in Nigeria's NAP process. Some techniques, such as limiting deforestation and forest degradation, postponing timber harvests, and reducing emissions from agricultural soils, can be implemented right away, even if many natural climate solutions will take time to reduce greenhouse gas emissions.

Challenges of Climate Change Adaptation in Nigeria

The adoption and implementation of climate change adaptation practices are faced with a variety of challenges. Key among these includes the following:

- Inadequate agricultural infrastructure: The infrastructure's sufficiency determines how productive agriculture can be. Investment in agricultural infrastructure has historically been concentrated mostly in urban regions at the expense of rural communities. The lack of adequate infrastructure in rural regions has raised poverty and encouraged rural-urban migration while preventing most agricultural value chains from reaching their full output potential. All necessary structures, institutions, tools, and services must be established in order to raise agricultural productivity in order to improve rural infrastructure and agricultural development.
- Lack of information: There is a lack of information and data on land resources and the agriculture (crops, fisheries, and livestock) industry. There is a lack of specific knowledge on climate projections, the effects of climate change on crops, fish populations, and cattle populations, among other dangers.
- Climate change: The agriculture sector, including fish, cattle, and crops, as well as forests, are particularly at risk from its effects. The majority of farmers rely on rain-fed agriculture, which is primarily done for subsistence. Rural farmers have very little capacity for adaptation and resistance to the dangers posed by climate change. In Nigeria, the degradation of land resources, farmlands, and rural infrastructure are already interfering with social and economic activities of urban and particularly rural residents. Conflicts, rivalry for limited resources, and increased insecurity are already results of this in many regions of the nation.
- Ineffective procedures for processing and marketing: The agriculture industry is an important one in Nigeria's economy and has the potential to be a driver of long-term, sustainable growth. Unfortunately, due to ineffective processing and marketing systems, the majority of the smallholder farmers' crops are lost after harvest. The processing and agricultural marketing systems must be improved in order to achieve sustainable gains in agricultural productivity. There is a chance that competitive agricultural marketing systems including both public and private agribusinesses will boost rural employment, productivity, and incomes. Transportation, storage, packaging or handling, pricing, advertising, and distribution are all parts of the marketing process in this situation. A value-adding procedure, this one adds value to agricultural products. On household and national incomes, domestic consumption, food security, and foreign exchange profits, this will have a major positive effect.
- Poor water management: Current farming methods lose a lot of water and use shoddy harvesting methods. Reducing water loss, harvesting water, controlling excess water, and increasing water storage would improve water productivity in agriculture.
- Lack of Funding: To scale up climate smart practices, large-scale systematic investments are required. However, access to the cash required to increase production is now challenging, and,
- Heightened insecurity that is making it difficult for farmers to go to the farm.

Potentials of Nature-based Solutions for climate change adaptation

Despite the fact that the majority of the research proving their potentials is still being developed, NbS can offer low-risk, low-cost solutions too many climate change-related concerns and offer considerable advantages over manufactured alternatives [39-42]. Engineered approaches "are designed and managed to be as simple, reproducible and predictable as practical [43]," and they have immediate,

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observable benefits on reducing particular repercussions, according to [39]. But they could be expensive and provide few, if any, co-benefits [44,45].

However, NbS can be more affordable for a developing country like Nigeria and, if well implemented, may supply a variety of ecosystem services, especially for the most marginalized and vulnerable sections of the population [46]. Ecosystems may also be more robust than static manmade interventions because they "offer room for self-reorganization and mutability," which makes them more dynamic than static created interventions [46-48]. Unlike most man-made solutions, NbS also have the ability to protect people from a number of effects of climate change [44]. This is important since these effects rarely occur alone.

This is particularly true of NbS in coastal ecosystems like mangroves, which can prevent flooding (e.g., by reducing water flow, wave height, and wave energy during storm surges) as well as erosion (e.g., by increasing sedimentation and binding soil) [49,50]. Multiple ecosystems can also support one another, boosting the benefits to both [39]. The financial benefits of protecting natural ecosystems by lowering the expenses associated with disasters due to climate change are also becoming increasingly obvious. Few studies, however, specifically compare the cost-effectiveness of NbS to the designed technique at this time.

Conclusion

This essay looked at Nigeria's potential for utilizing natural approaches to climate change adaptation. It came to the conclusion that Nigeria should focus on nature-based approaches to climate change adaptation because they take advantage of a variety of opportunities for the sustainable management, conservation, and restoration of ecosystems to offer services that help people adapt to the effects of climate change. It attempts to maintain and boost ecosystems' resilience while lowering people's vulnerability to the negative consequences of climate change. The approach's affordability and capacity to produce social, economic, and cultural advantages, such as lowering the risk of disasters, sustaining livelihoods and ensuring food security, carbon sequestration, and sustainable water management, are additional advantages.

Vulnerable communities can maintain local safety nets, increase the buffering capabilities of local ecosystems, and increase the range of options for building resilience and adapting to disruptive shocks and trends by protecting and enhancing the natural and managed ecosystem services that support livelihoods. The access rights to resources and the ability of communities to maintain exclusive rights over resources are determined by traditional and customary rules, which are frequently absent and result in the "tragedy of the commons" and the loss of ecosystem services. The acknowledgement of these communal rights by larger polities, such as the national and subnational governments, is also essential for adaptation. In order to manage land and other resources in the best possible way in the face of climate change, the nature-based approach builds on prior experiences and investigates a variety of governance possibilities.

Recommendations

Nigeria must engage in a multi-level approach that includes cross-sectoral involvement, vertical and horizontal coordination among several Ministries, Departments, and Agencies, and the mainstreaming of nature-based solutions in the battle against climate change.

As a result, the following suggestions are made:

- A nationwide assessment of the biophysical and socioeconomic traits of communities is advised to comprehend the connections between ecological services, resilience to climate change, and national development. This assessment will provide answers to questions pertaining to the needs of those who are vulnerable, the risks and vulnerabilities associated with climate change, the identification of ecosystem services and how they increase resilience, the identification of ways in which ecosystem services can build resilience, the identification of existing efforts to address them, and the identification of gaps in their current provision.
- An analysis of policy and institutional entry points for mainstreaming nature-based climate solutions is also recommended. This analysis will require continuous engagement with stakeholders at the national and subnational levels.
- Increasing awareness and building capacity. Building the technical and functional capability of the very stakeholders who will implement the methods for adapting to climate change is necessary once the entry points have been identified. Identification of key individuals and actors within institutions who can act as change agents, continuous dialogue and partnership building with relevant government institutions at various levels, assessment of the capacity gaps of the relevant institutions, and the necessity of ensuring horizontal and vertical coordination between the various institutions are all part of the process.
- Constructing on prior experiences and knowledge gained. In order for the nation to adapt to climate change, it is necessary to analyze previous experiences and lessons learnt and build on them. In order to assist policymakers in making wise decisions, the analysis will include both economic and spatial analysis. Demonstration projects will also be found to demonstrate the applicability and

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efficacy of earlier adaptation strategies.

- Strategy for engaging stakeholders. All proposed programs, projects, and target activities must be developed and carried out in collaboration with a variety of stakeholders, including local communities, extension officers, local, state, and federal government officials, ecosystem management experts, academics, civil society organizations, and donor agencies, for any climate change adaptation strategy to be successful. Strong ownership and long-term adaptation to climate change that is in line with national development goals depend on the ongoing involvement of all stakeholders in recognizing the issues, challenges, risks, and possibilities.

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