



Review article

Effect of climate change on biodiversity in Nigeria.

***Haruna, S.O., Musa Y., Raji, E.D., Mai-Jir, A.**

Department of Animal Biology. Federal University of Technology Minna, P. M. Box 65.

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SUMMARY

Climate change is a global threat that has a direct impact on humans, plants, animals' survival, and global biodiversity at large. The multiple components of climate change are projected to affect all pillars of biodiversity, from genes over species to biome level of particular concerns, and the exceedance ecosystem thresholds can lead to irreversible shifts of ecosystems and their functioning. As biodiversity underlies all goods and services provided by ecosystems that are crucial for human survival and well-being, this study focuses on the threats and problems affecting Nigeria as a country in terms of biodiversity due to climate change and gives an indication of policy measures that may help in shaping the future direction of the sector activities as climate change is gradually finding its way into the already existing crisis in Nigeria in agriculture, environmental and socio-economical aspects. Species affected by climate change may respond in three ways: change, move, or die. Local species extinctions or a rapidly affected ecosystem as a whole respectively might move toward its particular tipping point, thereby probably depriving its services to human society and ending up in a global crisis. These crises give rise to the need for urgent and appropriate actions within various scenarios of climate change impacts on biodiversity, especially in tropical regions, are needed to be considered. Foremost a multi-sectoral approach to biodiversity issues with broader policies, stringent strategies, and programs at international, national, and local levels is essential to meet the challenges of climate change impacts on biodiversity. This study explores novel perspectives on how biodiversity responds to climate change and further presents an up-to-date assessment of climate change impacts on biodiversity in Nigeria and implications for natural resource management.

Keywords: Effect, Climate change, Biodiversity, Nigeria.

Corresponding author's email: harunasalamatu991@gmail.com +234803 352 0057

INTRODUCTION

Climate change, an attribute of anthropogenic (human-induced) activities and natural climate cycle is a global phenomenon which has become very prominent in policy formulation processes and media on its unfavourable effect on biodiversity especially in developing countries as Nigeria. Climate change is a major global threat that has already had an observed impact on biodiversity and natural ecosystems [6]. It is the change in weather which can be identified through statistical tests; change in the mean and the variability of climatic properties that persist for an extended period of decades or longer.

A worldwide phenomenon, climate change results from natural and man-made climatic cycles. It has gained significant attention in the media and policy-making processes due to its detrimental effects on biodiversity, particularly in developing nations like Nigeria. Natural ecosystems and biodiversity have already been shown to be impacted by climate change, which is a serious worldwide concern [6]. The variations in weather can be detected using statistical tests; these include shifts in the mean and variability of climatic parameters that last for several decades or more.

According to [12], anthropogenic activities such as the burning of fossil fuels and changes in land use like deforestation, release greenhouse gases (GHGs) into the atmosphere which increase the already existing concentration of these gases. As a result of these activities, the planet warms, rainfall patterns shift, and extreme events such as droughts, floods, and forest fires, heat waves, storms has become more frequent which brings about less habitable space or a decline in biodiversity as even

the most important biodiversity hubs around the world are not immune to human pressures. These negative conditions of climate change are bound to compromise national activities mainly agricultural production, nutritional, and health status.

Biodiversity, however, is important both to climate change mitigation and to adaptation by its supportive ecosystem services. Climate change has a major effect on the availability of numerous earthly resources, especially water that supports the life of the earth. The loss of biodiversity is a significant issue for scientists and policymakers and the topic has found its way into living rooms and classrooms. Species are becoming extinct at the fastest rate known in geological history and most of these extinctions have been tied to human activity. Humans have always depended on the Earth's biodiversity for food, shelter, and health [2].

Although a certain variation of climate is compatible with the ecosystem survival and its function, the very rapid shift is detrimental to the variety of life. Climate change is expected to exacerbate biodiversity loss in the future [1]. Many species might simply be unable to adapt to the rapidly changing, probably unsuitable conditions and thus will be threatened by extinction. Phenological changes in populations, including shifting breeding cycles or deferred peaks of growth periods, are decoupling species interactions especially in flowering plants as it is potentially initiating the incompatibilities between plant and pollinator populations. This may lead to the extinction of both the plants and the pollinators with expected consequences on the structure of such mutualistic networks [5]. At the very basic level of

biodiversity, climate change can lessen the genetic diversity of populations due to directional selection, genetic drift, population differentiation, and rapid migration. As a consequence, the probability of population adaptation to new environmental conditions is reduced and thus the risk of extinction increases. Furthermore, altered species compositions and interactions are considered to directly affect ecosystem functioning and resilience [12]. At a higher level of biodiversity, an altered climate could induce changes in vegetation communities that are projected to be large enough to affect biome integrity as a whole.

Every component of the environment is affected by climate change as both terrestrial and aquatic environments are affected by climate change indescribably. The aquatic environment can be defined as an interacting system of resources such as water and biota and all of the communities of organisms that are dependent on each other and on their environment live in aquatic ecosystems [7]. The world has a variety of lotic (moving water) and lentic (stagnant water) aquatic environments which are a major source of food for millions of people all across the planet. The aquatic environment is much more sensitive rather than the terrestrial environment because it has a limited ability to adapt to climate change. All three ecosystems of the aquatic environment that are critical components of the global environment are now facing a crucial moment. Being an essential contributor to biodiversity and ecological productivity, the aquatic environment provides a variety of services for human populations and habitat [14]. The aquatic environment has been increasingly threatened, directly and indirectly by the

impacts of climate change that can cause loss of aquatic biodiversity as well as area of it. The entire world is a stakeholder and this raises issues on who should do what to combat environmental degradation [12].

METHODOLOGY

This study examined climate change's impacts on Nigeria's biodiversity through existing research works. The main purpose of this research work was to survey theoretical backgrounds and previous studies on the effects of climate change on biodiversity in Nigeria and the current progress with the implementation of adaptation and mitigation strategies in Nigeria in ensuring sustainable economic growth and development in Nigeria.

EFFECT AND RESPONSE OF PLANTS AND ANIMALS TO CLIMATE CHANGE

There is evidence that all three responses are occurring around the world as plant and animal species are already on the move toward the poles or to higher elevations hatching earlier, blooming earlier, or exhibiting other phenological changes or even evolving rapidly [12]. Climate change and agricultural production are highly correlated and can reduce the viability of either plants or animal species which could cause associated biodiversity loss that can impact ecosystem functions and services. The predictability of extreme meteorological events (e.g. heat waves, flood and drought), changes in pests and diseases, increase in atmospheric carbon dioxide and ground-level ozone concentrations, and changes in the nutritional quality of foods are among the drawbacks of this phenomena [15,8].

To persist, individuals, populations or species must develop adaptive responses,

which can be several mechanisms [2]. The first would be that a given species will be able to acclimate fast enough to keep up with the rapid pace of changing climate through plasticity which provides a measure of short-term responses within individual lifetimes. This may involve intraspecific variation in morphological, physiological, or behavioral traits, which can occur at varying temporal scales within the spatial range of the populations. Another type of response is a genetic one, where micro-evolution takes place. In such cases, species can genetically adapt to new conditions through mutations or selection of existing genotypes. Evolution can be very rapid through mutation and selection and could allow species with short life cycles to adapt successfully to severe environmental changes.

Species-specific differences in the reaction to climate change can become particularly important when interacting species, such as plants and their pollinators, are considered. According to [2], because of climate change, species might not acclimate through plasticity to the set of environmental conditions in a given region and could therefore fall outside their respective climatic niche. Temperatures persistently above those optimal for plant growth may induce heat stress (HS), thus constraining the flowering and fruit developmental processes and strongly reducing yields. At some threshold, high temperatures may cause plant death. Extreme heat events can be classified according to the maximum temperatures reached (intensity), how often the events occur (frequency), and how long they last (duration) [13].

Some plant life historical features, including long generation cycles or the ability to develop in colonies, are linked to

the distinctive and frequently sluggish way that many plant species respond to environmental changes [4]. Genetic drift may not significantly affect the genetic organisation of a population for several generations [3]. In addition to the various temporal and spatial responses that can be taken to adapt to a changing environment, modern species also face dangers such as habitat loss and destruction. Thus, during the past 10 years, there has been a growing concern about the potential increase in the number of species that are threatened by climate change [11]

Plants, like humans, are sessile creatures that cannot migrate away from unfavorable environments. Plants must therefore go for more substitute systems. The plant's defense mechanisms against unfavorable conditions are thought to include metabolic alterations that result in differences in secondary metabolite composition [15].

The resistance of aromatic and medicinal plants to climate change is lower than that of other living things. Many medicinal plants are becoming indigenous to specific geographic regions as a result of the considerable impact that climate change is having on plant lifecycles and distributions.

IMPACT OF CLIMATE CHANGE ON ANIMALS

Certain species might be driven to the brink of extinction by the consequences of climate change, while others might thrive [9]. Animals may emerge from hibernation sooner than usual and birds may start their seasonal migrations or nesting due to warmer springtime temperatures. These animals may starve to death or venture into towns in need of food if they emerge before their usual food sources, which are

plants, are accessible. Warmer, drier summers may make it more difficult for animals that depend on late-summer plants to survive the winter months. Researchers concluded that rising temperatures pose a special concern to mammals since they can quadruple their risk of dying [10]. Later-reproducing mammals are more likely to go extinct.

Additionally, in determining the sex of the progeny based on the temperatures encountered during embryonic development. It is most common in amniotic vertebrates, which belong to the class Reptiles. The temperature at which the eggs are incubated throughout the middle part of embryonic development impacts the eggs. The thermos-sensitive phase (TSP) is the name given to this crucial incubation period. The behavior of animals displaying TSD is starting to change due to habitat warming, and this could soon have an impact on their physiology as well. To maintain the sex ratio, several species start nesting earlier and earlier in the year. Many creatures' ability to adapt to the changing climate will probably be outpaced, and many will probably become extinct [10].

SUGGESTED CONTROL.

Some effective extension mitigation strategies include:

1. Sustainable land use, agroforestry, and enterprise diversification.
2. Restoring denuded and degraded land through reseeded and crop rotation, fertilizer and manure application, reduced-till and no-till cropping, contour farming, terracing, and mixed farming.
3. Safe chemical and industrial waste disposal.
4. Incorporating climate-change education in school curriculum and lobbying for good environmental policies through professional associations.
5. Multiplying desirable animal breeds and plant species; using energy-saving and biological pest control technologies.

CONCLUSION

In conclusion, biodiversity is an important and priceless resource for Nigeria since it offers a host of advantages and services that contribute to the growth and well-being of people. The numbers and ranges of species will be affected in complex ways by even a slight and gradual warming of the temperature, which might impair ecosystem services and functioning. However, human activities like habitat loss, overexploitation, pollution, invasive species, and climate change pose a major danger to biodiversity. Millions of Nigerians, particularly the rural and impoverished communities, are at grave risk for their health and way of life as a result of these challenges. Conservation of Nigeria's biodiversity is therefore a social as well as an environmental concern.

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