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HOUSING DEVELOPMENT: A CHALLENGE TO BIRD CONSERVATION AND BIODIVERSITY PRESERVATION IN NIGERIA

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ABSTRACT

Land use, biodiversity, and bird conservation are ecological and agricultural challenges presently facing Nigeria in its efforts at dealing with the problem of sustainable land productivity and agro ecosystem transformation. This paper used secondary sources of information to evaluate land reforms in Nigeria, the impact of land-use dynamics on biodiversity, and drivers of land-use change. However, the literature did not shed much light on whether informal housing development is a challenge to bird conservation. To bridge this gap in the literature, a literature search was conducted to find out if informal housing development was one of the direct or indirect challenges to bird conservation. The findings revealed that high levels of poverty, land conversion due to ignorance, invasive species, and climate change are some of the drivers of bird conservation and biodiversity loss in Nigeria. The people of Nigeria are changing the natural environment through continuous agricultural practices and expansion, such as converting forests to cultivated areas. While competing land uses for human settlements and agriculture, increasing demand for charcoal and fuel wood are contributing to the decline of woodland and forest areas. In addition, unregulated burning and overharvesting of resources are also some contributing factors that are resulting in a decline of many wild species. In light of these findings, appropriate recommendations have been provided, which the policymakers can use to ensure informal housing development does not affect bird conservation and biodiversity preservation in Nigeria.

Keywords: Housing Development; Land Use; Biodiversity; Bird Conservation; Nigeria.

INTRODUCTION

Background

There is a context-dependent and complex relationship between land use and biodiversity/bird conservation. Understanding the effects of land use on biodiversity and bird conservation is key while planning for the sustainable management of natural resources. Although in certain regions, specific land management practices or land uses may be vital in sustaining certain patterns of biodiversity and bird conservation, elsewhere, how the land can be used are heavily dependent on the existing biodiversity resources. In fact, it is reported that change in land-use practices or human land use is the single most important factor that reduces biodiversity and bird conservation (Catizzone, Larsson, and Svensson, 1998). Due to derivative activities of the population and continuous use of the resources, natural resources are depleting. The findings from this research will help in monitoring the land-use dynamics, which result from changing demand for land as a result of the rising population. Such a study is important for filling the gaps in the knowledge of the relationships between biodiversity/bird conservation and land use. In addition, it is also important to increase the awareness of policymakers and people. They should be informed of what is right and wrong with the land reforms in Nigeria and what are the existing and future trends in biodiversity and bird conservation.

Aim and Objectives

This study aims to find how land use due to housing development has become a challenge to bird conservation and biodiversity preservation. Following are the objectives of this research:

1. To find the impact of land use due to housing development on biodiversity preservation
2. To analyse the impact of land use due to housing development on bird conservation
3. To recommend what can be done to ensure land use due to housing development does not negatively impact biodiversity preservation and bird conservation

LITERATURE REVIEW

Nigeria has a range of fauna and flora, which are found in boundless grasslands and forests. This comprises approximately 7,895 species of plants, 1,000 species of fish, 123 species of reptiles, 247 species of mammals, 1,000 species of birds, and 20,000 species of insects (Dami, Daniel, and Garba, 2017). According to Falusi (2018), there are 7,895 species of plant identified in 2,215 genera and 338 families. In addition, Nigeria has around 1,417 known species of reptiles, mammals, and birds, 3.5% are threatened and 1.2% are endemic. Nigeria has around 4,715 species of vascular plants, 4.3% of which are endemic. The loss of wild populations of plants clearly indicates the absence of genetic resources that may be used to enhance the quality of crops, for example, disease resistance. In Nigeria, the land use has changed to a more cultivated area, with lesser grasslands, forests, and bushes (Onilude and Vaz, 2020). Due to these changes, areas with natural vegetation have become smaller. Once the primary land cover converts from natural vegetation to grazing or cultivation, land use becomes more complex. This is due to diversification and intensification as there is less land is available for conversion and subdivision reduces the size of farms.

Land Reforms in Nigeria

Once again, land policy reforms are on the agenda of the Nigerian government as well as the donors who support them. Berry (2020)

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has stated that over the last few decades, land reforms have not been prioritised much. Generally, land reforms change the institutional structure that governs the relationship of an individual with the land, including intervention in the pattern of land usage, control, and ownership to amplify the distribution of benefits, improve the productivity of land, and change the structure of holdings. Land reform is a sum of actions and ideas designed to resolve tenure-related problems. To offer a cheaper base for obtaining land for public purposes, the Federal Government promulgated the Public Lands Acquisition Decree in 1976 (Obuene, 2019). Although the government was able to obtain land for public purposes, the acquisition was not possible at affordable prices. Moreover, communal clashes, disputes, and land litigations did not stop. There are a lot of obstacles that come in the way of the effective implementation of conservation policies and land use acts. There is an added issue of the unavailability of sufficient data on the degree of degradation and the status of biodiversity in Nigeria. Some forms of land use such as construction, grazing, and agricultural activities are destroying natural forests (Isah *et al.,* 2017). This is mainly due to rapid urbanisation and uncoordinated land use policy, which leads to degradation and desertification of the environment. While there have been instances of land conversion to agriculture in certain forest reserves, the authorities did nothing to stop them (Wahab, Popoola, and Magidimisha, 2018). Plus, most of the activities and programs aimed at accomplishing the objectives aren't organised or well-designed. For example, there is no proper coordination in tree planting campaigns. This situation is compounded by the problem of discontinuity in commitment to the policy. Since the political leadership of Nigeria is known for its rapid turnover, there is a varying extent of commitment to the programs and their implementation. While the tree planting campaign was neglected by certain regimes, others did not do enough to promote or revive it. Furthermore, certain cultural factors have also come in the way of effective policy implementation in Nigeria. In most Nigerian communities, the land is perceived as a sacred property, which is passed from one generation to another. Normally, great opposition follows efforts by the government to convert communal or personal property into reserves. It is difficult to enforce many laws on forestry and biodiversity because the poverty level in Nigeria is high (Ahmed and Oruonye, 2017). Many people in both urban and rural areas depend on charcoal and firewood for cooking. Thus, the local trade in charcoal and firewood continues to thrive. The increasing prices of fuel and food aggravate the problem, forcing many more people to use forest resources for survival. Another serious problem is corruption among implementing officials and political office holders, which makes the implementation of biodiversity policies even more difficult. For example, ecological funds meant for programs and conservation like erosion and desertification control are usually diverted to other, mostly personal uses.

Impact of Land Use Dynamics on Biodiversity

The land is a gift of nature and arguably the most important factor of production. While the land is immovable in its physical form, its products can be moved from one part of the planet to another. Ahearn and Alig (2017) define land as the inputs, activities, and arrangements individuals undertake in a particular land cover type to change, produce, or maintain it. This definition establishes a direct association between land cover and the actions of individuals in their environment. It explains how a man uses a part of the earth's surface (such as for agriculture, habitation, industry, etc.). Since the environment is progressively dynamic in response to how an individual uses it, when the environment responds, it is just readjusting to the changes which either degrade or sustain it. On the other hand, land-use change is the use of certain land from one form to another over time (for example, from swamp to cultivation, from cultivation to grazing, or from forest/natural vegetation to cultivation) (Briassoulis, 2020). In Nigeria, rain-fed agriculture is the mainland use. Other land uses comprise wood collection, irrigated system along the alluvial plains (this is very common in northern Nigeria), and pastoralism (extensive grazing). Both collection and pastoralism combine to practice rain-fed agriculture. Moreover, the cultivation of irrigated crops comprises vegetable and grain-oriented activity. Supplementary water for irrigation is acquired from dams, walls, as well as other water bodies. For producing charcoal, wood collection is rampant and occurs in every area where there are abundant trees (Salihu and Go, 2020). For example, the humid agro ecological zones of Nigeria and the southern rainforest. Land use mitigates the diversity and complexity of the ecosystem by replacing more complex natural vegetation with a less complex agro ecosystem that does not have a lot of species.

In Nigeria, biodiversity is greatly affected by the effects of land-use changes. This mostly happens due to conversions of land cover from natural vegetation. Many people get rid of natural vegetation for livestock grazing or to create farmlands (Ihemezie and Dallimer, 2021). Since the majority of the cattle are concentrated in the semi-arid zones that support almost all the cattle, the area witnesses a frequent shortage of fodder and is subjected to overgrazing. This has led to the introduction of new species, an increase in the number of unpalatable grasses, reduction in the shade on soils, wind erosion, exposure of soils to water, and significant reduction of native species (such as birds, tropical fish, antelope, monkey, crocodile, leopard, as well as other reptiles) in natural habitats. By changing one cultivation type to another like from perennial crops to annual crops or from mixed crops to monocrop, variations in the volume of cover occur, which results in soil erosion.

Drivers of Land Use Change and Loss of Biodiversity in Nigeria

Numerous studies have identified some drivers or factors that affect biodiversity conservation and land-use change in Nigeria. The drivers of biodiversity and land-use change are similar. For example, land-use change includes climate, political and technological change, consumption patterns and higher income, increase in productivity, mediocre economic status in form of high poverty and hunger, and increases in the human population and density (Doelman *et al.,* 2018). Those affecting biodiversity comprise failure to incorporate concerns as a transversal element into policy, not being able to integrate the monetary value of biodiversity into decision making, public policies (perverse policies that offer incentives that degrade biodiversity), the shape of the soil types, vegetation, drainage and landscape, illegal hunting for bush meat and high population rate, ill-planned or indiscriminate bush burning, deforestation and overgrazing, gathering of firewood, and land clearing for uncontrolled logging and agriculture (Imarhiagbe, Egboduku, and Nwankwo, 2020). Some indicators of the direct drivers include irrigation, water consumption, increasing rate of fertilizer usage, while those for indirect drivers comprise landscape fragmentation, and invasion by land cover conversion, climate change, and non-native species.

Literature Gap

While the literature was able to discuss informal housing development as a challenge to biodiversity preservation, it did not shed much light on whether informal housing development is a challenge to bird conservation as well. To bridge this gap in the literature, a primary study was conducted to find out if informal housing development was one of the direct or indirect challenges to bird conservation.

METHODOLOGY

The methodology of this research revolves around a literature search, in which the following databases were included: annualreviews.org (including articles related to conservation, ecology, and biodiversity), springer link, royalsocietypublishing.org, movement ecology journal articles, tandfonline.com, cambridge.org journal, academic.oup.com, science direct, researchgate.com, and Jetz Lab yaleedu site. The specialist searches included US fish and comprehensive life services and US federal science database.

Some modifiers and operators were used for the Boolean search. The keywords for the Boolean search were: impacts (*challenges OR threat*) AND ("migratory birds" OR "roaming birds"), AND (*ecosystem OR habitat* OR biodiversity* OR wetland*), ("migratory birds" OR "roaming birds") AND ("long-distance OR transcontinental "), (conservation* OR safeguarding* OR preservation* OR ecology*) AND ("migratory birds" OR "roaming birds"), ("climate change" OR "climatic changes") AND ("migratory birds"), ("migratory birds" OR "roaming birds"), (mitigation* OR reduction*), (threat on migratory birds). The main purpose of this search was to understand the impacts of climate change on the conservation of migratory birds. This was to be done by searching several publications and journal articles. The initial search produced 116 results, which were screened by title. In total, 64 studies were discarded because they were duplicates. Thus, 52 studies were chosen, which then had to pass through inclusion and exclusion criteria. Then, 27 studies were further discarded, and 25 studies were included based on the inclusion and exclusion criteria. This was followed by searching the citations for these 25 studies and chain references were carried out. More relevant papers were extracted through Google Scholar, ensuring that they meet the inclusion and exclusion criteria. However, most of the studies were not linked to the research questions, and therefore, they were not included. Thus, 51 additional studies were chosen. Consequently, 76 studies are assessed for quality, and 72 of them were used while 4 had to be discarded because they did not meet the quality criteria. The inclusion criteria included studies related to migratory birds, conservation, and climate change; fact sheet; articles; publications; studies that were compiled only in English language journals; studies that included conservation methods and practices; studies that included a report on long-distance requirement; and studies that included the importance of birds' migration in the ecosystem. The exclusion criteria included studies that were conducted before 1993 as well as theoretical studies that did not have any empirical findings. To determine the quality against reliability, evaluation, generalisability, validity, credibility, dependability, conformability, and transferability, the papers were individually rated. These assessment tools were selected as Elo *et al.,* (2014) stated that they were widely used for quality control appraisal. The studies with mixed methods were analysed for both quantitative and qualitative, and their mean scores were computed. Thus, quality ratings for 76 studies were conducted using 0-5 potential ranges. The studies with a quality rating of 2.4 and below were considered low quality, with a quality rating between 2.5 and 3.5 were considered medium quality, while those above 3.5 were considered high quality. Thus, out of 76 studies, 67 studies scored between 2.5 and 4.7, which were rated as good, possessing medium to high quality. However, 9 studies were rated low, 4 of which were discarded because their rating was less than 2.0. In summary, 72 studies were included, out of which 42 were medium quality, 26 were high quality, and only 4 were low quality. Of the chosen studies, most of them were quantitative, followed by qualitative and mixed methods. Since diverse breeds were studied, the total number of bird samples was not specified in certain studies. The studies focused on at least one of the following: migratory birds, climate change, importance to the ecosystem, long-distance requirements, threats to migratory birds, and conservation methods. The oldest study was published in 1993 while the newest study was published in 2020. Most of the studies were conducted in Australia, America, and Europe and were published between 2004 and 2015. Only a few studies were conducted outside of these countries.

ANALYSES

Based on the findings of the primary research, this section discusses whether or not informal housing development is a challenge that migratory birds encounter, which ultimately affects their survival. Thus, findings from 29 studies were assessed. Both direct and indirect threats may affect migratory birds. The distributions of birds are strongly associated with both summer and winter temperatures. Since climate change has led to the rise in temperatures, it has directly affected birds by compelling them to use more energy for thermoregulation. According to Crick (2004), this can interrupt their timing of migration and breeding, reproduction, and preservation (the energy that organisms need to maintain their basal levels of activity and condition). This may significantly affect their fitness or survival. While birds may respond to these challenges by shifting to areas with better thermal conditions, Devictor *et al.,* (2008) commented that resources like habitat may not be adequate for their needs. In addition, climate change has led to soaring temperatures, which may lead to a plethora of indirect effects. For example, the desynchronisation of migrant bird reproduction with food resources. To ensure food requirements of the young take place during a period when the availability of food is not an issue, many bird species synchronise their nesting cycle (Visser, Holleman, and Gienapp, 2006). In many temperate ecosystems, migratory birds include the bulk of species. While their departures from colder areas are linked to photoperiod, plant phenology affects the accessibility of their largely insect-based food resources. According to Both and Visser (2001), plant phenology is associated with climate and is becoming prevalent in many regions where migratory birds arrive. Sometimes, breeding gets delayed, which does not allow birds to keep pace with the timing of their food supply. Some other indirect effects are conciliated by changes in the timing and type of disturbance. For example, in areas where climate change produces drought conditions that often cause wildfires. One study by Pearce-Higgins *et al.,* (2017) electronically distributed a questionnaire to experts, the responses to which produced insight results. It was found that climate change is a critical threat and is significantly impacting a number of regions. The authors further suggested that the abundance of food resources of migratory birds may be affected during breeding seasons as a result of climate change. In a study by Leito *et al.,* (2014), it was shown that climate change due to floods may indirectly affect the food habitat of migratory birds, which may threaten their survival. This study focused on the Numeniini species (a tribe of 13 wader bird species). Besides this, the studies of Ausden, Sutherland, and James (2001) and Zorn, Van Gestel, and Eijsackers (2005) demonstrated that flooding duration strongly determines the biomass, abundance, and occurrence of earthworms. Evidence is also available in the study of Senner, Stager, and Sandercock (2017) who claimed that climate change alters the breeding population. In his study, Senner (2012 explored the chick survival and breeding phenology of two different populations of Hudsonian godwits breeding at south-central Beluga River, Alaska, and Hudson Bay Churchill, Manitoba. The findings revealed that invertebrate abundance at both sites was affected by diverse environmental conditions. Due to climate change, one population experienced a mismatch as the birds at Churchill started breeding 11 days after the invertebrate peak. As a result of low invertebrate abundance, this affected the survival rate of chicks, especially the older ones. On the other hand, godwits in the Beluga

River hatched their chicks just before the invertebrate peak. However, they were threatened by the rainy season and increased predator risk. Walker *et al.,* (2011) supported this evidence. Thus, at Churchill, around 41.3% of chick deaths were caused by either hypothermia due to prolonged exposure to an extremely cold environment or starvation. In contrast, 13% of chick deaths at Beluga River, Alaska was caused by predation. One main factor that affects bird survival directly or indirectly is the weather. According to Robinson (2005), direct effects often lead to hypothermia when colder temperatures increase the rate of heat loss from a bird's body. Hypothermia interferes with the anti-predator behaviour of the birds, thus reducing their in-flight ability (Carr and Lima, 2013). This is a sign of concern for the younger birds as older birds have waterproof features and thus, they are better equipped to deal with colder temperatures. This is especially true for local passerine species in Europe, as reported by Robinson *et al.,* (2004) and Robinson *et al.,* (2007). According to Gosler, Greenwood, and Perrins (1995), many bird species do not have a lot of energy they can store as fat because the excess weight in birds requires more energy to fly, which exposes them to the risk of predators. In their study, Clark *et al.,* (2004) found out that due to extreme cold, the number of dead, migratory wader species increased. Climate change affects the abundance of the prey migratory birds as well as the intake rate. Bad weather may also limit their forage time. Unfortunately, these factors may threaten the survival of birds, which leads to a significant decline in their population. In fact, Robinson (2005) and Robinson *et al.,* (2007), who discussed the frost period that affects the foraging of birds and thus increases mortality rate, further mentioned that the indirect consequences of bad weather may affect survival. However, survival can be enhanced by the provision of additional food. This may also be proved by the research of Insley *et al.,* (1997) who assessed the survival rate of redshank birds (Eurasian wader species). According to Besbeas *et al.,* (2002), unsuccessful foraging leads to high rainfall, and food availability is negatively affected in colder temperatures, which threatens the survival rate of migratory shorebirds. Moreover, climate change also leads to the loss of habitat. In contrast, species including migratory birds may respond to global climate change by range shifts or phenotypic adaptation. Range shifts cause turnover (community assembly). Since the same region may offer plenty of resources during the breeding season and birds may avoid unreceptive conditions during the non-breeding season, seasonal migration may offer survival benefits. The findings of Schaefer, Jetz, and Böhning-Gaese (2008) suggested that climate change leads to both adaptations of migratory behaviour and the exchange of species in migratory birds. Climate change affects productivity and lowers reproductive success. In fact, climate change affects breeding migratory birds, which affects their arrival dates. Sometimes, adult birds face limited energy issues because climate change requires birds to use more energy for flying longer. This can affect their breeding. To proper themselves in the air, flight muscles consume a lot of energy. Birds fly longer to find the best habitats and ecological conditions for breeding and raising their young ones. Moreover, in the high arctic region, warmer temperatures of the surroundings may have a positive impact on the number of eggs laid in a single brood by certain birds. The studies of Winkel and Hudde (1997) and Broggi *et al.,* (2004) point to the evidence of earlier arrives in warmer temperatures by various bird species and increased eggs laid in the single brood (clutch size).

CONCLUSION AND RECOMMENDATIONS

There are various issues at the interface of land use and biodiversity. The loss of ecosystem services, biodiversity, and bird conservation in Nigeria is mainly driven by human transformations of land use and land cover. Biodiversity and bird conversation have cultural and ethical values and play an integral role in human wellbeing, economic production, and ecosystem function. While land is the basic resource that supports the production of every agricultural commodity, it is becoming scarce. The key pressure comprises technological changes, demographic changes, global climate changes, overexploitation, and unsustainable use. As discussed above, climate change is changing the relationship between biodiversity, bird conservation, and land use with certain parts becoming wetter and others drier. The rate of carbon dioxide in the atmosphere is increasing as well as flooding and erosion, which have contributed to global warming. Most changes are noted when the forest is used for other land uses, affecting not just biodiversity and bird conservation, but the idea of sustainable development too. In some instances, the removal of forest cover led to either outright extinction of a number of animal and plant species or scarcity.

Recommendations

To resolve the issue of land-use changes in Nigeria, the recommendations mentioned below must be taken into consideration.

1. Determine a new, community-based approach for forestry resources conservation in Nigeria, which must be strictly enforced.
2. Planning for land use sustainability must take into account the often competing, multiple social, economic, and environmental social values of the interest groups, decision-makers, and the public.
3. To stem the tide of biodiversity and bird conservation loss, pressures on protected areas must be checked.
4. The increasing rate of destruction of wild animals must be controlled as there is a heightened risk of their extinction. This may be done by building more game reserves that may transform such areas into tourist centres.
5. Determine and mitigate conflicts at various scales, while building up a big consensus on the biological diversity's value.
6. Training, education, economic instruments, as well as laws and regulations must improve the economic and social incentives to preserve biodiversity and bird conservation.
7. The use of non-biodegradable, synthetic, and toxic agrochemicals must be avoided because they negatively affect biodiversity and bird conservation. To accomplish this, the ministry of agriculture in Nigeria must introduce ICPM (Integrated Crop and Pest Management) programs.
8. Once the government is ready to tackle the challenges facing biodiversity and bird conservation, it must select policies that radiate the relative value people place on it.
9. The programs that aim to make more arable lands available through the restoration of already impoverished and degraded lands must be encouraged.
10. The government must recognise that intensive land use without the right soil management practices causes environmental degradation.
11. Consider the relationship of adjacent land uses while integrating proposed land uses with current physician and natural environments.

Future Work

This research will help scholars in this domain take the research of biodiversity preservation and bird conservation in Nigeria forward. The analyses and recommendations offer insightful points, which the policymakers can use to ensure informal housing development does not affect bird conservation and biodiversity preservation in Nigeria.

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