THE IMPACT OF CLIMATE CHANGE ON BIODIVERSITY IN THE LAKE CHAD BASIN: IMPLICATIONS FOR PEACE AND NATIONAL DEVELOPMENT IN NIGERIA

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Abstract

This book chapter examines the impact of climate change on biodiversity in the Lake Chad Basin and its implications for peace and national development in Nigeria. Climate change has severely disrupted the Lake Chad Basin ecological balance, threatening livelihoods that depend on farming, fishing, and pastoralism. These disruptions have resulted in widespread biodiversity loss, food insecurity, and economic hardship, with serious consequences for social stability and development. The study is anchored on Environmental Security Theory, propoundedby Thomas Homer-Dixon, which explains how environmental degradation and resource scarcity can generate social tensions and violent conflict. A qualitative content analysis approach was adopted to examine existing literature on climate change, biodiversity loss, and insecurity in the Lake Chad Basin. The findings indicate that rising temperatures, erratic rainfall, desertification, and increasing water scarcity caused by climate change have contributed to habitat degradation, species loss, declining agricultural productivity, and the depletion of vital natural resources. These environmental pressures have intensified competition over land and water, leading to communal conflicts, including farmer–herder conflict and the expansion of insurgent activities. Such conflicts pose significant threats to Nigeria's peace and national development by weakening economic growth, governance capacity, and social cohesion. The chapter concludes that climate change-induced biodiversity loss and ecosystem disruption are critical drivers of insecurity in the Lake Chad Basin. It therefore recommends the urgent implementation of integrated environmental restoration programmes by the North-East Governors to revive Lake Chad and its surrounding ecosystems as a pathway to sustainable peace and national development.

Keywords: Climate Change, Biodiversity, Lake Chad, Peace, National Development

Introduction

Globally, climate change, largely driven by industrial pollution and other human activities, has produced far-reaching and long-lasting consequences. These impacts include irregular temperature patterns, increasing losses from floods and storms, frequent wildfires, melting ice caps, rising sea levels, biodiversity degradation, higher mortality rates, and the spread of infectious diseases. Beyond environmental damage, climate change increasingly affects ecological, economic, and social systems worldwide. These outcomes are primarily linked to greenhouse gas emissions, which have intensified global warming and triggered widespread disruptions to both human societies and

natural ecosystems across multiple sectors. Consequently, more than one billion people now experience heightened water stress, while millions have been affected by flooding, particularly in Asia and the Middle East, North and South Africa regions (Droogers et al., 2012). Collectively, these challenges continue to weaken socio-economic activities and exacerbate poverty and insecurity. Thus, the global significance of climate change lies in its extensive and interconnected impacts, as rising temperatures drive extreme weather events such as hurricanes, floods, and droughts, while deforestation threatens food security, water availability, livelihoods, and the survival of coastal communities and ecosystems (Edo et al., 2024).

Within this broader global context, Nigeria has not been spared from the adverse effects of climate change. Rather, climate change has continued to pose serious challenges to the country's environment, livelihoods, and national development. Rising temperatures, irregular rainfall patterns, and prolonged droughts have significantly reduced agricultural productivity, particularly in northern Nigeria, where farming and pastoral livelihoods depend largely on rainfall. At the same time, increased flooding in coastal and riverine areas has destroyed homes, farmlands, and public infrastructure, leading to widespread displacement. These environmental pressures have also intensified competition over land and water resources, thereby aggravating farmer–herder conflicts, deepening poverty, and heightening insecurity, all of which threaten peace and sustainable national development.

More specifically, climate change has profoundly affected the Lake Chad Basin, leading to the shrinkage of Lake Chad, biodiversity loss, wildlife depletion, changes in vegetation, and the disruption of traditional livelihoods. These environmental changes have contributed to growing socio-economic instability and heightened conflicts, thereby undermining peace and national development in the region (Gajendiran, Kandasamy & Narayanan, 2024). The long-term shifts in temperature and weather patterns in the basin are largely driven by human activities such as the burning of fossil fuels, deforestation, and industrial emissions, which release greenhouse gases, including carbon dioxide (CO_2) and methane (CH_4), into the atmosphere. These gases trap heat, increase global temperatures, and intensify climate-related stresses in the Lake Chad region (Gajendiran et al., 2024). In addition, changing climate conditions have increased water scarcity, disrupted biodiversity, and heightened health risks, including heat-related illnesses and the spread of infectious diseases across the basin (Toromade et al., 2024).

As a result, the Lake Chad Basin has experienced profound environmental degradation characterised by declining rainfall, rising temperatures, and prolonged dry seasons, which have reduced the size of the lake and disrupted its natural recharge system. These changes have weakened ecosystems, reduced soil fertility, and limited access to water for both human and animal use. As wetlands dry up and vegetation disappears, the region’s capacity to sustain agriculture, fishing, and livestock rearing has continued to decline. These environmental pressures have, in turn, translated into serious socio-economic challenges for communities surrounding the lake. Many households have lost their primary sources of livelihood, leading to food insecurity, rising poverty, and increased migration. In this way, climate change has not only damaged the natural environment of the Lake Chad Basin but has also undermined social stability, peace, and long-term development.

For instance, states within the Lake Chad region, including Adamawa, Borno, and Yobe, have increasingly experienced frequent and intense floods, droughts, and heatwaves linked to extreme

weather events. These events have displaced communities, destroyed homes, worsened desertification, and intensified food insecurity across northeastern Nigeria. Moreover, climate change has contributed to biodiversity loss, reduced water availability for humans and animals, and rising levels of poverty, unemployment, and insecurity. These pressures have fuelled humanitarian crises, socio-economic instability, and adverse health outcomes for both ecosystems and human populations. Empirical evidence further supports this reality. Onnoghen et al. (2024) reveal that over 2.5 million people in Nigeria require humanitarian assistance, with approximately 1.5 million of them being children, representing about 60 per cent of affected persons in the Lake Chad region. Similarly, reports indicate that flooding affected 34 out of Nigeria's 36 states in 2022, displacing about 1.3 million people, causing over 600 deaths, and damaging more than 200,000 houses. These floods also contributed to rising cases of cholera, diarrhoea, respiratory infections, and skin diseases, particularly in Borno, Adamawa, and Yobe states.

Given these realities, climate change represents one of the greatest existential threats facing humanity today. If greenhouse gas emissions from fossil fuel use are not urgently reduced, rising global temperatures will continue to drive severe consequences, including widespread crop failure, collapse of fisheries, loss of biodiversity, and the displacement of entire communities. In the Lake Chad Basin, these risks are further amplified by heavy dependence on agriculture, weak infrastructure, and rapid population growth. The combined effects of extreme weather events, declining agricultural productivity, and reduced water availability have placed immense pressure on livelihoods and intensified socio-economic vulnerabilities. Consequently, competition for scarce resources has increased conflicts among farmers, herders, and fishing communities, while armed groups have exploited these tensions, further destabilising the region and forcing many people into displacement camps and urban centres.

Against this background, this chapter examines the impact of climate change on biodiversity in the Lake Chad Basin and its implications for peace and national development in Nigeria. The main objectives of the study are to conceptualise climate change, biodiversity, peace, and national development; analyse how climate change has affected biodiversity and livelihoods in the Lake Chad Basin; and examine the resulting socio-economic and conflict implications for peace and national development. The chapter adopts a qualitative content analysis methodology based on secondary data drawn from literature, policy documents, reports, and credible media sources. The scope of the study is limited to the Lake Chad Basin, with particular emphasis on Nigeria's affected states. The chapter is organised to provide a conceptual discussion of key concepts, an analysis of climate change impacts on the Lake Chad Basin and biodiversity, an examination of socio-economic and conflict implications, and a discussion of mitigation, adaptation, and policy intervention strategies.

Conceptual Clarification and Theoretical Framework

Climate Change

Climate change refers to a significant and lasting shift in the Earth's average weather patterns over an extended period, which is marked by key signs such as the steady rise in global land and ocean temperatures, an increase in sea levels, and the shrinking of ice sheets at the poles, as well as glaciers in mountain regions. Additionally, it is linked to more frequent and intense occurrences of extreme weather events, including hurricanes, heatwaves, wildfires, droughts, floods, and heavy

rainfall (Haider, 2019). Thus, Ayoola, Idowu, Ikenweiwe and Opele (2011) revealed that the primary driver of climate change is human activity, especially the burning of fossil fuels like coal, oil, and natural gas. As a result, these activities release large amounts of greenhouse gases, such as carbon dioxide and methane, that trap heat from the sun, leading to a gradual warming that alters in ways that affect ecosystems, human societies, and economies worldwide (Haider, 2019).

Biodiversity

According to Imarhiagbe, Egboduku and Nwankwo (2020), biodiversity is defined biodiversity as a wide variety of life forms that exist on Earth, including all plants, animals, fungi, and microorganisms, as well as the ecosystems that form genetic differences within each species which covers everything from the tiniest bacteria to the largest mammals, and from lush rainforests to vast oceans. Additionally, Anwadike (2020) argued thatbiodiversity is not only about the number of species, but also about the complex relationships and interactions between them and their environments. Thus, this diversity of life plays a vital role in supporting the natural systems that provide humans with essentials like clean air, fresh water, fertile soil, food and help regulate the climate, pollinate crops, and control pests and diseases (John, Chigbu, Osazuwa & Oghogho, 2024**).** Biodiversity holds cultural, recreational, and spiritual value for societies across the world. However, human activities such as deforestation, pollution, climate change, and overexploitation of resources are causing alarming rates of biodiversity loss, threatening the stability of ecosystems and the well-being of future generations.

Peace

Peace, derived from the Latin "pax," signifies harmony and the absence of conflict that involves justice, equity, and balance, fostering stability within societies (Johnson, Olosanye & Lawal, 2024). Toussaint and Rosino (2024) argued that peace is both an internal and external condition, encompassing individual serenity and broader societal stability. Furthermore, Ogunode, and Ayeni n (2024) stated that peace is a concord, an agreement, an amicable resolution that is aimed at attaining friendly relations through an idea of harmony and tranquillity.

National Development

National development is an overall improvement of the country's social, economic, political, and cultural life, aimed at raising the standard of living for all citizens, which involves building a strong economy through industrial growth, agricultural expansion, improved infrastructure, and the development of human capital through education and healthcare (Ukhurebor, Efanodor-Obeten, Otsupius, Jokthan, Opateye, Wada and Jatta,2024). Given the definition of national development, Abuh and Audu (2024) state that national development also means strengthening political institutions, promoting good governance, ensuring security, and upholding the rule of law to create a stable and inclusive society and address challenges such as poverty, unemployment, inequality, corruption, and insecurity. Similarly, national development seeks to harness the country's rich human and natural resources to create opportunities for growth and prosperity as well as improved access to basic services, reduced regional disparities, empowerment of vulnerable groups, preservation of cultural heritage, and active participation of citizens in shaping the nation's future (Aluko, Odewale, Taiwo & Adefeso, 2024).

Climate Change and the Decline of Lake Chad

Lake Chad is a large, shallow lake located in the Sahelian region of North-Central Africa, bordered by Chad, Cameroon, Nigeria, and Niger (Pham-Duc, Sylvestre, Papa, Frappart, Bouchez &Crétaux, 2020). Thus, this unique position makes it a crucial geographical feature serving as a shared resource for these nations and linking them geographically spans with approximately 2,500,000 square kilometres, involving parts of these four countries that serves as a critical water source for millions of people in the region, particularly for agriculture, domestic consumption, fishery, livestock rearing as well as providing water for cattle, camels, and other livestock (Yunana, Shittu, Ayuba, Bassah & Joshua, 2017). Similarly, Lake Chad supports a wide range of ecosystems, including wetlands, aquatic species, and migratory birds and is an essential stopover for migratory birds along the African-Eurasian Flyway, making it important for biodiversity conservation and home to a wide variety of fish species, which form an essential part of the diet and economy of local populations. In this, fishing, which is the major livelihood activity in the region, contributing to food security and income, has been affected by climate change. Furthermore, Lake Chad plays a role in regulating the local climate by moderating temperatures in the surrounding areas whereas provide large body of water that helps to stabilise the microclimate of the region, providing cooler temperatures during hot seasons and contributing to the local hydrological cycle and impacted the surrounding communities and ecosystems reducing the lake's size by over 90% since the 1960s (Wakdok & Bleischwitz, 2021). However, climate change has make the region experienced erratic rainfall patterns, with prolonged dry periods interspersed with heavy rainfall and inconsistent rainfall has led to droughts diminished the water levels in Lake Chad to become skeleton of itself led to loss of livelihoods making people who depend on the lake for fishing, agriculture, and animal husbandry has disrupted these traditional livelihoods, increasing poverty levels in the region. As a result of climate change, increased evaporation rates from the lake's surface further accelerate its decline, making water resources scarcer for the millions who rely on it, which worsens the situation in already vulnerable communities, leading to water stress and increased competition for the remaining water.

Certainly, climate change reduced access to water for irrigation has led to crop failures, which threaten food security in the surrounding countries as well as limits the availability of grazing land for livestock, further intensifying the food crisis and pastoralists also face challenges as water and grazing land become scarce, leading to conflicts over resources (Jedwab Haslop, Zarate & Rodriguez Castelan, 2023). Thus, many people who depend on farming, fishing, and livestock herding have lost their means of income, which has worsened poverty levels and increased rural-urban migration, as people seek alternative livelihoods in cities. Also, Evans and Mohieldeen (2002) confirmed that climate change has led to reduced rainfall and desertification, causing a significant drop in crop yields, making farmers struggle with shorter growing seasons and reduced soil fertility, leading to food shortages and increased hunger.

To this end, Jedwab, et al. (2023) in their study, *The effects of climate change in the poorest countries: Evidence from the permanent shrinking of Lake Chad*, revealed that the dramatic decline over the past several decades contributed to the following.

- **Environmental Changes**: make the region become increasingly unpredictable, and prolonged droughts have reduced the inflow of water into the lake, and higher temperatures have led to increased evaporation, further diminishing the lake's volume.

- **Human Activities**: the overuse of water for agricultural irrigation because of population growth and unsustainable farming, and dam constructions have also played a role in reducing the water that reaches Lake Chad.

- **Population Pressure**: a significant rise in population, leading to greater demand for water, land, and natural resources. This increased pressure has contributed to land degradation, deforestation, and the depletion of fish stocks, further worsening the ecological crisis.

Additionally,the shrinking of Lake Chad has also contributed to insecurity in the region because of the fewer resources to go around, which led to tensions between communities, whereas extremist groups have exploited the hardship and frustration caused by the lake's decline, recruiting vulnerable individuals and destabilising the area further (Evans & Mohieldeen, 2002).

Climate Change and Biodiversity in the Lake Chad Basin

The Lake Chad Basin has long been a rich source of biodiversity, particularly in terms of its fish populations and other aquatic species. However, over the years, the basin has witnessed a severe decline in biodiversity, mainly due to the steady depletion of water in the lake as a result of environmental change, which has had a direct impact on aquatic life, disrupting the delicate ecosystem that once supported a wide variety of species (Owonikoko& Momodu, 2020). Given these devastating effects, the lake has shrunk, large areas of open water have dried up or turned into wetlands and dunes, leading to a sharp decline in fish populations, as well as causing the loss of essential aquatic habitats. Thus, Owonikoko and Momodu (2020) in their study environmental degradation, livelihood and the stability of Chad Basin Region finds out that in the last six decades, climate change, over-exploitation and demographic pressure have contributed to the shrinking of the waterbody by over 90% leading to inability to sustain livelihoods of inhabitants which promoted criminality, easy recruitment by terrorist groups, migration to urban centres in search of better means of livelihood. According to them, this has also led to violent clashes and crimes in cities and towns, as well as caused conflicts among the riparian states, and this has greatly inhibited their ability to collectively fight insecurity in the region. Thus, it has led to the disappearance of plant species essential for local wildlife and human communities and has an impact on migratory birds and other wildlife dependent on the lake's ecosystem.

Additionally, Pham-Duc et al, (2020) pointed out that climate change in the Lake Chad Basin is evident through rising temperatures, which increase evaporation and reduce the overall water levels in the lake, causing desertification to spread across the region, turning once fertile land into dry, barren areas unsuitable for farming and grazing. As a result, rainfall patterns have become highly erratic, with long dry spells followed by intense but short-lived downpours that fail to replenish the lake adequately, which contributed to water scarcity, causing constant challenge, affecting access for both people and livestock and disrupting the environment, livelihoods, and food security across the basin.

Similarly, the effects of climate change have led to a significant loss of plant and animal species, as many can no longer survive in the harsh, dry conditions because of the shrinking water bodies and desertification that degraded natural habitats, forcing wildlife to migrate or face extinction as well as making native vegetation disappearing, reducing food sources and shelter for many species (Ehiane, & Moyo, 2022). These disruptions have created ecological imbalances, making the once

rich biodiversity under serious threat, putting pressure on the entire ecosystem. To this end, Wakdok and Bleischwitz (2021) highlighted that biodiversity plays a vital role in supporting agriculture in the Lake Chad Basin by maintaining healthy soils, pollinating crops, and controlling pests naturally and sustains fisheries by providing a variety of fish species that serve as both food and income for local communities. Ehiane and Moyo (2022) added that climate change has affected fishing communities, marking a drastic decline in catches due to the loss of fish species and shrinking water bodies, which resulted in widespread unemployment and income decline, pushing many families into extreme poverty and weakened local economies and increased the vulnerability of millions of people in the region.

Furthermore, climate change has contributed to desertification, drought, water shortages, and declining soil fertility, which have become more frequent and prolonged, reducing water availability for farming, livestock, household and natural ecosystems. Lack of moisture for vegetation exacerbates the decline in soil fertility, making it harder for crops to grow (Idoko, 2024). These combined impacts are severely weakening the region's ability to support life and sustain livelihoods. Additionally, Ahmed and Aliyu (2019) added that climate change-induced changes have also reduced agricultural productivity, loss of fishing and livestock livelihoods, and increased poverty and unemployment, making farmers and herders struggle with poor soil, limited rainfall, and the disappearance of grazing lands. Animals face water and food shortages as a result, fueling conflicts among the groups.

Social Implications of Climate Change in Lake Chard Basin Region

As a result of the devastating effects of climate change, communities are displaced, food insecurity increases, and competition over scarce resources intensifies, causing many people to lose their means of livelihood and further exacerbating poverty, unemployment, and insecurity (Aluko et al. 2024). Thus, violent crime such as insurgency, banditry, kidnapping, and farmer-herder conflicts are widespread, as reduced farming, fishing, and herding make it difficult for families to feed themselves Wakdok & Bleischwitz, 2021). Furthermore, climate change has brought scarcity of essential resources such as water, land, and pasture, which has fueled competition and tension among different groups, as well as induced migration, exacerbating social tensions. Thus, Climate-induced migration in Nigeria has led to increased competition for resources, as people move from areas affected by drought, desertification, and flooding to more fertile regions, which often puts pressure on already scarce resources, such as water, land, and jobs, creating tensions between host communities and migrants (Evans & Mohieldeen, 2002). Given these effects, Jedwab et al (2023). observed in their study titled *The effects of climate change in the poorest countries: Evidence from the permanent shrinking of Lake Chad*, that the movement of large numbers of people also heightens ethnic and religious divisions, as migrants are often viewed as outsiders who strain on local infrastructure and services, leading to frustration and conflict as a result of climate change.

Similarly, Yunana et al (2017) in their work titled Climate change and lake water resources in Sub-Saharan Africa: case study of lake Chad and lake discovered that climate change continues to drive migration making social fabric of communities becomes more fragile, leading to an increase in violence and instability within the Northeastern state of Adamawa, Borno, Bauchi, Yobe and Gombe as well as other states across Nigeria. Also, climate change has contributed to environmental degradation, hindered economic growth, reduced agricultural productivity, depleted

fisheries, and disrupted industries that rely on natural resources, affecting both rural and urban populations, stalling economic development. In addition, Imarhiagbe et al (2020)lent their voice to say that climate change has threatened national security as resource shortages fuel conflicts, particularly between farmers and herders, while insurgent groups exploit environmental stress, such as poverty, unemployment, and food insecurity caused by climate change, to recruit foot soldiers.

Climate Change: Implications for Peace and National Development in the Lake Chad Basin Region

Climate change has had profound consequences for peace and national development in the Lake Chad Basin region because of the pressing outcomes, including the loss of biodiversity and the depletion of natural resources, which have been shown to contribute directly to a range of conflicts, including farmer-herder clashes, insurgency, and communal violence (Kazeem, 2024). Additionally, the growing scarcity of fertile land, water and traditional grazing areas continues to diminish and frequently escalate when herders move their livestock into farmland in search of pasture, often resulting in violent confrontations (Sambo & Sule, 2024). Thus, the insecurity brought about by these disputes has, in turn, left many regions vulnerable to insurgent groups who take advantage of local grievances and widespread desperation to attract and recruit followers (Sambo & Sule, 2024). Moreover, struggles over limited natural resources have further inflamed ethnic and religious divisions, fueled communal violence and deepened existing social fractures.

Furthermore, socio-economic activities like farming, fishing, herding, and trading form the backbone of local economies facing environmental and security challenges cause by climate change heightened competition, tension among communities as well as threatened livelihoods marking people to engage in disputes over access to resources escalate into violence and long-standing conflicts that negatively impact peace and national development particularly in regions of the Lake Chad Basin (Kazeem, 2024). Moreover, Sambo and Sule (2024) attested that the loss of economic opportunities, especially for young people, exacerbates poverty, frustration, and a sense of hopelessness and creates conditions for criminal groups and insurgent movements find it easier to recruit followers, offering them financial incentives or promises of belonging and protection. As a result of this economic opportunity Balseth (2024) pointed out that the situation has disrupted socio-economic activities, weakened the foundations of national development, reduced agricultural production, affected food security, and the collapse of local markets slows down economic growth and discourages both local and foreign investment, stalling infrastructural development and job creation. Thus, the breakdown of socio-economic activities creates a cycle of insecurity, poverty, and underdevelopment.

Mitigation and Adaptation Strategies and Policy Intervention

Addressing the impacts of climate change on peace and national development requires a combination of effective mitigation and adaptation strategies, supported by strong policy interventions. However, Pillah and Ujoh (2024) stated that several approaches have been adopted or proposed to tackle the growing challenges in the Lake Chad Basin and beyond which call for more intensification afforestation programmes that will be aim to restore degraded land and prevent desertification will help to secure livelihoods for farming and herding communities as well as sustain water management projects, including the construction of small dams and the promotion of efficient irrigation methods that seek to conserve scarce water resources and ensure their equitable

distribution. Thus, conservation initiatives also play a vital role by protecting ecosystems that provide essential services like food, clean water, and climate regulation (Beitelmal, Nwokolo, Meyer, & Ahia, 2024). According to them, these strategies are crucial in enhancing the resilience of vulnerable communities and reducing the likelihood of conflict over natural resources. Furthermore, they suggest the following strategies for government and relevant stakeholders;

- **Role of Government Agencies, NGOs, and International Organisations**

Government agencies at the national and state levels have been instrumental in developing climate action plans, enforcing environmental regulations, and leading reforestation and water conservation projects. However, their efforts are often complemented by the work of non-governmental organisations (NGOs) and international bodies. Whereas NGOs frequently engage in grassroots initiatives, providing training, resources, and advocacy to support climate resilience among rural populations. International organisations such as the United Nations and the African Union contribute through funding, technical expertise, and policy guidance, helping to strengthen regional cooperation and integrate climate action into broader development goals. In their views, these collaborations between these actors are essential to build a coordinated response capable of addressing the complex links between climate change, conflict, and development.

- **Community-Driven Solutions**

While top-down policies are important, sustainable change also depends heavily on community-driven solutions by encouraging sustainable farming techniques, such as agroforestry, soil conservation, and crop diversification can help smallholder farmers adapt to shifting environmental conditions. Also, promoting alternative livelihoods, like fish farming, beekeeping, and handicrafts, reduces reliance on climate-sensitive activities and provides additional income sources. Climate resilience education programmes are equally vital, raising awareness at the community level about the causes and impacts of climate change and equipping people with the knowledge and skills needed to adapt, as well as empowering local communities to lead these initiatives, which fosters a sense of ownership and responsibility, which is key to building lasting resilience and preventing future conflicts.

Theoretical Framework

This book chapter is anchored on Environmental Security Theory, a perspective advanced by Thomas Homer-Dixon in the early 1990s, most notably in his seminal article *"On the Threshold: Environmental Changes as Causes of Acute Conflict"* (Homer-Dixon, 1991). At its core, Environmental Security Theory examines the links between environmental change, resource scarcity, social stress, and the outbreak of conflict. The theory rests on the assumption that environmental degradation, particularly when combined with population pressure and weak institutions, can undermine human security and increase the likelihood of violence. Central to the theory is the concept of environmental scarcity, which Homer-Dixon identifies as occurring through three main pathways: reduced supply of renewable resources, increased demand for these resources, and unequal access to them (Homer-Dixon, 1994). Climate change intensifies these forms of scarcity by altering ecosystems, reducing biodiversity, and disrupting the natural systems upon which livelihoods depend. As the ecosystems deteriorate, communities that rely heavily on natural resources for survival face growing economic hardship and social tension.

Building on this theoretical foundation, Environmental Security Theory provides a useful lens for understanding how climate change-induced biodiversity loss in the Lake Chad Basin contributes to insecurity. The shrinking of Lake Chad, declining fish stocks, loss of grazing land, and reduced agricultural productivity have significantly weakened the ecological base of the region. These changes have heightened competition over land, water, and biological resources among farmers, pastoralists, and fishing communities, thereby increasing the risk of conflict (Homer-Dixon, 1999).

In the Lake Chad Basin, biodiversity loss does not merely represent an environmental challenge, but it directly affects patterns of livelihood, migration, and social relations. As climate change reduces the availability of fertile land and water, affected populations are often forced to move or adopt alternative survival strategies, which can bring them into conflict with host communities. Environmental Security Theory explains how such ecological pressures, when filtered through existing social, ethnic, and political divisions, can escalate into violent conflict and prolonged insecurity. Furthermore, the theory highlights the broader implications of environmental degradation for peace and national developmentbecause thepersistent conflict linked to resource scarcity weakens state capacity, discourages investment, and diverts resources away from development priorities. From this perspective, protecting biodiversity and promoting sustainable resource management are not only environmental imperatives but also critical components of peacebuilding and national development in Nigeria. To this end, Environmental Security Theory offers a strong analytical framework for this study by clarifying how climate change-driven biodiversity loss in the Lake Chad Basin acts as a catalyst for conflict and insecurity, thereby posing serious challenges to peace and national development in Nigeria.

Discussion of Findings

The book highlights that climate change has had a profound and far-reaching impact on the Lake Chad Basin, affecting not only the physical environment but also the livelihoods, social fabric, and security of the region. The literature consistently shows that the shrinking of Lake Chad by over 90% since the 1960s has significantly disrupted ecosystems and traditional livelihoods such as fishing, farming, and pastoralism (Yunana et al., 2017; Wakdok & Bleischwitz, 2021). This environmental degradation has triggered a cascade of socio-economic challenges, including increased poverty, unemployment, and forced migration to urban areas in search of better opportunities (Jedwab et al., 2023; Owonikoko & Momodu, 2020). Moreover, the depletion of water resources due to climate change-induced erratic rainfall, droughts, and desertification has intensified competition for scarce resources, heightening tensions and leading to frequent conflicts between different groups, notably between farmers and herders (Sambo & Sule, 2024; Ahmed & Aliyu, 2019). The findings also highlight how extremist groups have exploited these environmental and social vulnerabilities to recruit disaffected individuals, further destabilising the region (Evans & Mohieldeen, 2002; Imarhiagbe et al., 2020).

In addition to the socio-economic and security implications, the loss of biodiversity, including the decline in fish populations and the disappearance of native vegetation, has further undermined food security and reduced the region's capacity to support livelihoods (Ehiane & Moyo, 2022; Pham-Duc et al., 2020). The literature reveals that the combined effects of climate change have not only weakened the region's economy and exacerbated social tensions but have also undermined national development by fuelling migration, disrupting agriculture, and fostering violence. In summary, the findings underscore that climate change in the Lake Chad Basin has far-reaching implications that

extend beyond environmental degradation but have triggered a cycle of ecological, economic, and social decline, posing a significant threat to peace and national development in the region.

Conclusion

The impact of climate change on biodiversity in the Lake Chad Basin has had far-reaching consequences, extending beyond environmental degradation to touch the core of human security and national development in Nigeria. The decline of Lake Chad, driven by erratic rainfall, prolonged droughts, and increasing temperatures, has diminished water levels and shrunk essential habitats for both aquatic and terrestrial life. This loss of biodiversity has undermined traditional livelihoods such as farming, fishing, and livestock herding, plunging millions into poverty and intensifying food insecurity across the region. The resulting socio-economic strain has not only led to increased migration and urban drift, but also heightened competition for scarce resources, fuelling violent clashes between farmers and herders. Moreover, extremist groups have exploited the vulnerabilities caused by climate change, further destabilising the region and undermining national security. The book chapter highlights that the shrinking of Lake Chad and the consequent biodiversity loss are central to these challenges, revealing a direct link between environmental change and social conflict. In light of these findings, it is clear that addressing climate change and protecting biodiversity in the Lake Chad Basin are essential for achieving lasting peace and fostering sustainable development in Nigeria. Strengthening environmental management, promoting adaptation strategies, and enhancing community resilience are vital steps in this direction. Only by recognising and tackling the intricate connections between climate change, biodiversity loss, and human wellbeing can Nigeria hope to secure a more peaceful and prosperous future for all.

Recommendation and Contribution to the body of knowledge

Based on the findings of this book chapter, several policy and practice-oriented recommendations are proposed to address the intertwined challenges of climate change, biodiversity loss, conflict, and underdevelopment in the Lake Chad Basin.

1. There should be an urgent need for integrated environmental restorationprogrammes to be implemented by the North East Governors that will be aimed in reviving Lake Chad and its surrounding ecosystems and strengthen cooperation with regional bodies such as the Lake Chad Basin Commission to promote sustainable water management, reforestation, and wetland restoration as well as protecting biodiversity, especially fish species and native vegetation, will help restore livelihoods and reduce pressure on scarce resources.

2. The Governors should prioritise climate-resilient livelihoods and invest in climate-smart agriculture, sustainable fishing practices, and improved grazing systems to reduce vulnerability among farming, fishing, and pastoral communities. Such interventions can help minimise competition over dwindling resources and reduce the likelihood of farmer–herder conflicts.

3. The governors should strengthen conflict-sensitive environmental governance through policies that will address climate change and biodiversity loss, must be linked with peacebuilding initiatives and improve community-based resource management mechanisms

that can encourage dialogue, cooperation, and equitable access to land and water to promote and rebuild trust among affected groups.

4. The Nigerian government should enhance social protection and youthempowermentprogrammes in the region to address poverty, unemployment, and forced migration to reduce the pool of disaffected individuals vulnerable to recruitment by extremist groups and enrol more people into education, skills acquisition, and employment opportunities linked to environmental conservation, which can serve as long-term stabilising measures.

Contribution to the Body of Knowledge

This book chapter makes several important contributions to existing scholarship on climate change, biodiversity, and security in Nigeria and the Lake Chad Basin.

First, it advances knowledge by explicitly linking climate change–induced biodiversity loss to peace and national development, rather than treating environmental degradation as a purely ecological issue. By demonstrating how declining ecosystems directly affect livelihoods, migration, conflict dynamics, and state stability, the study broadens the analytical scope of environmental security research.

Second, the chapter enriches the application of Environmental Security Theory by grounding it in the specific ecological and socio-political realities of the Lake Chad Basin. It provides empirical and literature-based evidence showing how biodiversity loss acts as a catalyst for resource competition, social tension, and violence, thereby strengthening the theory's relevance to fragile regions in the Global South.

Third, the study contributes to Nigerian and African climate literature by offering a multi-dimensional analysis that connects environmental change, socio-economic decline, extremism, and underdevelopment within a single framework. This integrated approach helps bridge gaps between environmental studies, peace and conflict studies, and development research.

Finally, the chapter provides a policy-relevant contribution by identifying practical pathways through which environmental protection and biodiversity conservation can support peacebuilding and sustainable national development. In doing so, it offers valuable insights for policymakers, development practitioners, and scholars seeking long-term solutions to climate-related insecurity in Nigeria and similar contexts.

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