

# Drivers of Lake Chad Shrinkage and Its Implications for Food Security in Borno State, Nigeria.

Babangida Umar Nasir<sup>1</sup>, Mohammed Bello Baban'umma<sup>2</sup>  
& Ruth Caleb<sup>3</sup>

<sup>1,2&3</sup> Department of Political Science Nasarawa State University, Keffi-Nigeria  
***Umarnasir2004@yahoo.com; mohammedbello@nsuk.ed.ng.***  
DOI: <https://doi.org/10.70118/AMR-0901-2025-17>

## Abstract

*Despite its strategic importance for food security and regional stability, the Lake Chad region (LCR) has become a perilous environment due to natural and anthropogenic factors. Its wetlands have diminished by 70%, while the population relying on this ecosystem has surged from 3.5 million in 1960 to over 45 million in 2020. This drastic reduction has led to severe food insecurity, making the LCR a hotspot for extreme humanitarian crises. Therefore, this study examines the factors responsible for the shrinking of Lake Chad. To achieve this, the paper uses Human Security Theory as a theoretical framework and employs a mixed-methods approach, combining quantitative and qualitative methods, to provide a comprehensive understanding of the shrinking Lake Chad region. The findings reveal that the basin's reduction is driven by several interrelated factors. Increased water usage for irrigation and domestic purposes demands vast amounts of water for crop cultivation, diverting it from the lake. Additionally, domestic water usage has surged due to population growth. Climate change has emerged as a critical factor, leading to decreased rainfall and altered precipitation patterns. These climatic changes have resulted in reduced inflow of water into the lake, thereby diminishing its size. The impact of climate change is compounded by rising temperatures, which increase evaporation rates and further decrease the lake's water volume. It is recommended that mitigating the impact of Lake Chad's shrinkage on livelihoods in Borno necessitates a holistic approach, incorporating sustainable water management, the promotion of alternative livelihoods, and regional cooperation. Sustainable water management practices, such as modern irrigation techniques and wetland restoration, are crucial for efficient water use. Promoting diversified agricultural practices and eco-friendly projects can reduce dependency on the lake's resources and enhance community resilience. Fostering regional cooperation among countries sharing the Lake Chad Basin is vital for comprehensive water resource management and environmental conservation, ultimately promoting sustainable development in the region.*

**Keywords:** Lake Chad, Food Security, Climate Change, Terrorism, Wetlands.

## Introduction

According to the International Atomic Energy Agency (IAEA) (2017), the Lake Chad (LC) region, located in the eastern Sahel and southern Sahara Desert, covers an area of 2,381,000 square kilometers. The Lake Chad Basin (LCR) is bordered by Chad, Cameroon, Niger, and Nigeria, which form the Lake Chad Basin Commission (LCBC), established on May 22, 1964. This region hosts diverse flora and fauna, including 44 species of medium and large-sized mammals, and features low savannah vegetation along the lake's shores.

The LCR is rich in resources such as crude oil, salts, copper, iron ore, and gold, supporting local crafts like pottery and basket weaving. The region's forests provide materials for construction and craft making. UNESCO is aiding efforts to designate parts of the LCR as World Natural Heritage Sites and biosphere reserves due to its biodiversity.

However, Lake Chad has significantly shrunk due to climate change, unsustainable water management, and increasing human demand. This shrinkage threatens human security, particularly in Nigeria, by disrupting ecosystems, reducing biodiversity, and accelerating desertification. Approximately 80-90% of the LCR's population relies on agriculture, including fishing, herding, and farming, for their livelihoods. The lake's decline affects these activities, threatening food security and economic stability.

The LCR has historically been a socio-economic hub, linking sub-Saharan and North Africa. Lake Chad, once over 25,000 square kilometers in the 1960s, is now around 1,350 square kilometers. Its reduction impacts water quality and availability, heightening the risk of waterborne diseases and exacerbating conflicts over resources. The lake's shrinkage has socio-political implications, undermining governance and increasing the potential for conflict.

Environmental changes in the region are severe, with the Intergovernmental Panel on Climate Change (IPCC) noting significant hydrological changes and a drastic decline in rainfall from 1960 to 2000. The lake's shrinkage has spurred social disturbances and raised security concerns. The Lake Chad Basin is one of the world's most water-stressed areas, impacting millions of people who depend on it for water and livelihoods.

Efforts to address these issues have been discussed at international forums, such as the 2015 COP 21 in Paris, where urgent action was called for to save the lake. The Lake Chad 4 Development and Climate Resilience Action Plan aims to enhance resilience and promote sustainable development in the region. The environmental degradation of Lake Chad has far-reaching implications, contributing to food insecurity, displacement, and the rise of extremist groups like Boko Haram, further complicating the region's stability and security.

## **Statement of the Problem**

The Lake Chad region (LCR), despite its strategic importance for food security and regional stability, has become a perilous environment due to natural and anthropogenic factors. Over the past 50 years, Lake Chad and its wetlands have diminished by 70%, while the population relying on this ecosystem has surged from 3.5 million in 1960 to over 45 million in 2020. This drastic reduction has led to severe food insecurity, making the LCR a hotspot for extreme humanitarian crises. In 2017 alone, over seven million people faced extreme food insecurity, and more than two million were displaced due to persistent conflicts. Climate change, characterized by reduced annual monsoons and increasing droughts, has exacerbated the desiccation of Lake Chad and its wetlands, adversely affecting vegetation and biodiversity. Studies highlight that global warming-induced heat waves, coupled with population pressure, urbanization, unsustainable farming practices, and overuse of forest areas, have intensified the humanitarian crisis. Furthermore, insecurity and armed violence from groups like Boko Haram and the Islamic State of West Africa have compounded the crisis, limiting access to vital resources such as water, grazing lands, fish stocks, and farmlands.

Efforts to mitigate these issues include initiatives by LCR member states, the Lake Chad Basin Commission (LCBC), and development partners like the World Bank, FAO, UNDP, and UNEP. These efforts focus on inter-basin water transfer projects and sustainable resource management. However, scholarly works addressing the impact of Lake Chad's shrinkage on food security are limited. This thesis aims to assess these effects, particularly in northeastern Nigeria, to fill this knowledge gap and contribute to the broader understanding and mitigation of the crisis.

## **Objective of the study**

- i) To examine the factors responsible for the shrinking of the Lake Chad Basin in North-eastern Nigeria
- ii) To examine the influence of the shrinking of Lake Chad on food security in North-eastern Nigeria

## **Research Propositions**

- i) climate change, unsustainable water usage, and regional conflicts are the major causative factors responsible for the shrinking of Lake Chad Basin in North-eastern Nigeria
- ii) The shrinking of Lake Chad has expressively compromised livelihoods, exacerbated scarcity of food and higher cost of food stuff in the North-eastern Nigeria

## **Conceptual Framework**

### **Food Security**

Food security is a multi-dimensional concept encompassing various facets such as agricultural production, trade, income, food quality, clean water, hygiene, and governance, all of which influence an individual's or nation's food security status. The concept gained prominence during the 1996 World Food Summit in Rome, where a consensus definition was established: food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for an active and healthy life (World Food Summit, 1996, cited in FAO, 2006).

This definition highlights the crucial role of climate regulation by forests in maintaining food security. Deforestation increases the vulnerability of food production to climatic factors like low precipitation, droughts, and desertification, leading to food insecurity characterized by crop failure, low agricultural outputs, food scarcity, and high food costs. The World Food Summit definition of food security incorporates four dimensions: availability, accessibility, utilization, and stability (Saint, 2019). The interaction among these dimensions is complex and their absence can lead to food insecurity, a "wicked problem" that is ill-defined, ambiguous, and resistant to solutions (Candel, 2014). Food insecurity can manifest in various forms, including material poverty, malnutrition (both obesity and undernourishment), and socio-cultural losses, such as the loss of indigenous crop varieties and traditional ecological knowledge (Farrell et al., 2017; Hendriks, 2015).

Food security, therefore, is defined as the ability of all people at all times to access adequate nutrition, safe, and culturally appropriate foods, and ensure that food producers earn a decent living wage (FAO, 2021). The three major pillars of food security are food accessibility, availability, and affordability. In Africa, affordability is crucial for food access, which depends on both food cost and disposable income (Hassan-Wassef, 2012). The 1996 World Food Summit definition was reaffirmed and amended in the 2009 declaration, emphasizing physical, social, and economic access to sufficient, safe, and nutritious food (CFS, 2012).

Food and nutrition security, a term increasingly used, integrates nutrition into food security policies (CFS, 2012). Food security is built on four pillars: food availability, access, utilization, and stability (CFS, 2012; UN-HLTF, 2011). Food availability involves having consistent food supplies, food access entails having sufficient resources for a nutritious diet, food use requires knowledge of basic nutrition and care, and stability encompasses consistent availability, access, and utilization.

FAO estimates that 842 million people globally, or 12% of the world's population, were chronically hungry in 2011-2013, primarily in developing regions where undernourishment was 14.3% (FAO, IFAD, and WFP, 2013). This figure represents a 17% reduction since 1990-1992, indicating progress but also highlighting ongoing challenges (FAO, IFAD, and WFP, 2013).

## **Shrinking of Lake Chad**

Lake Chad, once one of Africa's largest lakes, has been significantly shrinking, leading to serious ecological and socioeconomic repercussions. The reduction in the lake's surface area over recent decades is attributed to both natural variability and human activities such as irrigation, damming, and deforestation (Sehoppa, 2019). These factors have led to ecological degradation, loss of biodiversity, and socioeconomic challenges for the millions reliant on the lake for their livelihoods (Boko et al., 2019).

The shrinking of Lake Chad is intertwined with broader issues of environmental degradation, resource scarcity, and conflict. As the lake recedes, competition for dwindling water resources intensifies, potentially escalating conflicts and causing displacements (Urama & Ozor, 2017; Smith, 2020). This situation exemplifies a complex environmental crisis with extensive implications for both local communities and the broader region, necessitating interdisciplinary research and sustainable management interventions to mitigate its adverse effects and build resilience (Urama & Ozor, 2017).

Historically, Lake Chad covered approximately 25,000 square kilometers in the 1960s but has now reduced to around 1,350 square kilometers with an average depth of 1-5 meters (Conflict and Insurgency in Lake Chad - Interview with Mohammed Bila). The lake's water volume, estimated at 72.5 cubic kilometers in September 2022, fluctuates due to seasonal and annual changes, largely influenced by decreased inflow from the Chari River and other tributaries.

Lakes globally hold over 90% of Earth's freshwater resources and provide critical ecosystem services, including hydrological buffering, habitats, recreational spaces, and freshwater fisheries (Rast, 2014). They support basic ecological processes and contribute to the well-being of surrounding communities. However, lakes are increasingly threatened by human activities such as damming, dumping, and draining, as well as natural causes (Schuyt, 2005).

Hydrological fluctuations in lakes reduce agricultural opportunities and impact the well-being of human populations within and outside their basins. Mismanagement and unsustainable use of lake resources can lead to significant societal concerns. Despite the multifunctionality of lakes and their growing

importance in environmental research, awareness of the degradation of many lakes remains limited.

In summary, the shrinkage of Lake Chad illustrates a multifaceted environmental crisis with severe consequences, highlighting the urgent need for comprehensive research and sustainable management practices to address and mitigate these challenges (Sehoppa, 2019; Boko et al., 2019; Urama & Ozor, 2017; Smith, 2020).

## **Empirical Review of Related Literature**

### **Factors Responsible for the Shrinking of the Lake Chad Basin**

The shrinking of the Lake Chad Basin is attributed to several factors, with climate change and human activities being the primary culprits (Schilling et al., 2018). Climate change has led to variations in precipitation patterns and rising temperatures, resulting in decreased inflow from rivers and increased evaporation rates. Human activities such as deforestation, overgrazing, and unsustainable water abstraction have exacerbated the situation (Olaniyan et al., 2020). Population growth and agricultural expansion also play significant roles, intensifying land use changes that reduce the lake's water retention capacity and increase sedimentation (Lemoalle et al., 2012; Adams et al., 2019).

Geopolitical conflicts and inadequate water resource management further contribute to the shrinking of the Lake Chad Basin. Political instability and conflicting interests among riparian states hinder effective cooperation in managing water resources. This has led to unregulated water extraction, inefficient irrigation practices, and the construction of dams, all of which decrease water availability (Adano et al., 2019; Klute et al., 2017).

Remote sensing studies by Alhassan and Onyekuru (2020) revealed that climate change, particularly prolonged droughts and increased temperatures, significantly contributes to the shrinking of the basin. Human activities such as irrigation, deforestation, and overgrazing are identified as exacerbating factors. However, this study primarily focuses on environmental impacts, overlooking socio-economic and political dimensions.

Climate change has also been linked to violent conflict in the Lake Chad Basin. The Boko Haram insurgency and herders-farmers conflicts are partly driven by environmental degradation and resource scarcity (Maha Skar & Rida Lyammouri, 2018). The region has seen increased violence due to economic hardship, inequality, and marginalization, compounded by the retreating lake and its impact on livelihoods.

Griffin (2020) highlights the intersection of changing hydrology, violent extremism, and conflict. Climate change has security implications globally, and the Lake Chad region is no exception. The weaponization of water resources by violent actors can exacerbate hunger, famine, and migration. Security in the region is worsening due to several socio-economic and environmental factors, necessitating a strategic response to climate change.

### **Impacts of the shrinking Lake Chad on Food Security**

Adelekan, Johnson, and Manda (2023) examine the challenges and opportunities for socioeconomic development in Nigeria in the context of climate change and variability. Using a mixed-methods approach, which includes surveys, interviews, and data analysis, the authors focus on the impacts of climate change, particularly the shrinking of Lake Chad, on human security. Their findings reveal that the shrinking lake has intensified competition for diminishing water resources, critically affecting the livelihoods of communities dependent on fishing, agriculture, and water supply. This has led to increased poverty, food insecurity, and displacement, as people are forced to migrate in search of alternative livelihoods. Additionally, the study highlights that existing conflicts and tensions over resource allocation have been exacerbated, further threatening human security in the region. While the study provides valuable insights, it identifies gaps needing further research, particularly on the differential impacts on vulnerable groups such as women and children, and on potential adaptation strategies and policy responses to mitigate adverse effects (Adelekan et al., 2023).

Schilling (2022) delves into the interplay between environmental changes and human security in the Lake Chad region, beyond the Boko Haram insurgency. Through a mixed-methods approach combining qualitative interviews and quantitative socio-economic data analysis, Schilling finds that the shrinking Lake Chad has significantly reduced agricultural productivity, exacerbating economic strain and social tensions. This economic downturn has contributed to the growth of conflicts, including the Boko Haram insurgency, which Schilling argues has environmental roots linked to the lake's shrinkage. The study emphasizes the transboundary nature of the Lake Chad crisis, advocating for a collaborative, region-wide response to the interconnected challenges faced by communities in Borno States (Schilling, 2022).

Ahmed, Jones, and Smith (2019) focus on the ecological consequences of Lake Chad's shrinkage using satellite imagery and on-the-ground surveys. They discover a significant loss of biodiversity and ecosystem disruption, adversely affecting traditional activities such as fishing and farming. This ecological degradation has forced local communities to adapt to the changing landscape, presenting new challenges (Ahmed et al., 2019).

Smith (2017) explores the socio-economic ramifications of Lake Chad's shrinkage through qualitative methods. Interviews and field observations reveal that diminished water resources have reduced agricultural productivity, heavily impacting farmers reliant on the lake for irrigation. Fishermen have also faced declining fish stocks, leading to increased poverty and food insecurity (Smith, 2017).

Adedeji (2015) investigates the socio-economic and environmental consequences of Lake Chad's diminishing size in Northern Nigeria. Using qualitative methodologies, Adedeji identifies a direct correlation between the shrinking lake and heightened resource competition, leading to conflicts among communities. The study emphasizes the surge in demand for water, arable land, and fishery resources as the lake contracts, triggering conflicts (Adedeji, 2015).

The shrinking of Lake Chad has profound implications on human security and conflict in the region. Research by Ludwig et al. (2011) and Kelly and Adger (2000) discusses the impact of environmental change on vulnerabilities and conflicts, highlighting how water scarcity can lead to social tensions and instability. Vulnerability to resource scarcity, combined with high population density, low GDP, and poor water management, exacerbates the challenges in the Lake Chad region (Ludwig et al., 2011; Kelly & Adger, 2000).

Dortmans (2019) further explores the impact of Lake Chad's shrinkage on livelihoods, conflicts, and migration, noting that subsistence activities have become more difficult. The presence of terrorist groups like Boko Haram has also influenced the livelihoods and security of the region's inhabitants, highlighting the need for effective humanitarian and environmental strategies by the Lake Chad Basin Commission (Dortmans, 2019).

Historically, the shrinking of Lake Chad has led to numerous conflicts over resource access, as evidenced by various clashes between local and interstate groups during the droughts of the 1980s and 1990s. The region's socio-economic conditions, including widespread poverty, inadequate infrastructure, and limited livelihood opportunities, further compound these issues (Odada et al., 2006; Wallenstein & Margareta, 1999).

In conclusion, the shrinking of Lake Chad presents multifaceted challenges, from ecological and socio-economic impacts to heightened conflicts and human insecurity. Addressing these issues requires a comprehensive approach that includes understanding socio-economic dynamics, implementing adaptation strategies, and fostering regional cooperation to manage water resources effectively (Adelekan et al., 2023; Schilling, 2022; Ahmed et al., 2019; Smith, 2017; Adedeji, 2015).



Research also links climate change to farmer-herdsmen conflicts. Increasing drought and desertification in Northern Nigeria push herders south, leading to resource disputes with farmers (Dioha & Emodi, 2018; Elisha, 2017). This conflict is driven by competition over land and water resources, intensified by population growth and non-sustainable farming practices. The connection between climate change and conflict is widely documented but remains contentious. Some studies indicate that higher temperatures and altered precipitation patterns increase civil conflict incidence (Burke et al., 2009; Sutton, 2010). However, the complexity of war and peace, influenced by various political, social, economic, and environmental factors, makes it challenging to predict future conflicts solely based on climate change (Maslin, 2018).

In summary, the shrinking of the Lake Chad Basin is a multifaceted issue involving climate change, human activities, geopolitical conflicts, and inadequate water resource management. Addressing these challenges requires comprehensive interdisciplinary research and sustainable management interventions to mitigate adverse effects and build resilience in the region (Schilling et al., 2018; Olaniyan et al., 2020; Adano et al., 2019; Maha Skar & Rida Lyammouri, 2018; Griffin, 2020)

## **Theoretical Framework.**

### **Human Security Theory**

In international relations and security studies, human security has emerged as a significant theoretical framework, emphasizing the protection and empowerment of individuals and communities from threats such as armed conflicts, environmental degradation, and economic instability (Adelekan et al., 2023). This concept gained prominence in the 1990s, with notable contributions from Martha Nussbaum and Amartya Sen, and was solidified by the 1994 UNDP Human Development Report, which shifted the focus from state security to individual security, linking development, freedom, and security (UNDP, 1994).

Human security theory challenges traditional state-centric approaches by recognizing individuals as the primary referents of security. It encompasses freedom from fear and want, addressing threats like poverty, disease, environmental degradation, and political repression (Adelekan et al., 2023). The theory underscores the interconnectedness of various threats, highlighting how economic insecurity can lead to social tensions and conflict, and how environmental degradation can fuel poverty and food insecurity (Schilling, 2022). Advocates argue for a holistic approach that addresses the underlying causes of insecurity.

The theory also emphasizes human rights and dignity, advocating for a humanitarian approach to security that prioritizes civilian protection and promotes human rights in conflict zones (Kaldor, 2007). Scholars such as Ken Booth and Cynthia Enloe have further refined this framework, emphasizing an inclusive, people-centered understanding of security and highlighting the gendered nature of security threats (Booth, 2007; Enloe, 2000).

Applying human security theory to the shrinking of Lake Chad in Northern Nigeria, particularly Borno State, reveals critical insights. The lake's reduction affects economic security by disrupting livelihoods dependent on fishing and agriculture, exacerbating poverty and food insecurity (Adelekan et al., 2023). Environmental security is compromised as the lake's shrinkage intensifies desertification and climate change effects, leading to land degradation and community displacement, and increasing competition over scarce resources (Schilling, 2022). Personal security is impacted through displacement and migration, exposing individuals to violence, exploitation, and human rights abuses (Adelekan et al., 2023). Health security is also threatened by increased waterborne diseases and inadequate sanitation (Smith, 2017).

Analyzing the impact of Lake Chad's shrinkage through the lens of human security highlights the need for comprehensive approaches addressing underlying drivers of insecurity and prioritizing individual well-being. This requires concerted efforts at local, national, and international levels, including sustainable resource management, conflict resolution, and socio-economic development initiatives (Adelekan et al., 2023; Schilling, 2022).

## **Methodology**

This research employs a survey research design to examine the impact of the shrinking Lake Chad region on food security in Borno State, northeastern Nigeria. A mixed-methods approach, combining quantitative and qualitative methods, is used to provide a comprehensive understanding. Quantitative methods involve analyzing data from questionnaires to explain changes in the lake's size and volume and their implications on Nigeria's human security. Qualitative methods include focused group discussions with local communities, experts, and stakeholders (Adelekan et al., 2023).

The study population includes 2636 individuals from various farmers' associations in Borno State and 1003 staff from the Lake Chad Basin Commission (LCBC). Purposive sampling identifies relevant participants, while cluster and simple random sampling are used for questionnaire distribution to ensure diverse perspectives on the lake's shrinkage. A 10% sample size of each population segment is selected, totaling 1709 respondents (Black & Champion, 1976).

Data collection methods include questionnaires and key informant interviews (KII). The questionnaire, a 5-point Likert scale, assesses the impact of Lake Chad's shrinkage on food security, with questions derived from the research objectives. Interviews supplement the data, involving sessions with crop farmers, fish farmers, cattle breeders, and LCBC staff.

Secondary data are sourced from journals, news articles, and the LCBC database, focusing on climate change and conflicts in the Lake Chad region. Data analysis uses descriptive and inferential statistics through SPSS for quantitative data, while qualitative data undergo content analysis to identify thematic insights and draw conclusions (George & Mallery, 2001)

### Data presentation and analysis

Table 1.1 Respondents view on factors responsible for the shrinking of Lake Chad region

Response	Frequency	Percentage
Damming	87	25%
Deforestation %	55	16
Global warming	114	33%
Over Grazing %	42	12
Natural Disaster	47	14%
<b>Total</b>	<b>345</b>	<b>100</b>

Field Survey, February, 2024

The table provides insight into respondents' perceptions of the causes behind the shrinking of Lake Chad. Among the identified factors, global warming is cited most frequently, with 33% of respondents attributing the phenomenon to this cause. Damming follows closely behind, noted by 25% of respondents. Deforestation, overgrazing, and natural disasters are also recognized as contributing factors, albeit to a lesser extent. The prominence of damming underscores the perceived impact of human activities on the lake's decline, while the acknowledgment of global warming highlights awareness of broader environmental issues. Overall, these findings shed light on the multifaceted

nature of the challenges facing Lake Chad and the complex interplay of human and environmental factors in its shrinkage.

The shrinking of Lake Chad is significantly influenced by climatic impacts and altered precipitation patterns, which disrupt the ecosystem balance and reduce the lake's size over time. An interview with Mallam G., a member of the Rice Farmers Association of Nigeria, Borno State chapter, revealed that:-

The shrinkage is due to a combination of natural and human-induced factors, including climate change, population growth, and over-extraction of water resources. Similarly, Mr. M. from the Lake Chad Basin Commission highlighted deforestation, land use changes, and political instability as contributing factors, disrupting the hydrological cycle and hindering coordinated environmental efforts. Additionally, Mallam N., a community leader in Baga, pointed to poor water management practices and the introduction of invasive species like water hyacinth as exacerbating the lake's reduction by competing for resources and obstructing water flow. These insights from various stakeholders emphasize the complex, interconnected causes behind the shrinking of Lake Chad.

**Table1.2 :** Responses on whether the shrinking of Lake Chad has affected food security in Borno state around the Lake

Response	Frequency	Percentage
Strongly agree	140	(40.6%)
Agree	172	(49.9%)
Undecided	15	4.3%,
Disagree	12	(3.5%)
Strongly Disagree	06	(1.7%)
<b>Total</b>	<b>345</b>	<b>100</b>

**Source:** Field Survey, October 2023

The table illustrates respondents' views on whether the shrinking of Lake Chad has impacted food security in Borno State. A significant majority, 140 respondents (40.6%) strongly agree and 172 respondents (49.9%) agree, summing up to 90.5%, believe that the shrinking lake has negatively affected food security. A small percentage, 4.3%, remain undecided, while those who

disagree (3.5%) and strongly disagree (1.7%) constitute a minimal portion of the responses. This strong consensus indicates widespread recognition of the adverse impact of Lake Chad's shrinkage on food security in the region.

The above analysis entails that, the diminishing size of Lake Chad has significantly impacted local fishing activities. As the lake shrinks, the available fishing grounds diminish, reducing fish populations and affecting the livelihoods of communities' dependent on fishing. This environmental decline poses a threat to the economic and food security of the region, exacerbating the challenges faced by those reliant on the lake for sustenance and income.

In an interview conducted with Thomson a member of the International Atomic Energy Agency (IAEA) revealed that,

The reduced water levels in Lake Chad severely affect the livelihoods of those dependent on the lake for fishing and farming. This reduction in water levels leads to desertification, which negatively impacts agricultural productivity and contributes to food insecurity. Mallam B further emphasized that the diminishing lake reduces the availability of water for irrigation, directly affecting agriculture and, consequently, food production and security. The fishing industry around Lake Chad, a significant source of income for many, is also threatened, potentially leading to economic challenges and food shortages if the lake continues to shrink (Field Survey, October 2023).

In another interview with Mr. S., a staff member of the Lake Chad Basin Commission, conducted on February 12, 2024, revealed that the shrinking of Lake Chad is often linked to climate change. Mr. S. highlighted the necessity of addressing climate issues to ensure long-term food security in Nigeria and the surrounding regions. He suggested that implementing climate change mitigation and adaptation strategies is crucial to counteracting the adverse effects on food production caused by the shrinking lake. These interviews underscore the multifaceted impact of Lake Chad's reduction on regional livelihoods, agriculture, and food security, emphasizing the need for comprehensive climate and environmental strategies.

## **Discussion of Findings**

- i. The first objective of this study is to examine the primary factors contributing to the shrinking of the Lake Chad Basin in Nigeria. The findings reveal that the basin's reduction is driven by several interrelated factors. Firstly, increased water usage for irrigation and domestic purposes has significantly depleted the lake's water levels. The agricultural sector, in particular, demands vast amounts of water for crop cultivation, diverting it from the lake. Additionally, domestic water

usage has surged due to population growth, further straining the lake's resources.

Furthermore, climate change has emerged as a critical factor, leading to decreased rainfall and altered precipitation patterns. These climatic changes have resulted in reduced inflow of water into the lake, thereby diminishing its size. The impact of climate change is compounded by rising temperatures, which increase evaporation rates and further decrease the lake's water volume.

In addition, deforestation and soil erosion have exacerbated the situation by reducing the basin's capacity to retain water. The removal of vegetation cover disrupts the natural hydrological cycle, leading to increased runoff and decreased infiltration of water into the soil. This, in turn, reduces groundwater recharge and surface water availability in the lake.

In a nut shell, rapid population growth in the region has intensified the pressure on the lake's resources. As the population increases, more people rely on the lake for their livelihoods, including fishing, agriculture, and domestic water use. This heightened demand accelerates the depletion of the lake's water levels and strains the surrounding ecosystem.

Collectively, these factors contribute to the accelerated shrinking of the Lake Chad Basin, posing significant challenges for communities that depend on its resources for their survival. These findings are consistent with the study by Alhassan and Onyekuru (2020), which identified human activities such as irrigation, deforestation, and overgrazing as critical factors exacerbating the basin's reduction in size. Addressing these issues requires integrated and sustainable management practices to mitigate the adverse impacts on the Lake Chad Basin and ensure the well-being of the local communities.

- ii.. The investigation shows that shrinking of Lake Chad has severely impacted human security in Borno States. The diminishing water source has led to resource scarcity, triggering conflicts over access. This, coupled with environmental degradation, has exacerbated poverty and heightened the vulnerability of communities. The resulting instability has facilitated the proliferation of extremist groups, posing a significant threat to the region's overall security. This finding is in tandem with Schilling (2018) who states whose research underscore the intricate linkages between environmental degradation and the exacerbation of existing vulnerabilities. The shrinking of Lake Chad has led to a decline in agricultural productivity, impacting the livelihoods of communities'

dependent on the lake's resources. Schilling argues that the Boko Haram insurgency, often attributed solely to ideological and religious factors, has deep-rooted environmental dimensions, with Lake Chad's shrinking acting as a catalyst for the insurgency's growth.

## Recommendations

- i. **There should be holistic approach to mitigate the** impact of Lake Chad's shrinkage on livelihoods in Borno necessitates a holistic approach, incorporating sustainable water management, the promotion of alternative livelihoods, and regional cooperation. Sustainable water management practices, such as modern irrigation techniques and wetland restoration, are crucial for efficient water use. Promoting diversified agricultural practices and eco-friendly projects can reduce dependency on the lake's resources and enhance community resilience. Additionally, fostering regional cooperation among countries sharing the Lake Chad Basin is vital for comprehensive water resource management and environmental conservation, ultimately promoting sustainable development in the region.
- ii. The adverse effects of the shrinking Lake Chad on food security in Borno State can be mitigated through the implementation of various measures. adopting sustainable water management practices is essential to ensure the efficient use of available water resources. This involves strategies such as rainwater harvesting, water recycling, and the maintenance of water quality to meet the needs of both humans and ecosystems. This entails promoting afforestation initiatives to help prevent further desertification and soil erosion, thereby preserving the environmental integrity of the region. There should be investment in irrigation systems to enhance agricultural productivity and reduce reliance on rainfall-dependent farming, thereby enhancing food security and livelihoods. Moreover, providing support for communities to develop alternative livelihoods, such as sustainable agriculture or eco-tourism, can reduce their dependence on shrinking resources and enhance their resilience to environmental changes. By implementing these multifaceted strategies, the adverse impacts of Lake Chad's shrinkage on human security can be effectively address

## References

- Adams, S. M., & Jean, P. (2019). Land cover change in the Lake Chad Basin: an assessment of 1990-2014 using machine learning algorithms. *Remote Sensing*, 11(9), 1088.

- Adano, W. R., Dietrich, S., & Witsenburg, K. M. (2019). Trapped in fragmentation? The shifting geography of the pastoral economy in North-eastern Kenya. *Pastoralism*, 9(1), 16.
- Adewole, O. (2023). Sustainable livelihood strategies in conflict-affected environments: A case study of the Lake Chad Region. *Journal of Environmental Management*, 45(3), 321-335.
- Ahmed, M., Jones, B., & Smith, K. (2019). "Ecological Consequences of Lake Chad Shrinkage: Implications for Livelihoods." *Environmental Science & Policy*, 90, 102-110.
- Baechler, G. (Ed.) (1999). Environmental Degradation in the South as a Cause of Armed Conflict, In *Environmental change and security: A European perspective*, *World Development*, 60:14 - 30.
- Banks, J. (1998). The lives and values of researchers: Implications for educating citizens in a Multicultural Society. *Educational Researcher*, 27(7): 4 - 17.
- Barnett, J. (2001). *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*. Zed Books.
- Booth, K. (2007). *Theory of World Security*. Cambridge: Cambridge University Press.
- Burke, M., Hsiang, S. & Miguel, E. (2015). Climate and Conflict. *Annual Review of Economics*, 7:577 - 617.
- Hunters, L. & Twine, W. (2008). Rural household demographics, livelihoods, and the environment. *Global Environmental Change*, 18(1): 38 - 53.
- Deligiannis, T. (2012). The evolution of environment-conflict research: Towards a livelihood framework. *Global Environmental Politics*, 12(1): 78 - 100.
- Detraz, N. (2011). Threats or vulnerabilities? Assessing the link between climate change and Security. *Global Environmental Politics*, 11(3) 104 - 120.
- Elfversson, E. (2015). Providing security or protecting interests? Government interventions in violent communal conflicts in Africa. *Journal of Peace Research*, 52(6) 791- 805.



- Ellis, F. & Freeman, H. (2004). Rural Livelihoods and Poverty Reduction Strategies in Four African Countries. *Journal of Development Studies*, 40(4)1- 3 0.
- Enloe, C. (2000). *Maneuvers: The International Politics of Militarizing Women Lives*. Berkeley: University of California Press.
- Eriksen, S. & Kelly, P. (2006). Developing credible vulnerability indicators for climate adaptation policy assessment: Mitigation and Adaptation Strategies for Global Change, *Journal of Agricultural Economics*. 12(4): 495 - 524.
- FAO (2012). Climate change implications for fishing communities in the Lake Chad Basin. In Food and Agriculture Organization Fisheries and Aquaculture Proceedings, 25. Rome, 84.
- Fisher, M., Reimer, J. & Carr, F. (2010). Who should be interviewed in surveys of household income? *World Development*, 38(7) 966 - 973.
- Fjelde, H. (2015). Farming or fighting? Agricultural price shocks and civil war in Africa. *World Development*, 67: 525 - 534.
- Gill, P., Stewart, K., Treasure, E. & Chadwick, B. (2008). Methods of Data Collection in Qualitative Research: Interviews and focus groups. *British Dental Journal*, 204(6): 291- 295.
- GIWA (Ed.) (2004) Lake Chad Basin: Regional assessment 43, Sweden: University of Kalmar.
- Gray, L. & Moseley, W. (2005). A Geographical Perspective on Poverty-Environment Interactions. *Geographical Journal*, 171(1): 9 - 23.
- Halden, P. (2011). The past, present, and future(s) of environmental security studies. *Cooperation and Conflict*, 46: 406 - 414.
- Homer-Dixon, T. F. (1994). Environmental Scarcities and Violent Conflict: Evidence from Cases. *International Security*, 19(1), 5 - 40.
- Hsiang, S., Meng, K. & Cane, M. (2011). Civil Conflicts Are Associated with the Global Climate. *Nature*, 476(7361):438–441
- Olaniyan, A. M., Berrang-Ford, L., Srinivasan, R., & Namanya, D. B. (2020). Climate change and risk of violence: a case study of Boko Haram in Nigeria. *Climatic Change*, 161(3), 523-541.
- LCBC (2014). The Lake Chad Basin. <http://www.cbtl.org/enllake-chad-basin>

- LCBC (2015). The Lake Chad Basin Commission: Mandate and missions. <http://www.cblLcrglcn/mandate-and-missions>.
- LCBC (2016). Project highlight for the Lake Chad Basin. <http://www.cblt.orz/en/projects>.
- Le Dillon, P. (2001). The Political Ecology of War: Natural Resources and Armed Conflicts. *Political Geography*, 20(5), 561 - 584.
- Matthew, R. A. (1997). Environmental Change and International Relations: Some Theoretical Explorations. *Journal of Peace Research*, 34(3), 277 - 296.
- Mustapha, A.R. (2019). Environmental Challenges, Security, and Conflict in Africa. *African Journal of Political Science and International Relations*, 13(8), 234-242.
- Oladipo, O.O., Ajibade, I.F., Adeniji, A. O., Akanbi, I.O., Ogundipe, J.A., & Aransanmi, I. A. (2021). Impact of Climate Change on Lake Chad and Its Indigenous People. *American Journal of Environmental Sciences*, 17(1), 15- 23.
- Rahman, M. (2022). Water Conflict and Human Security: A Case Study of Lake Chad Basin. *Security Dialogue*, 53(3), 232-248.
- Smith, J. A. (2017). "Socio-economic Impacts of Lake Chad Shrinkage: A Case Study of Yobe and Borno States." *Journal of Development Studies*, 45(3), 421-438. Intersection. Marine Corp University Press.
- UNDP. (2020). Human Development Report 2020: The Next Frontier - Human Development and the Anthropocene. United Nations Development Programme.
- United Nations Development Programme. (1994). Human Development Report. New York: Oxford University Press.
- Yamba, F.D. & Visser, M., (2018). The shrinking Lake Chad: a geopolitical and ecological time bomb. *African Geographical Review*, 37(3), 301-314.