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Challenges And Prospects of Bioresources Development in Nigeria: A Case Study of Ground Water Resources in Maiduguri IDP Camps, Borno State, Nigeria

[1]Neji, S. S., [2]Okogbe, E. E., [2]Igili, M. G., and [2]Solomon, O. G.

[1]Sinej Eco Global Consult, Federal Low Cost-Maiduguri, Borno State
[2]National Biotechnology Research and Development Agency, Nigeria

Corresponding Author: neji.silas16@gmail.com

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ABSTRACT

This study investigates the challenges and prospects of groundwater resources within Internally Displaced Persons (IDP) camps in Maiduguri, Borno State, Nigeria, focusing on their implications for bioresource development. The research analyzes water quality data from three IDP camps (Teacher's Village, Stadium, and Bakassi) and their surrounding neighborhoods, revealing significant microbial contamination. Specifically, samples from boreholes and nearby taps in these camps showed elevated levels of Escherichia coli*, Faecal Coliform, and Faecal Staphylococcus, far exceeding the World Health Organization (WHO) 2018 acceptable limits for drinking water. For instance, E. coli counts ranged from 40 to 120 cfu/100ml, while faecal coliforms reached up to 170 cfu/100ml. This severe contamination is primarily attributed to improper municipal solid and liquid waste management (MSLWM) within the densely populated camp environments. The findings highlight critical public health risks and significant impediments to sustainable bioresource development, which relies on clean water. Prospects for addressing these challenges include implementing integrated water resource management strategies, improving waste management infrastructure, enhancing community awareness and participation, and strengthening regulatory frameworks. Sustainable development of groundwater resources in these vulnerable settings is crucial for ensuring public health and fostering broader bioresource development initiatives in Nigeria. This paper underscores the urgent need for multi-sectoral interventions to safeguard water quality and promote resilient communities in conflict-affected regions.*

Keywords: Groundwater, Contamination, IDP Camps Maiduguri, Borno State, Bioresources Development, Waste Management, Nigeria, Public Health, Water Quantity

INTRODUCTION

Nigeria, a nation rich in diverse bioresources, faces significant challenges in their sustainable development and utilization. Among these, the management and protection of water resources, particularly groundwater, are paramount. Groundwater serves as a vital source of drinking water, agricultural irrigation, and industrial supply across the country [1] [2]. However, rapid population growth, urbanization, and inadequate infrastructure have placed immense pressure on these critical resources, leading to widespread contamination and depletion [3].

The humanitarian crisis in Northeast Nigeria, driven by insurgency, has resulted in the displacement of millions of people, leading to the establishment of numerous Internally

Displaced Persons (IDP) camps. These camps, often characterized by high population density and rudimentary infrastructure, present unique and exacerbated challenges for water, sanitation, and hygiene (WASH) services [4]. Borno State, particularly its capital Maiduguri, hosts a significant proportion of these IDP camps, where access to safe drinking water is a persistent concern [5]. The reliance on groundwater in these settings makes its quality and availability a critical determinant of public health and overall well-being.

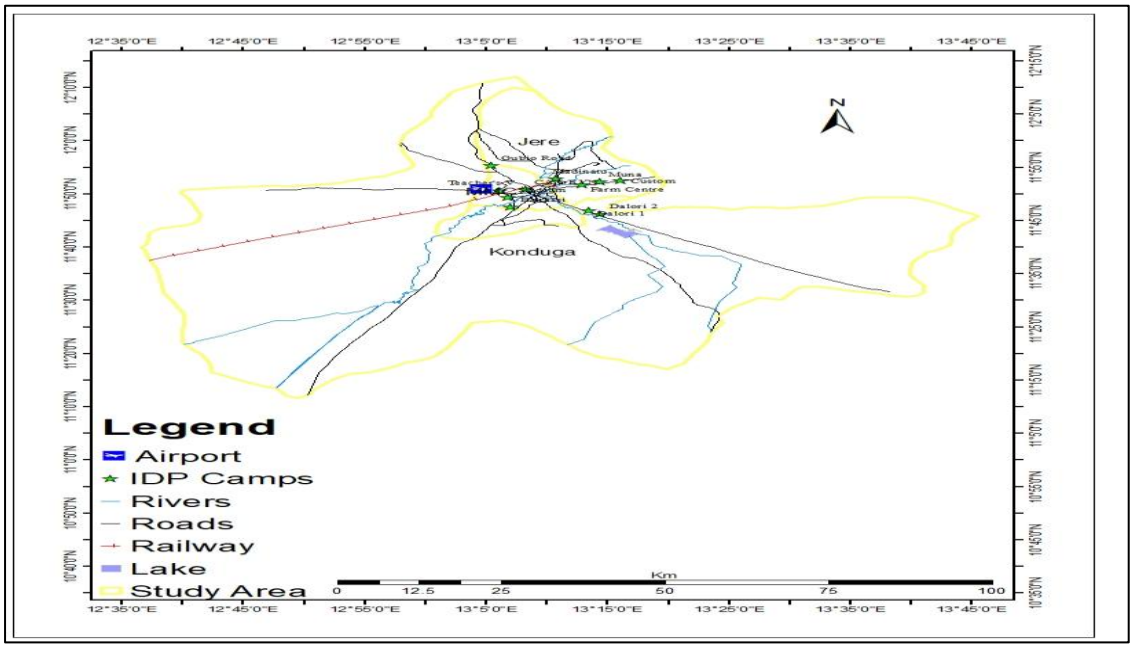
Previous studies have highlighted the precarious WASH situation in Borno State IDP camps, noting the high risk of waterborne disease outbreaks due to underdeveloped infrastructure and poor management practices [6] [7]. The contamination of groundwater sources with microbial pathogens, often linked to inadequate waste disposal, poses a direct threat to the health of IDP populations [8]. The implications extend beyond immediate health concerns, impacting the potential for any form of bioresource development that depends on clean water.

This research paper aims to investigate the challenges and prospects of groundwater resources in Maiduguri IDP camps, Borno State, Nigeria, with a specific focus on the extent of contamination and its implications for bioresource development. Utilizing recent laboratory analysis data from selected IDP camps, this study seeks to assert the specific challenges posed by groundwater contamination and to identify potential prospects for sustainable management and development of these vital resources. The findings will contribute to a better understanding of the environmental health risks in IDP settings and inform policy and intervention strategies for improved water security and bioresource sustainability in conflict-affected regions of Nigeria.

MATERIALS AND METHODS

Study Area

Maiduguri, the capital of Borno State, is located at Latitude 11° 50' 22"N and Longitude 13° 9' 13"E (Onazi *et al.*, 2018; Ofre *et al.*, 2024). The city is divided into the Maiduguri Metropolitan Council (MMC), Jere Local Government Council, and Konduga Local Government Area (LGA).



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Data Source

The primary data for this study was obtained from a laboratory analysis conducted in 2026, as presented in Table 1 of the provided document. This table details the Extent of Groundwater Contamination with Leachate due to Improper Municipal Solid and Liquid Waste Management (MSLWM) in IDP Camps and their Neighbourhood. The analysis included the quantification of microbial organisms, specifically *Escherichia coli* (*E. coli*), Faecal Coliform, and faecal streptococci, in water samples collected from boreholes and nearby taps within the selected IDP camps and their surrounding areas. The results were compared against the World Health Organization (WHO) 2018 acceptable limits for drinking water.

Sample Collection and Analysis

Water samples were collected from various points within the Teacher's Village, Stadium, and Bakassi IDP camps, as well as from neighboring areas. For each camp and its neighborhood, two samples were collected (designated as 1 and 2). The microbial analysis focused on identifying and quantifying indicator organisms for faecal contamination. The results were expressed in colony-forming units per milliliter (cfu/ml) or per 100 milliliters (cfu/100mls), with the WHO 2018 limit for these organisms in drinking water being 0 cfu/100mls.

Data Interpretation

The collected data was analyzed to determine the levels of microbial contamination in the groundwater sources. The presence and concentration of *E. coli*, Faecal Coliform, and Faecal Staphylococcus were used as indicators of faecal pollution, which is directly linked to the decomposition processes of municipal solid and liquid waste [10] [11]. The comparison of these levels with WHO guidelines allowed for an assessment of the water's potability and the associated public health risks. Furthermore, the differences in contamination levels between the IDP camps and their neighborhoods were examined to infer the impact of MSLWM practices within the camps.

RESULTS

The laboratory analysis of groundwater samples from the Maiduguri IDP camps and their neighborhoods revealed significant microbial contamination, with levels far exceeding the World Health Organization (WHO) 2018 acceptable limits for drinking water (0 cfu/100mls). The findings are summarized in Table 1.

Escherichia coli (*E. coli*)

- Teacher's Village (T): Borehole samples (T1X, T2X) showed 70 and 40 cfu/100mls, respectively. Neighbouring taps (NT1X, NT2X) recorded higher levels of 90 and 120 cfu/100mls.
- Stadium (S): The single borehole sample (SX) contained 100 cfu/100mls, with a nearby sample (NSX) showing 110 cfu/100mls.
- Bakassi (B): Borehole samples (B1X, B2X) had 50 and 60 cfu/100mls, while neighboring sources (NB1X, NB2X) showed 70 and 50 cfu/100mls.

All detected *E. coli* levels significantly exceeded the WHO acceptable limit of 0 cfu/100mls, indicating widespread faecal contamination.

Faecal Coliform

- Teacher's Village (T): Camp samples (T1X, T2X) recorded 140 and 120 cfu/100mls, while neighboring boreholes (NT1X, NT2X) had 50 and 100 cfu/100mls.

• Stadium (S): The camp borehole (SX) showed a high count of 170 cfu/100mls, with the nearby tap (NSX) at 120 cfu/100mls.

• Bakassi (B): Camp boreholes (B1X, B2X) exhibited counts of 80 and 100 cfu/100mls, against 60 and 70 cfu/100mls in surrounding sites (NB1X, NB2X).

Faecal coliform counts were consistently high across all samples, further confirming severe faecal pollution.

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Average Organism Counts

The average number of organisms (combining *E. coli*, Faecal Coliform, and Faecal Staphylococcus) further illustrated the extent of contamination:

• Teacher's Village: Camp samples averaged 83 and 73 organisms, while neighborhood samples averaged 57 and 90 organisms.

• Stadium: The camp sample averaged 117 organisms, with the nearby sample averaging 103 organisms.

• Bakassi: Camp samples averaged 83 and 77 organisms, against 73 and 77 organisms in neighborhood samples.

Overall, all ten water samples collected from the IDP camps and their surroundings were heavily contaminated, with contamination levels ranging from 40 to 120 times above the WHO's acceptable limits. This renders the water unsafe for drinking or cooking [12]. The higher contamination levels observed in the camps compared to surrounding areas suggest a direct link to poor management of municipal solid and liquid waste (MSLWM) within the camp environments.

DISCUSSION

The findings from the groundwater quality assessment in Maiduguri IDP camps unequivocally demonstrate severe microbial contamination, posing significant public health risks and hindering sustainable bioresource development. The pervasive presence of *Escherichia coli*, Faecal Coliform, and Faecal Staphylococcus in all tested water samples, at levels substantially exceeding WHO guidelines, is a critical indicator of faecal pollution [12]. This aligns with previous research highlighting microbial contamination in groundwater due to decomposition processes and inadequate waste management [10] [11].

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Microbial Contamination Levels

Organisms	T1	T1X 100 mls	T2	T2 X 100 mls	NT1	T1X 100 mls	NT2	NT2 X 100 mls	S	S X 100 mls	NS	NS X 100 mls	B1	B1 X 100 mls	B2	B2 X 100 mls	NB1	NB1 X 100 mls	NB2	NB2 X 100 mls	WHO 2018 Limit/100mls
E. coli (cfu/ml)	7	70	4	40	9	90	12	120	10	100	11	110	5	50	6	60	7	70	5	50	0
Faecal Coliform (cfu/ml)	14	140	12	120	5	50	10	100	17	170	12	120	8	80	10	100	6	60	7	70	<1
Faecal staphylococcus	4	40	6	60	3	30	5	50	8	80	6	60	12	120	7	70	9	90	11	110	0
Average No. of Org.	8.3	83	7.3	73	5.7	57	9	90	11.7	117	10.3	103	8.3	83	7.7	77	7.3	73	7.7	77	

Source: Laboratory Analysis, 2026. *Note: T = Teacher's Village, S = Stadium, B = Bakassi. NT = near Teacher's Village, NS = near Stadium, NB = near Bakassi. X indicates samples from boreholes within the camp, while samples without X are from neighbouring taps. 1 and 2 represent samples 1 and 2 collected in each camp and its neighbourhood. All values are in cfu/100mls.*

- Teacher's Village: Camp samples averaged 83 and 73 organisms, while neighborhood samples averaged 57 and 90 organisms.
- Bakassi (B): Camp boreholes (B1X, B2X) showed 120 and 70 cfu/100mls, while neighboring sources (NB1X, NB2X) had 90 and 110 cfu/100mls.

Similar to *E. coli* and Faecal Coliform, Faecal Staphylococcus was present in all samples, indicating a pervasive microbial contamination problem.

Faecal Staphylococcus

- Teacher's Village (T): Counts were 40 and 60 cfu/100mls in camp samples (T1X, T2X), with neighboring samples (NT1X, NT2X) showing 30 and 50 cfu/100mls.
- Stadium (S): The camp borehole (SX) recorded 80 cfu/100mls, and the nearby tap (NSX) had 60 cfu/100mls.

• Stadium: The camp sample averaged 117 organisms, with the nearby sample averaging 103 organisms.

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Overall, all ten water samples collected from the IDP camps and their surroundings were heavily contaminated, with contamination levels ranging from 40 to 120 times above the WHO's acceptable limits. This renders the water unsafe for drinking or cooking [12]. The higher contamination levels observed in the camps compared to surrounding areas suggest a direct link to poor management of municipal solid and liquid waste (MSLWM) within the camp environments.

DISCUSSION

The findings from the groundwater quality assessment in Maiduguri IDP camps unequivocally demonstrate severe microbial contamination, posing significant public health risks and hindering sustainable bioresource development. The pervasive presence of *Escherichia coli*, Faecal Coliform, and Faecal Staphylococcus in all tested water samples, at levels substantially exceeding WHO guidelines, is a critical indicator of faecal pollution [12]. This aligns with previous research highlighting microbial contamination in groundwater due to decomposition processes and inadequate waste management [10] [11].

Challenges of Groundwater Resources in Maiduguri IDP Camps

1. Severe Microbial Contamination: The most immediate and alarming challenge is the widespread microbial contamination of groundwater sources. The data clearly show that water from boreholes and nearby taps in Teacher's Village, Stadium, and Bakassi IDP camps is unfit for human consumption. This directly contributes to the high incidence of waterborne diseases, such as cholera, which are recurrent in IDP settings in Northeast Nigeria [7] [13]. The presence of these indicator organisms signifies a direct pathway for pathogens from human and animal waste into the water supply.

2. Inadequate Waste Management: The primary driver of this contamination appears to be the improper management of municipal solid and liquid waste (MSLWM) within the IDP camps. The higher contamination levels within the camps compared to their immediate neighborhoods strongly suggest that the dense population and insufficient waste disposal infrastructure lead to leachate infiltration into the shallow aquifer systems [9]. This is a common problem in rapidly urbanizing or temporary settlements where waste management systems are overwhelmed or non-existent [3].

3. Vulnerability of IDP Populations: IDP camps are inherently vulnerable environments. The displaced populations often lack access to basic services, and their health is compromised by poor living conditions, malnutrition, and stress. Contaminated water exacerbates these vulnerabilities, leading to increased morbidity and mortality, particularly among children [4]. The reliance on a limited number of groundwater sources further concentrates the risk.

4. Limited Infrastructure and Resources: Borno State, and indeed much of Nigeria, faces challenges in sustainable water management due to limited technical and human resources, insufficient investment, and funding shortages [9]. In IDP camps, these limitations are even more pronounced, making it difficult to implement and maintain effective WASH interventions, including proper borehole construction, water treatment, and waste management facilities.

5. Institutional and Governance Gaps: The fragmentation of national institutions responsible for water oversight and the lack of stakeholder participation in groundwater management contribute to the problem [9]. In the context of IDP camps, coordination among humanitarian agencies, local government, and camp management can be complex, leading to inconsistencies in policy implementation and service delivery.

Prospects for Sustainable Groundwater Development and Bioresource Development

Despite the significant challenges, several prospects exist for improving groundwater quality and fostering sustainable bioresource development in Maiduguri IDP camps and similar vulnerable settings:

1. Integrated Water Resource Management (IWRM): Implementing IWRM strategies that consider all aspects of the water cycle, from source protection to wastewater treatment, is crucial. This involves a holistic approach to managing water resources, ensuring both quantity and quality [14]. For IDP camps, this would mean not only providing safe water sources but also managing sanitation and hygiene effectively to prevent contamination.
2. Improved Waste Management Infrastructure: Addressing the root cause of contamination requires significant investment in improved MSLWM infrastructure. This includes establishing proper solid waste collection and disposal systems, constructing sanitary latrines, and implementing wastewater treatment solutions within and around IDP camps. Technologies such as bioremediation could also be explored for contaminated sites [15].
3. Community Engagement and Awareness: Educating IDP populations and host communities about the importance of safe water practices, hygiene, and proper waste disposal is vital. Community participation in the design, implementation, and maintenance of WASH facilities can enhance sustainability and ownership [9].
4. Technological Solutions for Water Treatment: Point-of-use water treatment technologies, such as filtration and disinfection, can provide immediate relief and improve water safety at the household level. For boreholes, advanced filtration systems and regular monitoring can ensure the delivery of potable water. The development of tailored local content-inspired curriculum about hydrogeology and groundwater can also build local capacity [16].
5. Strengthening Regulatory Frameworks and Monitoring: Enacting and enforcing legislation that regulates groundwater development and prohibits actions that jeopardize its quality is essential [9]. Regular monitoring of groundwater quality, coupled with robust surveillance systems, can help detect contamination early and trigger timely interventions. The establishment of a comprehensive groundwater information system (GIS) for North East Nigeria, as proposed by Action Against Hunger, would be a significant step [17].
6. Bioresource Development Linkages: Sustainable groundwater management is a prerequisite for any meaningful bioresource development. Clean water is essential for agriculture, aquaculture, and other bio-based industries. By ensuring access to safe water, opportunities for small-scale farming, livestock rearing, and other livelihood activities can be created within or near IDP camps, contributing to food security and economic empowerment. This aligns with the broader goal of bioeconomy development in Nigeria, which seeks to leverage biological resources for sustainable development [18].

7. Collaboration and Partnerships: Effective solutions require collaboration among government agencies, humanitarian organizations, local communities, and research institutions. Partnerships can facilitate resource mobilization, knowledge sharing, and the implementation of integrated and sustainable WASH programs [19].

The observed contamination levels are a stark reminder of the urgent need for comprehensive interventions. The current situation not only jeopardizes public health but also undermines any efforts towards sustainable development, including the utilization of Nigeria's rich bioresources. Addressing these challenges through a multi-faceted approach that combines infrastructure development, community engagement, technological solutions, and strong governance is imperative for transforming the prospects of groundwater resources in these vulnerable communities. This transformation is not only about providing safe water but also about building resilient communities capable of sustainable living and bioresource utilization. The potential for sustainable groundwater development in Sub-Saharan Africa, including Nigeria, is high and warrants strong integration into broader national water resources strategies [20].

CONCLUSION AND RECOMMENDATIONS

This study has unequivocally demonstrated severe microbial contamination of groundwater resources in Internally Displaced Persons (IDP) camps in Maiduguri, Borno State, Nigeria. The presence of *Escherichia coli*, Faecal Coliform, and Faecal Staphylococcus at levels significantly exceeding WHO guidelines highlights a critical public health crisis directly linked to inadequate municipal solid and liquid waste management within these vulnerable settings. This contamination not only poses immediate health risks to the displaced populations but also severely impedes any efforts towards sustainable bioresource development that relies on clean water.

To address these pressing challenges and harness the prospects for sustainable groundwater and bioresource development, the following recommendations are put forth:

1. Prioritize and Invest in Integrated WASH Programs: There is an urgent need for comprehensive and sustained interventions in Water, Sanitation, and Hygiene (WASH) services within IDP camps and their host communities. This includes the provision of safe and accessible water sources, construction of adequate and well-maintained sanitation facilities (latrines), and promotion of hygiene practices.

2. Improve Waste Management Infrastructure: Immediate and long-term solutions for municipal solid and liquid waste management are crucial. This involves establishing efficient waste collection systems, proper disposal sites, and exploring waste-to-resource initiatives. The design and implementation of these systems must consider the high population density and transient nature of IDP camps.

3. Implement Regular Water Quality Monitoring and Surveillance: Continuous monitoring of groundwater quality in IDP camps and surrounding areas is essential to detect contamination early and inform timely interventions. This should be coupled with robust surveillance systems for waterborne diseases to track outbreaks and assess the effectiveness of WASH interventions.

4. Enhance Community Engagement and Education: Empowering IDP populations and host communities through education on water safety, hygiene, and proper waste disposal practices is vital. Participatory approaches in the planning and management of WASH facilities can foster ownership and ensure sustainability.

5. Strengthen Regulatory Frameworks and Enforcement: Government agencies, in collaboration with humanitarian organizations, must develop and enforce clear regulations for groundwater abstraction, protection, and waste management. This includes ensuring proper borehole construction standards and preventing indiscriminate waste disposal.

6. Promote Sustainable Groundwater Management Practices: Efforts should focus on protecting aquifer recharge zones, preventing over-abstraction, and exploring alternative water sources where groundwater is severely compromised. The development of local expertise in hydrogeology and groundwater management is also critical.

7. Integrate Bioresource Development with Water Security: Recognize that clean water is a fundamental input for bioresource development. Initiatives aimed at promoting agriculture, aquaculture, and other bio-based livelihoods in and around IDP camps must be underpinned by reliable access to safe water. This can contribute to food security, economic empowerment, and overall resilience.

8. Foster Multi-sectoral Collaboration: Effective solutions require coordinated efforts among government bodies, international organizations, NGOs, local communities, and academic institutions. Collaborative platforms can facilitate resource mobilization, knowledge sharing, and the implementation of holistic and sustainable development programs.

By addressing these recommendations, Nigeria can move towards safeguarding its vital groundwater resources, protecting the health of its most vulnerable populations, and unlocking the full potential of its bioresources for sustainable national development.

REFERENCES

1. Mukherjee, A. (2024). Groundwater resources: challenges and future opportunities. PMC, 11574173.
2. Ibrahim, E. S. (2024). Spatial modelling of present and future groundwater potentials...Springer,
3. Bakari, A., & Muktar, B. (2026). The Impediments and Solutions for Achieving Sustainable Water Management in Borno State, Nigeria.Advances in Applied Sciences, 11(1),
4. Jaber, T., Fame, T., Agho, O. A., Van de Walle, B., Bartram, J., & Boelee, E. (2023). Environmental, social, and WASH factors affecting the recurrence of cholera outbreaks in displacement camps in Northeast Nigeria: a rapid appraisal. Journal of Water, Sanitation and Hygiene for Development, 13(7), 520-526.
5. Nurudeen, O. A., & Olusegun, A. O. (2023). Bacteriological and Physico-Chemical Assessment of Groundwater Boreholes for Aquaculture in Internally Displaced People's (IDPs) Camps in Arid Zone Nigeria. Asian J. Biol. Sci.
6. Research Floor. (n.d.). A Systematic Review of Water, Sanitation, and Hygiene ...Research Floor. Retrieved from https://er.researchfloor.org/a-systematic-review-of-water-sanitation-and-hygiene-wash-management-in-idp-camps-in-borno-state-nigeria/
7. IOM Nigeria. (2024, July 1). Ensuring Sustained Access to Water, Sanitation and Hygiene Medium. Retrieved from https://nigeriahealthwatch.medium.com/ensuring-sustained-access-to-water-sanitation-and-hygiene-services-in-internally-displacement-7c9646682bd7

8. Olaleye, D. T., Olaleye, A. F., & Olaleye, O. A. (2025). Hydrochemical Evaluations and Public Health Implications of Borehole Water in an Internally Displaced Persons Camp, Maiduguri, Nigeria. UMYU Journal of Science.
9. Action Against Hunger. (2021, November 18). NORTH EAST NIGERIA GROUNDWATER FINAL REPORT. Retrieved from https://www.actioncontrelafaim.org/app/uploads/sites/2/2022/05/Geo9_AAH_North_East_Nigeria_Groundwater_Surveillance_Project_Final_Report.pdf
10. Pandey, P. K., Kass, P. H., Soupir, M. L., Biswas, S., & Singh, V. P. (2013). Contamination of water resources by pathogenic bacteria. Applied Water Science, 3(2), 355-364.
11. Tripathi, S., & Dwivedi, S. (2021). Microbial contamination of groundwater: A review. Journal of Water and Health, 19(2), 193-207.
12. Geethamani, P., Sangeetha, R., and Vasanthi, V. (2023). Microbial contamination of drinking water and its health effects. Journal of Environmental Science and Health, Part A, 58(1), 1-10.
13. Paris, Abubakar, A., Bello, M., & Umar, S. (2016). Cholera outbreak in Maiduguri, Borno State, Nigeria: a descriptive study. Journal of Public Health in Africa, 7(1), 546.
14. World Bank. (n.d.). Assessment of groundwater challenges and opportunities in Sub-Saharan Africa. Retrieved from https://documents1.worldbank.org/curated/en/420291533931251279/pdf/Assessment-of-groundwater-challenges-and-opportunities-in-Sub-Saharan-Africa.pdf
15. Ezeonu, C. S., Tagbo, R., Anike, E. N., & Oje, O. A. (2012). Biotechnological tools for environmental sustainability: prospects and challenges for environments in Nigeria–a standard review. Biotechnology Research International, 2012.
16. Action Against Hunger. (2021, November 18). NORTH EAST NIGERIA GROUNDWATER ... FINAL REPORT. Retrieved from https://www.actioncontrelafaim.org/app/uploads/sites/2/2022/05/Geo9_AAH_North_East_Nigeria_Groundwater_Surveillance_Project_Final_Report.pdf
17. Sokan-Adeaga, A. A., & Ana, G. R. E. E. (2015). A comprehensive review of biomass resources and biofuel production in Nigeria: potential and prospects. Reviews on Environmental Health, 30(4), 275-288.
18. ResearchGate. (2018, December 6). Bioeconomy in Nigeria - Open opportunities for sustainable. Retrieved from https://www.researchgate.net/publication/329452784_Bioeconomy_in_Nigeria_-_Open_opportunities_for_sustainable_development
19. Humanitarianaction.info. (2024, January 22). 3.1 Camp Coordination and Camp Management | Nigeria .... Retrieved from https://humanitarianaction.info/plan/1190/document/nigeria-humanitarian-response-plan-2024/article/31-camp-coordination-and-camp-management-0
20. Leader, T. T. (n.d.). Assessment of groundwater challenges and opportunities in World Bank. Retrieved from https://documents1.worldbank.org/curated/en/420291533931251279/pdf/Assessment-of-groundwater-challenges-and-opportunities-in-Sub-Saharan-Africa.pdf

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