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Assessment of Access to Water Supply Services in Uyo Capital City, Akwa Ibom State, Nigeria

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Abstract

This study investigates access to water supply services in Uyo, the capital city of Akwa Ibom State, Nigeria. It aims to identify the major sources of water supply, assess the quality and safety of the water accessible to residents, and examine the infrastructural and institutional factors influencing water availability. The study adopts a qualitative research design, incorporating household surveys, key informant interviews, field observations, and laboratory analysis of selected water samples. Three water sources were examined: Iba Oku River, Esuk Ita River, and a public tap at Akpan Anem Market. These samples were tested for key physicochemical parameters, including pH, turbidity, total dissolved solids, electrical conductivity, magnesium, and calcium, to determine their compliance with national and international water quality standards. The findings reveal a high dependence on sachet water and other private sources, primarily driven by the unreliability and irregularity of the public water supply system. Although pipe-borne water is officially the dominant source, many residents supplement their needs with alternative sources such as table water, boreholes, and untreated surface water. Laboratory analysis indicates that surface water sources, particularly Esuk Ita River, are significantly polluted and often exceed recommended thresholds for turbidity, total dissolved solids, and conductivity. Magnesium levels across all samples also exceeded acceptable limits, posing potential health risks to consumers and vulnerable populations. These results point to systemic deficiencies in water governance and underline the urgent need for infrastructural reforms, regulatory oversight, and coordinated policy action. The study concludes that improving water access in Uyo requires a multifaceted approach, including the rehabilitation of existing infrastructure, stricter monitoring of water quality, public health education, and increased investment in institutional capacity and technical expertise. Addressing these pressing issues will be critical in achieving equitable and sustainable water access in line with the United Nations Sustainable Development Goal 6 (SDG 6).

Keywords: *Access, Water Supply Services, Uyo Capital City, Akwa Ibom State*

Introduction

Access to clean and safe water is a fundamental human right and a cornerstone of public health, economic development, and environmental sustainability. It is also a key determinant of the quality of life and a necessary resource for the achievement of the United Nations Sustainable Development Goal 6 (SDG 6), which seeks to ensure availability and sustainable management of water and sanitation for all by 2030 (Usen, 2024). Despite Nigeria's vast freshwater resources and its commitment to international development targets, millions of its citizens still lack regular access to safe and potable water, especially in rapidly growing urban centres and informal communities. Uyo Capital City, the administrative headquarters of Akwa Ibom State, exemplifies this national water challenge. Like many emerging cities in Nigeria, Uyo has experienced significant population growth, rapid urban expansion, and increasing demand for water services. However, the city's water supply infrastructure has not kept pace with this growth. Although

public water systems exist, they are often characterised by outdated equipment, limited coverage, irregular supply, and poor maintenance. As a result, residents have adopted coping strategies that involve sourcing water from private boreholes, sachet water vendors, table water producers, and natural surface water bodies such as streams and rivers (Solihu, Olakunle and Bilewu, 2021). These alternative sources, however, raise critical concerns. Private water vendors are largely unregulated, and there is growing evidence that some of these sources do not meet the safety thresholds outlined by the World Health Organization (WHO) and the Nigerian Standard for Drinking Water Quality (NSDWQ). Prior studies, such as those by Eludoyin (2020) and Olalekan, Vivien, and Adedoyin (2018), have shown that water quality in many Nigerian cities frequently falls below acceptable standards, posing serious risks to public health. In addition, fragmented institutional responsibilities and inadequate investment in the water sector have made effective governance difficult and inefficient at all administrative levels. Furthermore, the lack of public awareness and community participation in water planning and monitoring efforts has contributed to limited accountability and poor service delivery (Ishaku, Majid & Ajayi, 2011). Many urban residents remain unaware of the quality of water they consume or the implications for long-term health and environmental sustainability. This study contributes to the ongoing discourse by assessing the level of access to safe water in Uyo Capital City. It identifies the main sources of water, analyses their quality, and evaluates institutional efforts supporting water distribution. Its aim is to offer evidence-based recommendations for improving water access in a sustainable and equitable manner.

Uyo Capital City faces enduring challenges in water service delivery, driven by population growth, ageing infrastructure, and weak policy enforcement (Ansa and Uzoma, 2019). The public water system is characterised by inconsistent supply, prompting many residents to depend on private boreholes and sachet water (Solihu, Olakunle and Bilewu, 2021). These alternatives, though widely used, are not always subject to regulation and may pose health risks (Olalekan, Vivien and Adedoyin, 2018). Meanwhile, coordination between relevant water agencies remains limited, and public investment insufficient. A holistic assessment is thus essential to guide sustainable and equitable water access.

Objectives of the Study

This study aims to:

1. Identify the major sources of water supply in Uyo Capital City;
2. Assess the level of access to safe and adequate water among residents in the study area.

Study Area

Uyo Capital City, located in the South-South geopolitical zone of Nigeria, serves as the administrative headquarters of Akwa Ibom State. Geographically, it is positioned between latitudes 4°58'N and 5°04'N and longitudes 7°51'E and 8°01'E as seen in figure 1.0. The city experiences a humid tropical climate with high annual rainfall, making it conducive for both surface and groundwater development. Major surface water bodies, including the Ikpa River and Iba Oku stream, contribute to the city's hydrological potential. However, the underutilization of these resources, due to infrastructural and management constraints, has limited their contribution to domestic water supply (Ansa and Ukpong, 2015).

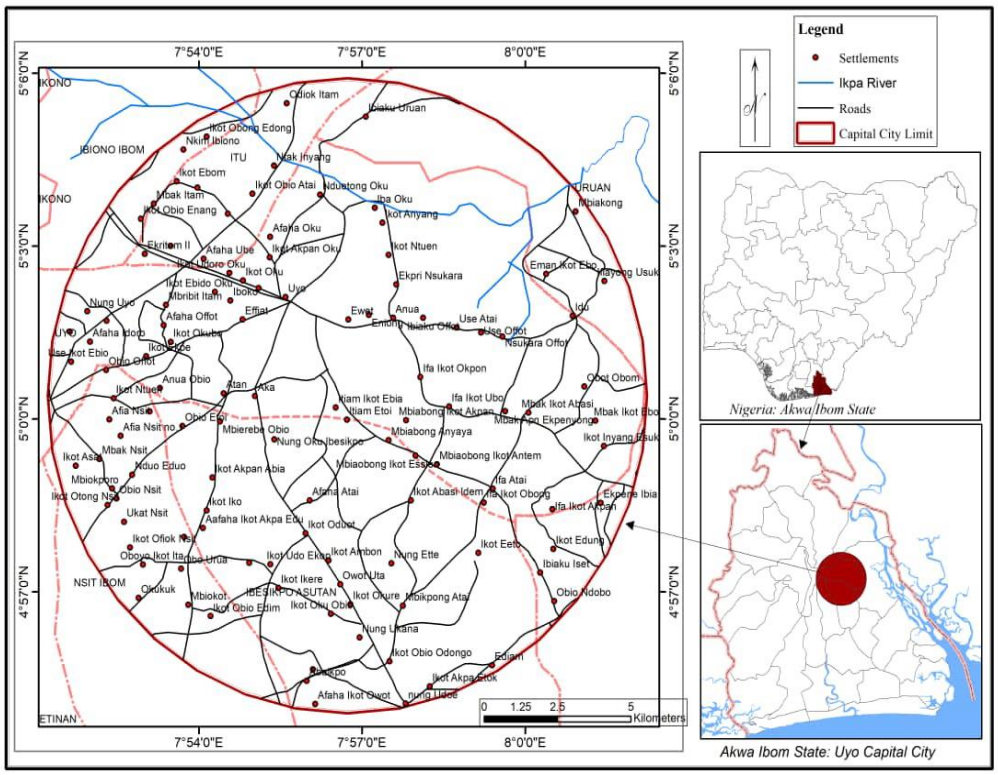

Figure 1:0 Uyo Capital City

Conceptual Framework

Theory of Access

The Theory of Access was propounded by Jesse Ribot and Nancy Peluso in 2003. In developing this theory, they shifted the analytical focus from formal property rights to the broader concept of access, which they defined as "the ability to benefit from things." Central to their argument is the idea that differential relationships exist among various actors and the resources they seek to benefit from and control. Rather than limiting the discussion to legal ownership or tenure, Ribot and Peluso examined the broader socio-political and economic mechanisms that shape individuals' and groups' ability to access resources. The theory synthesizes multiple strands of thought across human geography, political economy, and political ecology, grounded in both social theory and extensive empirical research. As Ribot and Peluso (2003) note, their shift from property and tenure to access emphasizes that property is merely one among many institutions and relationships—alongside political, economic, and discursive mechanisms—that influence who benefits from resources, and how. This approach enables a multi-disciplinary understanding of access, highlighting that formal rights alone do not guarantee actual access. Instead, social relations, institutional arrangements, and structural inequalities play a critical role in enabling or constraining access.

By focusing on access as an ability, rather than merely rights, the theory reveals how people may benefit from resources even without holding formal property titles, and conversely, how those with legal rights may be unable to exercise them due to social or political constraints. Ribot and Peluso's framework thus encompasses a broader spectrum of structural and relational mechanisms, such as market relations, labor arrangements, authority, social identity, and technology, among others.

This theory is particularly relevant to the present study as it provides a conceptual lens for understanding how access to water supply is gained, maintained, and controlled. By moving beyond formal rights and legal entitlements, the Theory of Access enables a comprehensive analysis of the multiple actors, institutions, and power dynamics involved in water resource management. It will assist in exploring the sources of water supply, water treatment processes, and the sectors involved in delivering water services. Ultimately, this framework will help unpack the complexities of water access, revealing how it is shaped not only by infrastructure and policy but also by the underlying social, economic, and political factors that govern everyday access to this vital resource.

Materials and Methods

A mixed research design was adopted, combining structured household questionnaires, laboratory analysis, in-depth interviews with water officials, and field observations. Water samples were collected from three locations: the Iba Oku River (S1), the Esuk Ita River (S2), and a public tap at Akpan Anem Market (S3). Akpan Anem was selected due to its central location and high frequency of public usage, making it a representative sample of municipally supplied water. Laboratory analyses were conducted at the Akwa Ibom State Water Corporation. The samples were tested for pH, turbidity, total dissolved solids (TDS), electrical conductivity, phosphate, calcium, magnesium, and total hardness. Survey data and water quality results were analyzed using descriptive statistical techniques. The results were compared with WHO standards for drinking water (WHO, 2017) to determine compliance. Institutional performance was evaluated through documentary reviews and interviews with relevant stakeholders, focusing on issues of policy implementation, inter-agency coordination, and resource allocation (Akpabio and Rowan, 2021).

Result and Discussion

Sources of water supply services

The sources of water supply identified in the course of the research are listed below.

Sources of Water Supply Services

S/N	Sources	Frequency	Percentage
1.	Pipe-borne	209	52.25
2.	Borehole	5	1.25
3.	Stream/River	28	7
4.	Sachet Water	119	29.75
5	Table Water	39	9.75
	Total	**400**	**100**

Source: Field Survey, 2024

The results in table 4.1 shows that respondents who agreed that the source of water supply in the study area was pipe-borne water were 209 represented by 52.25% while borehole were 5 represented by 1.25%, stream and rivers were 28 represented by 7% while respondents who make use of sachet water were 119 represented by 29.75% and table water were 39 represented by 9.75%. The result identified multiple sources of water supply which includes rain, river/stream, pipe borne, borehole, sachet water and table water with pipe borne and sachet water being the major source.

Parameters of access to safe to water supply services

The parameters of access to safe water supply are identified below. The analysis above is based on Nigerian Standard for Drinking Water Quality (NSDWQ). The results of the physicochemical analysis of the water samples S1 to S3, collected from 3 places which include S1 standing for Iba Oku river, S2 refers to Esuk Ita River while S3 is a public water supply at Akpan Anem Market. The result from the water samples is presented below in Table 4.2.

Physicochemical examination result of three water sample

S/N	Parameters	S1	S2	S3	NSDWQ
1	Temperature	26.2	26.3	26.2	Ambient
2	Turbidity Niu	1.03	6.12	0.76	5
3	pH	6.58	7.56	6.35	6.5-8.5
4	Total Dissolved Solid	595	7920	296	500
5	Conductivity	1225	16830	613	1000
6	Phosphate	BD	0.34	0.06	3.50
7	Magnesium	62	110	72	0.2
8	Calcium	52	52	64	75.0
9	Total Hardness	114	136	136	500

Source: Field Survey, 2024

From the result presented above, it shows that:

Temperature: Sample one had a temperature of 26.2^0C, sample two had a temperature 26.3^0C while sample three had a temperature 26.2^0C. Turbidity: Sample one had 1,03 units, sample two had 6.12 units while sample three had 0.76units. pH: Sample had a value of 6.58, sample two was 7.56 while sample three was 6.35 Total Dissolved Solid: Sample one was 595 milligrams per litre of water (mg/L), sample two was 7920 milligrams per litre of water (mg/L) while sample three was 296 milligrams per litre of water (mg/L). Conductivity: Sample one had contained 1225 microsiemens per centimetre (µs/c), sample two had contained 16830 microsiemens per centimetre (µs/c) while sample three had contained 613 microsiemens per centimetre (µs/c). Phosphate: Sample one was beyond detection, sample two was 0.34 milligrams per decilitre while sample three was 0.06 milligrams per decilitre. However, phosphate levels greater than 1.0mg/l. Hence, sample on was not detected while two and three met the criteria Magnesium: Sample one had 62 mg/dL, sample two had 110 mg/dL while sample three had 72 mg/dL. However, the first sample alone meets the criteria. Calcium: Sample one had contained 52 mg/dl, sample two had contained 52 mg/dl while sample three contained 64 mg/dl. The maximum desirable standard is 75mg/l. Hence, from the result all the sample met the desirable standard. Total Hardness: Sample contained 114 milligrams per litre, sample two contained 136 milligrams per litre while sample three had contained 136 milligrams per litre.

The study revealed that residents in Uyo Capital City rely on a diverse range of water sources. The most commonly accessed source is pipe-borne water, used by over half of the respondents (52.25%). However, despite its prevalence, this source is often unreliable due to intermittent supply and infrastructural limitations. Consequently, many households turn to alternative sources to meet their daily water needs. Sachet water is the second most utilized source, accounting for nearly 30% of responses. This growing reliance reflects both the unavailability of treated public water and a perceived assurance of quality, although sachet water itself is not always subject to rigorous regulation. Table water, a more expensive option, is used by approximately 10% of the population, mostly by middle-income households seeking safer alternatives. Streams and rivers contribute to 7% of household water use, particularly in peri-urban and low-income areas where access to piped or packaged water is limited. Borehole usage, surprisingly low at just over 1%, may be due to the high cost of drilling, operational maintenance, or local hydrogeological constraints. These findings are consistent with the work of Oladipo and Igbokwe (2017), who observed that Nigerian urban residents increasingly depend on packaged and informal

water sources as public systems deteriorate. The data underscore a growing fragmentation in water access across Uyo, with significant implications for equity, affordability, and health outcomes.

Laboratory results revealed notable variations in the physicochemical characteristics of water samples collected from three locations: Iba Oku River (S1), Esuk Ita River (S2), and a public tap at Akpan Anem Market (S3). The turbidity level in sample S2 was 6.12 NTU, exceeding the Nigerian Standard for Drinking Water Quality (NSDWQ) threshold of 5 NTU, suggesting potential contamination. Total Dissolved Solids (TDS) in the same sample were alarmingly high at 7920 mg/L-far above the permissible limit of 500 mg/L. This was accompanied by elevated electrical conductivity, recorded at 16,830 µS/cm, indicating a heavy presence of dissolved ions. All three samples exceeded the recommended limit for magnesium, with S2 again showing the highest level at 110 mg/L, against the NSDWQ standard of 0.2 mg/L. In contrast, calcium levels in all samples remained within acceptable limits (below 75 mg/L), and pH values were mostly within or marginally below the recommended range of 6.5–8.5. These results are consistent with findings by Ukpong et al. (2017) who analysed the physico-chemical and bacteriological analysis of borehole water in Ikot Akpaden and the surrounding villages in Mkpat Enin Local Government area of Nigeria designated as S1, S2, S3, S4, S5 and S6 have been carried out using standard analytical techniques. The physico-chemical results show that the secondary water quality parameters such as pH, EC, TDS, Turb., Alka., CaH, MgH, TH, DO, Cl-, NO3-, NO2-, SO4 2-, F- and Fe were either within or below the permissible range recommended by NSDWQ, USPH and WHO.

Similarly, the study also aligned with that obtained by Publio et al. (2023) on pollutants in groundwater in Maricá Municipality, located on the east side of Rio de Janeiro state in Brazil suing 124 groundwater samples. A greater number of parameters including DO were above permissible limit.

The present study reinforces these patterns, highlighting a persistent challenge across Nigerian regions: surface and public water sources often fail to meet basic safety criteria due to inadequate treatment, infrastructural neglect, and weak regulatory enforcement. These findings underscore the urgent need for regular water quality assessment and targeted remediation efforts, particularly in urban centres like Uyo where population pressure further strains existing systems. These results suggest that surface water sources, particularly S2, are significantly polluted, while public tap water (S3) is relatively safer, albeit requiring continuous monitoring.

Conclusion and Recommendations

This study has shown that access to safe and reliable water in Uyo Capital City remains a significant challenge, driven by a combination of infrastructural deficiencies, environmental contamination, and institutional inefficiencies. While over half of the population continues to rely on pipe-borne water, its erratic availability forces many residents to supplement their needs with alternative sources such as sachet water, table water, and untreated surface water. Laboratory analysis revealed that some of these sources, particularly streams and rivers, frequently exceed recommended safety thresholds for turbidity, total dissolved solids, and magnesium, posing considerable public health risks. The findings underscore systemic weaknesses in water governance, including poor regulatory oversight, limited investment in public infrastructure, and a lack of integrated planning. These issues are compounded by rapid urbanisation and population growth, which place additional stress on an already fragile water supply system. Without targeted intervention, disparities in access to clean water will likely deepen, contributing to health inequities and undermining sustainable urban development in the city. Improving water access and quality requires a multifaceted approach, beginning with urgent investment to upgrade aging public water infrastructure and extend distribution to underserved communities, thereby reducing reliance on unsafe sources. Strengthened monitoring and regulation are essential, with agencies conducting routine assessments and ensuring compliance across both public and private providers, including sachet and table water producers. Public health campaigns should promote household-level purification methods such as boiling, filtration, and chlorination, especially in areas dependent on surface water. Increased institutional funding, coupled with better coordination among water-related agencies, can enhance policy coherence and resource efficiency. Community engagement in water governance is also crucial, fostering accountability and ensuring locally appropriate solutions. Finally, alternative water sourcing methods, including rainwater harvesting and groundwater recharge, should be adopted to supplement supply during periods of high demand

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