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DOMESTIC WATER SOURCES AND FACTORS INFLUENCING URBAN HOUSEHOLD ATTITUDES ON WATER STORAGE FACILITIES IN SOKOTO METROPOLIS, NORTH WESTERN NIGERIA

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Abstract

Water scarcity and inconsistent supply remain critical challenges in many urban areas of developing countries, including Sokoto Metropolis in Northwestern Nigeria. This study explores the domestic water sources and the factors influencing urban household attitudes towards water storage facilities in Sokoto, with a focus on understanding the socio-economic, cultural, and environmental dynamics shaping water management practices. A qualitative research design was employed, utilizing semi-structured interviews, focus group discussions, and direct observations to gather data from households across different socio-economic backgrounds. Findings revealed a variety of water sources utilized by residents, including municipal tap water, boreholes, wells, water vendors, and rainwater harvesting. Household decisions regarding water storage were influenced by several factors, including economic status, perceptions of water quality, cultural practices, and t semi-arid climate. Higher-income households predominantly used modern storage solutions such as large-capacity plastic tanks, while lower-income families often relied on more affordable options like metal drums and traditional clay pots. Despite the urban setting, traditional storage methods persisted alongside modern alternatives, reflecting a unique blend of cultural continuity and adaptation to urbanization. Key challenges identified included the high cost of modern storage facilities, risks of water contamination due to inadequate maintenance, limited space for storage in densely populated neighborhoods, and the unreliable municipal water supply, especially during dry seasons. The study concludes that a holistic and context-sensitive approach is needed to enhance water security in Sokoto Metropolis. Recommendations include improving municipal water infrastructure, promoting affordable and safe storage solutions, educating households on safe water management practices and encouraging sustainable, culturally appropriate water conservation strategies.

Keywords: *Domestic Water, Household, Attitudes, Water Storage, Facilities and Sokoto Metropolis*.

Introduction

Access to reliable and clean domestic water is a fundamental need for urban households, directly impacting health, hygiene, and quality of life. In Sokoto Metropolis, a key urban center in Northwestern Nigeria, water scarcity and inconsistent supply have driven households to explore various water storage solutions (Yakubu and Musa, 2020). As urbanization in Sokoto continues to raise, the pressure on existing water infrastructure intensifies, necessitating an examination of how residents navigate these challenges through water storage practices. The diverse domestic water sources in Sokoto, ranging from public tap water to boreholes, wells and commercial water vendors, reflect a complex landscape shaped by socioeconomic factors, infrastructural constraints, and

environmental conditions. The quality and availability of these sources can be unpredictable, making water storage an essential strategy for many households to ensure consistent access (Efe, 2006).

Understanding the attitudes of urban households in Sokoto towards water storage facilities requires a deep exploration of factors such as reliability of water supply, cultural practices, economic conditions, and perceptions of water quality and safety. These attitudes influence not only the type of storage facilities adopted; ranging from traditional clay pots to modern plastic tanks, but also how households prioritize, maintain, and utilize stored water (Adekunle, 2007). This qualitative study aims to explore the domestic water sources in Sokoto Metropolis and the various factors influencing urban household attitudes toward water storage facilities. By engaging with residents' lived experiences, the research seeks to identify the motivations, challenges, and adaptive strategies that shape water storage practices, providing insights that can inform policy interventions and support sustainable urban water management in the region.

Research Problem

In Sokoto Metropolis, Northwestern Nigeria, access to a reliable and consistent supply of clean domestic water remains a significant challenge (Adedayo and Mari, 2008). The region's rapid urban growth has placed a strain on existing water infrastructure, leading to frequent interruptions and variability in water supply (Adedayo and Mari, 2008). Consequently, urban households are compelled to adopt diverse water storage practices to mitigate the uncertainty associated with accessing adequate and safe water. Despite the widespread reliance on various water storage facilities, there is limited understanding of the factors influencing urban households' attitudes toward these facilities. Factors such as perceptions of water quality, economic constraints, cultural norms, and the reliability of different water sources shape household decisions, yet there is little qualitative research exploring these dynamics in Sokoto Metropolis (Gleick, 1996, Kar and Chambers, 2008). This gap in knowledge hinders the development of effective water management policies and strategies that address the specific needs and preferences of urban residents. Without a clear understanding of why households choose particular storage methods and how they manage stored water, efforts to improve urban water supply systems and promote sustainable water use may fall short (Gandy, 2008, Mmom and Mmom 2011). This study, therefore, seeks to investigate the domestic water sources available in Sokoto Metropolis and examine the factors that shape urban household attitudes towards water storage facilities. The findings aim to provide insights that could guide water management policies, improve water storage practices, and contribute to more resilient and sustainable urban water systems in the region.

Literature Review

The issue of domestic water access and storage in urban areas has been a focus of extensive research globally, particularly in regions where water scarcity and unreliable supply are common United Nations development Programme (UNDP) (2006). In Sokoto Metropolis, as in many other urban areas in Sub-Saharan Africa, the need to store water arises due to challenges associated with both the availability and reliability of water sources. The literature reviewed (Adedayo and Mari, 2008; Efe, 2006; Sule *et al*., 2013; Nuwagaba and Namanya, 2016) explores the existing research on domestic water sources, household attitudes toward water storage facilities, and the socio-economic and environmental factors influencing water management in urban contexts.

Domestic Water Sources in Urban Areas

Urban water supply systems in many developing countries face numerous challenges, including rapid population growth, aging infrastructure, and the impacts of climate change. Research highlights that domestic water sources in urban areas like Sokoto Metropolis are diverse, ranging from public piped water, boreholes, wells, and rainwater harvesting to water purchased from vendors (Sule *et al*., 2013). Studies in similar contexts (Adekunle, *et al*., 2007; ademuliyi and Odugbesan, 2008 and Agboola & Agunbiade, 2018) emphasize that households often rely on multiple water sources to cope with the inconsistent supply from municipal systems (UNICEF, 2015). In Nigeria, research indicates that access to clean and reliable water varies significantly depending on socio-economic status, location, and the availability of infrastructure (Ademiluyi & Odugbesan, 2008).

Water Storage Practices and Household Attitudes

Water storage practices are a common coping strategy in urban areas where water supply is unreliable or intermittent. Literature indicates that households' attitudes toward water storage facilities are influenced by a range of factors, including perceptions of water quality, storage capacity, and ease of access (Kanyoka *et al*., 2008). In many parts of Africa, traditional water storage methods, such as clay pots and metal drums, coexist with modern storage solutions like plastic tanks and cisterns. These choices are often shaped by cultural preferences, cost, and space availability (Van der Merwe *et al*., 2019).

In Sokoto Metropolis, where the climate is semi-arid, and water scarcity is exacerbated by long dry seasons, storing water becomes a critical household strategy. Research conducted in similar urban settings reveals that households prioritize storage solutions that can mitigate the risks of inconsistent water supply, ensuring that basic needs such as drinking, cooking, and hygiene are met even during water shortages (Onemayin & Ogunbode, 2015).

Factors Influencing Water Storage Choices

Several factors have been identified in the literature as determinants of household attitudes toward water storage facilities in urban areas (World Bank, 2018, Sokoto State water Board, 2020, Yakubu and Musa, 2020, Efe, 2006 and Fedral Ministry of Water Resources, 2018). These factors can be broadly categorized into socio-economic, cultural, and environmental influences:

Socio-economic Factors: Income level, education, and household size are significant determinants of water storage behavior. Wealthier households tend to invest in more sophisticated storage facilities, such as large-capacity plastic tanks, while lower-income families may rely on affordable and accessible options, such as clay pots or metal containers (Kanda *et al*., 2016). Education also plays a role, as households with higher education levels may have better awareness of safe storage practices and the health risks associated with improper water storage.

Cultural Factors: Cultural norms and traditions influence how households perceive and use water storage facilities. In some communities, traditional storage methods are preferred due to their familiarity and perceived benefits, such as keeping water cool. However, modernization and urbanization often introduce new practices that may clash with or replace traditional methods (Nuwagaba & Namanya, 2016).

Environmental Factors: The local climate, water availability, and quality play a crucial role in shaping water storage practices. In semi-arid regions like Sokoto, where water scarcity is a recurring issue, the need to store water for longer periods during dry seasons influences the choice of storage

facility. Studies such as Kande, et al., (2016) and Sule et al., (2013) suggest that in areas with poor water quality, households may invest in storage solutions that can maintain or improve water safety, such as covered tanks or containers with filtration systems (WHO, 2017).

The literature underscores the complexity of water storage behavior in urban areas, influenced by a web of socio-economic, cultural, and environmental factors. While various studies have documented water storage practices in similar contexts, there is a need for localized research that focuses on the specific challenges and perspectives of households in Sokoto Metropolis. This study seeks to contribute to the existing body of knowledge by providing a nuanced understanding of the motivations, challenges, and adaptive strategies of urban households regarding water storage, with implications for policy and sustainable water management in the region.

Aim of the Research

The aim of this research is to explore the domestic water sources and understand the factors influencing urban household attitudes towards water storage facilities in Sokoto Metropolis, Northwestern Nigeria. The study seeks to provide insights that can inform effective water management policies and promote sustainable water use in the urban context.

Objectives of the Research

The main objectives of this research are to:

- **i.** identify the primary domestic water sources used by urban households in Sokoto Metropolis and assess their reliability, accessibility, and perceived quality
- **ii.** examine the attitudes of urban households towards different types of water storage facilities, including traditional, modern, and makeshift options
- **iii.** investigate the socio-economic, cultural, and environmental factors that influence household decisions regarding water storage facilities in the study area.

The Study Area

Sokoto Metropolis, the capital of Sokoto State, is situated in the northwestern region of Nigeria. It is part of the semi-arid Sahelian belt, characterized by a hot and dry climate, with a brief rainy season and a longer dry season (Adedayo and Mari, 2008; Okonkwo and Akpabio, 2008). The Metropolis lies approximately between Latitude 13°01' and 13°06' N and Longitude 5°13' and 5°20' E (Figure 1), covering a considerable urban area that serves as a central hub for commerce, education, and administration in Northwestern Nigeria (Nwakwoala and Mmom, 2007). The climate in Sokoto is predominantly hot, with temperatures ranging from an average of 22°C (72°F) during the cooler months to over 40°C (104°F) in the peak of the dry season (Schmidt, 2014). Rainfall is highly seasonal, occurring mostly between June and September, with annual precipitation averaging around 500 to 700 millimeters (Dawodu and Akinola, 2019). The dry season spans from October to May, characterized by the dry, dusty Harmattan winds that blow from the Sahara Desert. The topography of Sokoto Metropolis is generally flat, with gentle undulations and scattered rocky outcrops. The region's soil is mostly sandy, with low water retention capacity, which can impact the recharge of groundwater resources. The river system in the area is dominated by the Sokoto River, a seasonal watercourse that is part of the larger Niger River Basin, but water levels are highly variable throughout the year. The vegetation in Sokoto Metropolis is primarily savannah, consisting of sparse grasses, shrubs, and drought-resistant trees, which reflect the semi-arid climate. Water resources are a critical concern due to the limited and erratic rainfall (Agboola and Agunbiado, 2018), making

water storage facilities an essential strategy for urban households to cope with fluctuations in water availability.

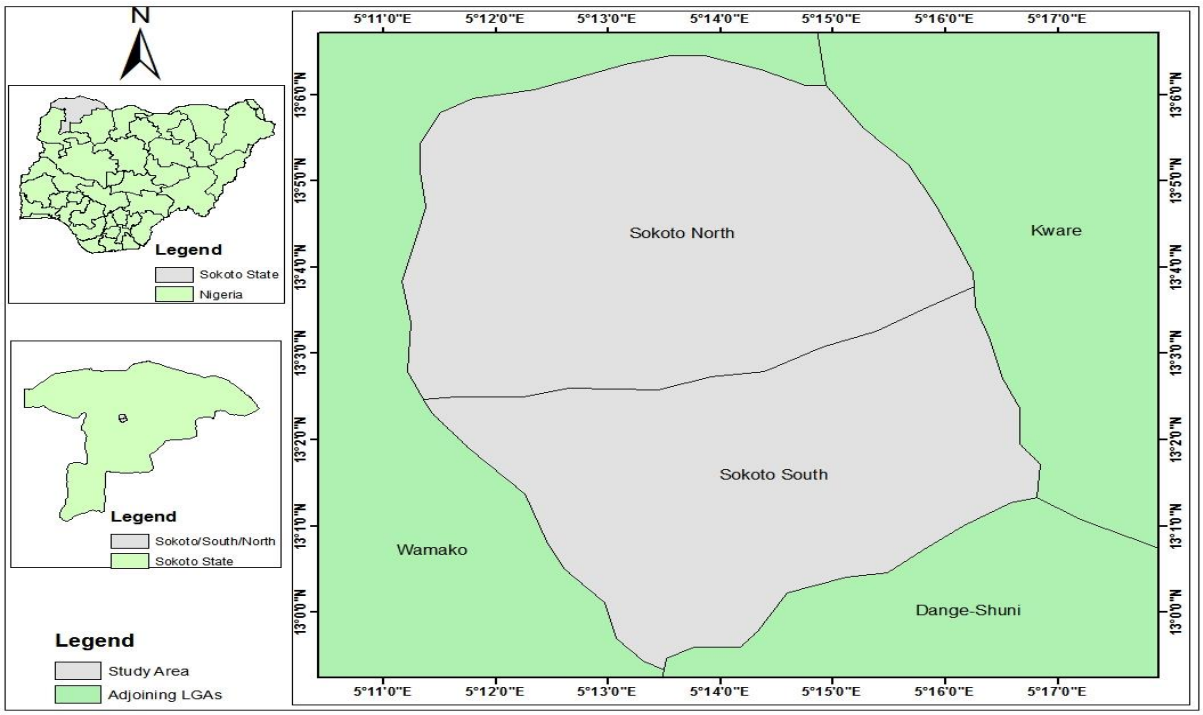

Figure 1: The Study Area
Source: Generated from the GIS Laboratory, UDUS, Sokoto (2024)

Sokoto Metropolis is divided into various neighborhoods, each with distinct social and economic characteristics, influencing how residents access and manage water resources. According to the National Bureau of Statistics (NBS) (2016) the Sokoto urban area is rapidly expanding, with an increasing population putting pressure on existing infrastructure, including water supply systems. This geographical context, with its unique climatic, topographical, and socio-economic features, forms the backdrop for studying domestic water sources and water storage practices among urban households in the region.

Materials and Methods

The materials and methods section outlines the research design, study area, data collection, sampling techniques, and data analysis methods used to explore the domestic water sources and factors influencing urban household attitudes towards water storage facilities in Sokoto Metropolis, Northwestern Nigeria. This study employs a qualitative research approach to provide in-depth insights into the lived experiences of urban households and the contextual factors affecting their water storage practices.

Research Design

This study uses a qualitative research design, focusing on the exploration of attitudes, behaviors, and perceptions of urban households regarding water storage. The qualitative approach is chosen to capture the complexities of household water management in Sokoto Metropolis, where socio-

economic, cultural, and environmental factors intersect. Semi-structured interviews, focus group discussions, and direct observations are employed as the primary methods of data collection to gather detailed and context-specific information.

Study Population

The target population for this study includes urban households residing in Sokoto Metropolis. The study focuses on household heads and primary water managers within each household, as they are the key decision-makers regarding water collection, storage, and management. Participants are drawn from a variety of socio-economic backgrounds to ensure a broad understanding of the factors influencing water storage practices across different segments of the population.

Sampling Techniques

A purposive sampling technique is used to select participants for the study. This non-probability sampling method is chosen to deliberately target households that are likely to provide rich and relevant information on the topic. The criteria for selecting households include: Households with varied access to domestic water sources (e.g., public taps, boreholes, wells, vendors). Households using different types of water storage facilities in the study area (e.g., traditional clay pots, plastic tanks and metal containers). Representation from different socio-economic groups and neighborhoods within Sokoto Metropolis. A total of 40 households are targeted for in-depth semi-structured interviews, while additional data is gathered through 3 focus group discussions with 8 participants each, allowing for triangulation and validation of findings.

Data Collection Methods

Semi-Structured Interviews: Semi-structured interviews are conducted with household heads or primary water managers to gain insights into their experiences, attitudes, and motivations regarding water storage. An interview guide is developed, covering topics such as: Access to and reliability of domestic water sources. Types of water storage facilities used and reasons for choosing them. Perceptions of water quality and safety, the challenges faced in storing and managing water and socio-economic and cultural factors influencing water storage decisions.

Focus Group Discussions (FGDs): Three (3) Focus group discussions were held with groups of residents from different neighborhoods to facilitate collective exploration of attitudes and practices related to water storage. FGDs were used to capture a broader range of perspectives and to observe group dynamics that may influence water management decisions. A focus group discussion guide, similar to the interview guide, is used to steer the conversation, focusing on common themes, shared challenges, and community-level coping strategies.

Direct Observations: Direct observations are carried out to validate self-reported data from interviews and focus groups. Observations focus on the physical state of water storage facilities, the location of water sources, and the general water management practices within households. This method helps in capturing real-life practices that may not be fully articulated during interviews or focus group discussions.

Data Analysis: The data collected from interviews, focus group discussions, and observations are analyzed using thematic analysis. Thematic analysis involves identifying, coding, and categorizing key themes and patterns that emerge from the data. The analysis process includes the following steps:

1. **Transcription**: All audio recordings from interviews and focus group discussions are transcribed verbatim to ensure accuracy in data representation.
2. **Coding**: The transcripts are systematically coded to highlight recurring themes, sub-themes, and patterns related to household water sources and storage practices.
3. **Categorization**: Codes are grouped into categories reflecting broader themes, such as socio-economic factors, cultural influences, environmental challenges, perceptions of water quality, and motivations for choosing specific storage facilities.
4. **Interpretation**: The themes are interpreted to understand the underlying factors shaping household attitudes toward water storage and to identify any correlations between socio-economic status, cultural norms, and water management behavior.

Ethical Considerations

Ethical approval for the study was obtained from the relevant authorities (Sokoto State Water Board Authorities) and research ethics committee, ensuring that the research adheres to ethical guidelines. Key ethical considerations include: **Informed Consent:** Participants are fully informed about the study's purpose, procedures, potential risks, and benefits. Informed consent was obtained in writing before participation. **Confidentiality:** Participants' identities and responses are kept confidential, and pseudonyms are used in data analysis and reporting to protect privacy. **Voluntary Participation**: Participation in the study is voluntary, and participants have the right to withdraw at any point without any consequences. **Cultural Sensitivity**: The research is conducted with respect for local cultural practices, norms, and values, ensuring that questions and interactions are culturally appropriate.

Limitations of the Study

The study's reliance on a purposive sampling method may limit the generalizability of findings to other urban areas with different socio-economic and cultural contexts. Additionally, qualitative research is inherently interpretative, which means that the analysis may be influenced by the researcher's perspective. Efforts are made to minimize bias through rigorous data triangulation and validation methods.

Results

This section presents the key findings from the qualitative research on domestic water sources and the factors influencing urban household attitudes toward water storage facilities in Sokoto Metropolis, Northwestern Nigeria. The results are organized around the main themes that emerged from the analysis of interviews, focus group discussions, and direct observations, followed by a discussion that interprets these findings in light of existing literature and the local context.

Domestic Water Sources in Sokoto Metropolis

The research identified a variety of water sources that urban households in Sokoto Metropolis rely on for their domestic needs. The main sources are:

Public Tap Water: Municipal tap water is a significant source, but many households reported that the supply is inconsistent and often unreliable, especially during the dry season. The quality of tap water is also a concern, with some households indicating a preference for alternative sources due to doubts about cleanliness and safety. Public tap water is widely regarded as the official municipal water supply; however, its coverage is uneven, with better availability in more developed neighborhoods compared to peripheral and low income areas. Many households reported that they

had access to public tap water only a few times a week, while others particularly in low income or informal settlements, lacked direct access and depended on neighbors or public standpipes. The reliability of the public water supply emerged as a major concern. Supply interruptions forced households to seek alternative sources, such as boreholes or water vendors.

Boreholes and Wells: Private and community boreholes, as well as traditional wells, are commonly used by households. These sources are often seen as more reliable than municipal supply, particularly in neighborhoods where access to public water is limited. However, the depth and water quality of boreholes and wells can vary, affecting their acceptability. Boreholes were reported as a common water source, particularly among the middle and high-income households and institutions such as schools, mosques and businesses. They provide a reliable supply of water compared to the inconsistent public tap water system. Although boreholes were considered a more reliable household water sources, however, households often faced long queues and occasional mechanical breakdowns which disrupted their water access.

Water Vendors: In areas where access to piped water is scarce or unreliable, households frequently purchase water from local vendors. This source is convenient but relatively expensive, making it less accessible to low-income households.

Rainwater Harvesting: Rain water harvesting emerged as a supplementary water source for households in Sokoto Metropolis, particularly during rainy season. A few households practice rainwater harvesting, especially during the short rainy season, to supplement other water sources. However, rainwater collection is often limited by storage capacity and the seasonal nature of rainfall. Rainwater harvesting was primarily practiced by households in areas with limited access to municipal tap water or boreholes. It was more common among low-income and middle income households who relied on it as a cost-effective alternative during rainy season. The most common methods involved the use of rooftops to channel rainwater into storage containers, such as plastics barrels, clay pots and metal drums. Some of the challenges faced with rainwater harvesting are its unreliability throughout the year. Rainwater harvesting is limited to only the rainy season which is approximately 4 to 5 months in Sokoto

Types of Water Storage Facilities Used

Households in Sokoto Metropolis utilize a range of water storage facilities to ensure they have adequate water during periods of supply disruption. The types of storage facilities include:

Plastic Tanks: These are the most popular storage facilities, particularly among middle and upper-income households. They provide a large storage capacity, are durable, and are often equipped with covers to protect water from contamination.

Metal/Rubber Drums and Containers: Metal and Rubber drums are commonly used by lower-income households due to their affordability. However, Metal tanks are prone to rusting and may not be as hygienic as plastic tanks if not properly maintained.

Traditional Clay Pots: In some neighborhoods, traditional clay pots are still in use. These pots are favored for their ability to keep water cool, which is especially valued in Sokoto's hot climate. However, their storage capacity is limited, and they are more vulnerable to contamination if not covered.

Buckets and Jerry Cans: Buckets and jerry cans are widely used for short-term storage, particularly for fetching water from communal sources or vendors. They are affordable but offer limited capacity and require frequent refilling.

Factors Influencing Household Attitudes toward Water Storage

The study identified several key factors that shape household attitudes toward water storage facilities:

Socio-Economic Factors

Economic status significantly influences the choice of water storage facilities. Higher-income households tend to invest in modern storage solutions like large-capacity plastic tanks due to their durability, convenience, and ability to store large amounts of water. In contrast, lower-income households often rely on more affordable options like metal drums or traditional clay pots, which may require frequent cleaning and maintenance to ensure safe water storage. Here is an excerpt from an FGD conducted.

"The High cost of storage facilities such as Overhead tank, large rubber tanks has compelled us to be using our traditional clay pots that are cheap and easily accessible for us to buy".

Household size also plays a role, with larger households more likely to invest in bigger storage facilities to meet higher water consumption needs. Additionally, households with better education levels displayed greater awareness of safe storage practices and the risks of contamination.

Perceptions of Water Quality and Safety

Perceptions of water quality are a major determinant of water storage behavior. Many households expressed concerns about the safety of municipal tap water, leading them to store water for longer periods or use multiple filtration methods before storage. The presence of visible contaminants, bad odors, or unusual taste often prompted households to seek alternative sources and invest in more secure storage solutions. For households using boreholes or wells, the perceived purity of the water reduced concerns about storage conditions. However, some households still preferred to use covered storage containers to minimize the risk of contamination.

Cultural and Traditional Influences

Cultural practices continue to influence water storage choices in Sokoto Metropolis. Traditional clay pots are still popular among some households, not only for their practical cooling benefits but also due to their familiarity and cultural acceptance. However, modernization and urbanization have led to a gradual shift, with many households transitioning to modern storage solutions as they become more affordable and accessible. Cultural beliefs around water purity and the role of specific storage methods in maintaining water safety were highlighted in focus group discussions, indicating a blend of traditional knowledge and modern practices in water management.

Environmental Factors

Environmental conditions, particularly the semi-arid climate and seasonal rainfall, significantly impact water storage practices. The long dry season and unpredictable rain patterns make it essential for households to store enough water to last through periods of scarcity. Households reported storing more water during the dry season, using larger containers to avoid running out of water when supply

is unreliable. The harsh climate also influenced the choice of storage materials, with plastic tanks preferred for their resistance to high temperatures and durability.

Challenges in Water Storage

Households in Sokoto Metropolis face several challenges related to water storage, including: High Cost of Modern Storage Facilities: The cost of purchasing and installing large-capacity plastic tanks is a barrier for many low-income households, limiting their access to secure and convenient storage options. Water Contamination Risks: Poor maintenance of storage containers, lack of proper covers, and infrequent cleaning were observed as common issues, increasing the risk of water contamination and health problems. Space Constraints: Urban households, particularly in densely populated neighborhoods, often face space limitations, affecting their ability to install larger storage facilities. Fluctuating Water Supply: The unpredictable nature of water supply, especially during the dry season, complicates storage practices and forces households to adapt their strategies frequently.

Discussions

The findings of this study underscore the complexity of water management in urban areas facing water scarcity and unreliable supply. The diversity of water sources and storage practices in Sokoto Metropolis reflects a combination of socio-economic, cultural, and environmental factors, each playing a significant role in shaping household decisions. These results align with previous research, which highlights that urban households often adopt a range of adaptive strategies to ensure water security, depending on their specific circumstances.

The preference for plastic tanks among higher-income households suggests that economic factors are a major driver of storage choices, supporting findings from studies in similar contexts that emphasize the role of income in access to modern storage solutions. The continued use of traditional clay pots among some households also highlights the persistence of cultural practices, indicating that modernization does not completely displace traditional water management methods but rather coexists with them. In a one of the FGDs conducted, here is an excerpt from one of the respondents.

"We are still using our traditional clay pots to store our water because it gives you a cooling system that is healthier and harmful free, compared to cold water stored in a fridge which sometimes lead to cold associated ailments".

The challenges identified in this study, such as the cost of modern storage facilities and risks of contamination, point to the need for targeted interventions to support households in managing water more effectively. These could include subsidies for secure storage options, community education on safe storage practices, and improvements to the municipal water supply to reduce the dependence on storage.

The study provides a nuanced understanding of the domestic water sources and factors influencing water storage practices in Sokoto Metropolis. It highlights the adaptive strategies that households employ to navigate the challenges of water scarcity, underscoring the importance of considering local contexts in urban water management policies. The findings suggest that a combination of improved infrastructure, targeted support for low-income households, and culturally appropriate interventions is necessary to enhance water security in the region.

Conclusion and Recommendations

The study concludes that household water management in Sokoto Metropolis is a complex interplay of socio-economic, cultural, and environmental factors. Despite the rapid urbanization and modernization of water infrastructure, many households continue to rely on traditional practices due to financial constraints and cultural preferences. The semi-arid climate of Sokoto, combined with the inconsistent municipal water supply, forces households to adapt their storage practices to ensure that their domestic water needs are met throughout the year. The persistence of traditional water storage practices alongside modern solutions indicates that water management in Sokoto is a dynamic process that requires context-sensitive approaches. Effective interventions must take into account the diverse needs and preferences of urban households, particularly in neighborhoods where water scarcity and socio-economic disparities are pronounced. Ensuring access to reliable and safe water in urban areas like Sokoto requires a multi-faceted approach that addresses infrastructure gaps, economic challenges and public health concerns.

Based on the findings and conclusions of the study, the following recommendations are made to improve water security and household water management in Sokoto Metropolis**:**

1. Improve Municipal Water Infrastructure: The government and local authorities should prioritize upgrading the municipal water infrastructure to ensure a more consistent and reliable water supply. Efforts should focus on increasing the coverage and reliability of the public tap water system, particularly in underserved neighbour hoods and implementing measures to improve water quality at the source to build public trust in municipal water.
2. Promote Affordable and Safe Storage Solutions: To address economic constraints, there is a need to promote affordable and safe storage options for lower-income households. This could include: Subsidizing the cost of modern water storage tanks for low-income families to make them more accessible. Encouraging the use of hygienic and covered containers for short-term storage, accompanied by training on safe water handling practices.
3. Educate Households on Safe Water Storage Practices: Public health education campaigns should be launched to raise awareness of the risks of water contamination and the importance of safe storage practices. These campaigns should be culturally sensitive and consider local traditions, emphasizing:
4. Encourage Sustainable and Culturally Appropriate Practices: Programs aimed at improving household water storage should respect cultural traditions while encouraging the adoption of more efficient methods. This could involve: Collaborating with community leaders to promote sustainable practices that blend traditional and modern techniques. Providing training on how to modify traditional storage methods to enhance safety and efficiency.

References

Adedayo, A. & Mari, F. (2008). Water Management Practices in Urban Nigeria: Evidence from Kaduna City. *Journal of Environmental Planning and Management*, 51(4), 499-509. https://doi.org/10.1080/09640560802117085.

Adekunle, A., Adetunji, M. & Oguntoke, O. (2007). Assessment of Groundwater Quality in a Typical Rural Settlement in Southwest Nigeria. *International Journal of Environmental Public Health*, 4(4), 307-318. https://doi.org/10.3390/ijerph2007040403.

Ademiluyi, I. A. & Odugbesan, J. A. (2008). Sustainability and Impact of Community Water Supply and Sanitation Programmes in Nigeria. *Journal of Sustainable Development in Africa*, 10(3), 46-54.

Agboola, O. & Agunbiade, E. (2018). Challenges and Opportunities in Urban Water Supply Management: Insights from Lagos, Nigeria. *Urban Water Journal*, 15(6), 584-593. https://doi.org/10.1080/1573062X.2019.1567352.

Dawodu, A. M. & Akinola, F. O. (2019). Water Scarcity and Its Socio-economic Impact in Semi-arid Northern Nigeria. *African Journal of Environmental Science and Technology*, 13(3), 120-131. https://doi.org/10.5897/AJEST2019.2736.

Efe, S. I. (2006). Quality of Rainwater Harvesting for Domestic Consumption in the Niger Delta, Nigeria. *Environmentalist*, 26(3), 175-181. https://doi.org/10.1007/s10669-006-7825-x.

Federal Ministry of Water Resources. (2018). *National Water Policy*. Abuja, Nigeria: Federal Government of Nigeria.

Gandy, M. (2008). Landscapes of Disaster: Water, Modernity and Urban Fragmentation in Lagos. *Environment and Planning A*, 40(1), 100-114. https://doi.org/10.1068/a39111.

Gleick, P. H. (1996). Basic Water Requirements for Human Activities: Meeting Basic Needs. *Water International*, 21(2), 83-92. https://doi.org/10.1080/02508069608686494.

Kanda, E., Van der Zaag, P. & Gumbo, B. (2016). Factors Influencing Households' Water-Saving and Water-Storing Behaviour in Harare. Physics and Chemistry of the Earth, Parts, A/B/C, 92, 127-135.

Kanyoka, P., Farolfi, S. & Morardet, S. (2008). *Households' Preferences and Willingness to Pay for Multiple-Use Water Services in Rural Areas of South Africa*. Water SA, 34(6), 715-720.

Kar, K. & Chambers, R. (2008). *Handbook on Community-Led Total Sanitation*. Institute of Development Studies.

Mmom, P. C. & Mmom, F. D. (2011). Assessing Rural Water Supply in Nigeria: The Need for a Paradigm Shift. *Journal of Sustainable Development in Africa*, 13(1), 1-15.

National Bureau of Statistics. (2016). *Annual Abstract of Statistics*. Abuja, Nigeria: NBS.

Nuwagaba, A. & Namanya, J. (2016). *Household Water Security in a Peril-Urban Area*: A Case Study from Uganda. Urban Forum, 27(3), 351-368.

Nwankwoala, H. O. & Mmom, P. C. (2007). Groundwater Utilization in Port Harcourt, Nigeria: Challenges and Sustainability. *Journal of Sustainable Development in Africa*, 9(3), 143-155.

Okonkwo, E. & Akpabio, E. (2008). Water Governance and Institutional Changes in the Nigerian Water Sector. *Water Resources Development*, 24(4), 669-689. https://doi.org/10.1080/07900620801923222.

Onemayin, O. S. & Ogunbode, A. M. (2015). Coping with Water Scarcity in Nigeria: An Analysis of the Household Water Management Strategies in Ilorin Metropolis. *Journal of Water, Sanitation and Hygiene for Development*, 5(3), 340-350.

Schmidt, W. P. (2014). The Potential of Water Storage for Water Supply Improvement in Rural Areas: A Case Study from Africa. *Water Policy*, 16(5), 946-960.

Sokoto State Water Board. (2020). *Annual Report on Water Supply in Sokoto Metropolis*. Sokoto, Nigeria: Sokoto State Government.

Sule, B. F., Alabi, A. & Abdulraheem, M. I. (2013). Assessment of the Bacteriological Quality of Drinking Water in Nigeria. *African Journal of Microbiology Research*, 7(29), 3774-3779.

Tadesse, M., Bosona, T. & Gebresenbet, G. (2013). Rural Water Supply Management and Sustainability: The Case of Adama Area, Ethiopia. *Journal of Water Resource and Protection*, 5(2), 208-221. https://doi.org/10.4236/jwarp.2013.52021.

UNICEF. (2015). Water, Sanitation and Hygiene (WASH) in Nigeria: Strategic Framework. Abuja, Nigeria: UNICEF Nigeria.

United Nations Development Programme. (2006). *Human Development Report 2006: Beyond Scarcity-Power, Poverty and the Global Water Crisis*. New York, NY: UNDP.

Van der Merwe, J., Du Plessis, J. A. & Strydom, H. A. (2019). Urban Water Security in Africa: Case Studies of Gaborone and Francistown in Botswana. *Journal of Environmental Planning and Management*, 62(8), 1447-1465

World Bank. (2018). *Water and Sanitation Program: Connecting Urban Households to Improved Water Services*. Washington, DC: World Bank.

World Health Organization. (2017). *Guidelines for Drinking-Water Quality (4th Ed.)*. Geneva, Switzerland: WHO.

World Health Organization. (2017). *Guidelines for Drinking-Water Quality: First Addendum to the Fourth Edition*. WHO.

Yakubu, A. & Musa, H. A. (2020). Urban Water Supply Challenges and the Need for Sustainable Solutions in Northern Nigeria. *Journal of Environmental Management*, 25(2), 210-221. https://doi.org/10.1007/s10669-020-7500-x.