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Water Tariff Structures and Access to Clean Water. A Case Study of Lira City, Uganda

Acen Vicky[1,2], Anthony M Olyanga[1], Muhire Francis[1]

[1]Faculty of Economics, Energy and Management Sciences Makerere University Business School, Plot 21A New Portbell Road, Kampala, Uganda

[2]Wáter Utility Regulation Department Ministry of Water and Environment, Portbell Road, Kampala, Uganda

ABSTRACT: This study investigates the influence of water tariffs, willingness to pay, and household income on access to clean water in Lira City, Uganda. A mixed-method approach was employed, utilizing both quantitative and qualitative data collection methods. The Quantitative data was gathered through a structured questionnaire survey, while qualitative insights were obtained from focus group discussions (FGDs) and key informant interviews. The questionnaire survey captured responses from a diverse cross-section of households, assessing their perceptions of water pricing, accessibility, and service quality. FGDs and key informant interviews provided in-depth perspectives from community leaders, public stand or yard tap attendants, and water management committee members, enriching the understanding of the contextual dynamics influencing water access. The findings reveal a significant relationship between water tariff levels and access to clean water, with affordability of water tariffs emerging as a critical factor. While the majority of households found current tariffs manageable, a substantial portion reported difficulties in affording water services, particularly among lower-income groups. The study also highlights a strong willingness among residents to pay more for reliable and higher-quality water services, dependent on improved proximity and quality service. These results highlight the importance of policy interventions that include targeted subsidies to improve water accessibility for vulnerable populations and enhance efficiency in service delivery. They also emphasize the necessity for strong regulatory frameworks, increased transparency, and active community participation in the tariff determination processes, which will help reduce inequalities.

KEYWORDS: Water Tariff, Water Access, Lira, Uganda

1. INTRODUCTION

Globally, water accessibility remains critical to achieving broader sustainable development goals (United Nations, 2015). Recognized as a fundamental human right, clean water is essential for basic survival and underpins various aspects of development, including health, education, and economic prosperity (United Nations, 2015). The United Nations' Sustainable Development Goal 6 (SDG 6) outlines a clear agenda for universal access to clean water and sanitation by 2030, reflecting a global commitment to addressing water-related challenges (United Nations, 2015). Achieving this goal requires ensuring clean water availability and tackling factors like affordability, infrastructure development, and policy effectiveness. (Biswas, 2008; Hutton & Varughese, 2016). Despite significant progress, disparities persist, with over 2.2 billion people worldwide lacking access to safe drinking water. (WHO, 2019). This enduring challenge emphasizes the need for comprehensive approaches that include affordability, sustainability, and policy coherence. (Biswas, 2008; Hutton & Varughese, 2016).

Water tariffs are the costs consumers pay for water services, influencing access to clean water, particularly in economically diverse areas. Affordability relates to households' ability to pay for water services without trading off other basic needs (Boland & Whittington, 2000). High water tariffs can restrict access for low-income households, leading to inequalities. While willingness to pay measures the extent to which consumers are prepared to pay for improved water services. It reflects the perceived value of water services and can be influenced by factors such as income levels, service quality, and cultural attitudes towards water (Whittington et al., 1990).

In Uganda, the quest for water accessibility is intricately linked to national policies, institutional frameworks, and socio-economic factors. The country has achieved notable progress in enhancing access to clean water, particularly for low-income households, through policies such as the pro-poor strategy for the Water and Sanitation Sector (2006). This strategy has facilitated the

establishment of public water points and yard taps with water tariffs set below the domestic rate in underserved areas. However, despite the progress made challenges persist, especially in terms of affordability and equitable access, as the low-income households have continued to pay a water tariff higher than the domestic tariffs due to an extra fee imposed by the public water point attendants (World Bank, 2020).

The Northern Region of Uganda, specifically Lira City, has various water system technologies, which include; boreholes, and piped water systems managed by the National Water and Sewerage Corporation (NWSC). This diverse landscape of water provision highlights the necessity for a comprehensive and integrated approach to water management, ensuring sustainable access to clean water for all residents of Lira City (Lira City Council, 2022). Initiatives have been undertaken to improve water supply infrastructure through the construction, rehabilitation, and expansion of water distribution networks in Lira city. However, challenges such as vulnerability to climate change and pollution persist, affecting water quality and availability. (World Bank, 2020). The existing water tariff structure, designed for cost recovery, may disproportionately burden low-income communities in Lira City, further restricting their access to clean water (Lira City Council, 2022; NWSC, 2023). As a result of affordability constraints, residents may be compelled to rely on unreliable and potentially unsafe alternative water sources, thereby exposing themselves to heightened health risks, particularly waterborne diseases (Hope & Rouse, 2019; WHO, 2019). Furthermore, limited clean water access may hinder economic productivity, educational attainment, and overall well-being, and as a result perpetuate the poverty cycle (GIZ, 2021).

While research existed on broader water management issues, a focused analysis specific to Lira City was lacking (Lira City Council, 2022). This study therefore focused on bridging this knowledge gap through a comprehensive examination of the relationship between water tariff structures and access to clean water in Lira City with the aim to inform policy adjustments and interventions for sustainable universal access to clean water in the region.

2. LITERATURE REVIEW

2.1 Theoretical Review

Theoretically, Boland and Kirkwood (2007) under the affordability curve indicate that as water prices rise, consumption patterns shift, potentially leading to reduced consumption, particularly among low-income households. Analyzing water tariffs through this lens sheds light on the potential for pricing mechanisms to act as a barrier to access, particularly for vulnerable groups who may struggle to afford even basic water needs. This necessitates considering the impact of different tariff structures, on household budgets and water consumption patterns. Additionally, economic theories of equity and efficiency can guide the development of policies that influence tariff determination therefore balancing cost recovery with affordability, ensuring that everyone has access to safe and reliable water.

In addition, the Governance theories, proposed by Ostrom (1990), emphasize the critical role of institutional frameworks and policy decisions in shaping water management and distribution. These frameworks highlight the importance of transparency, accountability, and participation in decision-making processes, to ensure equitable access to essential resources like water. Examining the governance structures surrounding water management, including the role of government agencies, and community organizations, is crucial. Studies like that of Hunter et al,. (2017) in South Africa, revealed opaque decision-making processes behind tariff increases, demonstrate the potential for power imbalances and inequitable outcomes. Ensuring transparency and incorporating community voices in decision-making processes can lead to more inclusive and sustainable water management practices. Additionally, governance theories can guide the development of participatory and inclusive water management practices that empower communities to have a say in decisions that affect their access to water.

The Environmental justice frameworks championed by Walker and Day (2008) shed crucial light on the systemic inequalities embedded within water access issues. These frameworks argue that environmental burdens, including inadequate access to essential resources like water, are disproportionately distributed across populations, often affecting marginalized communities the most. Analyzing access to clean water through this lens necessitates investigating how geographical, social, and economic inequalities shape water distribution patterns, resource allocation, and decision-making processes. This framework encourages researchers to recognize and address the potential impact of water tariff structures and governance practices on existing inequities, particularly affecting low-income households, women, and other marginalized groups.

In a nut shell, increasing water prices can disproportionately impact low-income households, necessitating the establishment of affordable tariff structures. This can be achieved through robust regulatory frameworks, enhanced transparency, and active community involvement in the tariff determination processes, which will help mitigate inequalities in access to water services.

2.2 Empirical Review of Literature

Water tariff structures across the globe exist within a complex landscape of possibilities. A review by the World Bank (2016) identifies common structures like flat fees, block tariffs (with prices increasing as consumption rises), and progressive tariffs (where higher rates apply to larger water users). Flat fees, while seemingly egalitarian, can disproportionately burden low-income households with fixed costs, while block tariffs, as demonstrated by Hunter et al,. (2017) can incentivize reduced consumption or reliance on unsafe alternatives for those struggling to afford higher tiers. Progressive tariffs, though potentially more equitable, require robust metering infrastructure and transparent billing practices, which can be challenging in certain contexts. Beyond the types and levels of tariffs lies the regulatory framework governing water pricing. The regulatory framework governing water pricing plays a crucial role in ensuring transparency, accountability, and ultimately, equitable access. Johnson's (2020) investigation underscores the importance of regulations that prevent arbitrary price hikes or discriminatory practices. This includes establishing clear guidelines for tariff setting, public participation in decision-making processes, and effective mechanisms for grievance redress. Studies by Smith et al, (2019) highlight how regulations can shape the quality and availability of water services, influencing whether tariffs effectively fulfill their revenue generation and development goals. It is also important to note that water tariff structures play a vital role in the development and maintenance of water infrastructure. Studies by Smith et al, (2019), demonstrate that tariff levels directly affect the quality and availability of water services. Insufficient revenue can lead to deferred maintenance and poor service delivery, disproportionately affecting vulnerable communities. Analyzing how tariff structures incentivize investment and ensure the long-term sustainability of water services is critical for promoting equitable access. Furthermore, the concept of dynamic pricing, explored by Wang and Zhang (2017), introduces a new dimension to the conversation. This approach suggests adjusting tariffs based on real-time water availability, demand fluctuations, and even environmental factors. While promising in its potential to promote efficient water use and cost recovery, implementing dynamic pricing requires sophisticated technology, robust data collection systems, and a high degree of public trust.

The willingness to pay for improved water services, while crucial for sustainable water management, is not a static concept. Brown and Jones' (2020) research aptly points out the temporal dimension of this willingness, emphasizing that individual attitudes and commitments can evolve. Factors like improved service delivery, personal experiences, changes in economic circumstances, and community engagement efforts can all influence residents' readiness to contribute financially to improved water provision (Brown and Jones; 2020). Understanding this temporal dimension allows us to design effective communication strategies and financial models that adapt to changing perceptions and encourage sustainable contributions to water services. By fostering trust and transparency in water management practices, ensuring service improvements are tangible and perceived as valuable, and creating opportunities for community participation in decision-making processes, we can cultivate a culture of sustained willingness to pay that contributes to long-term water security for all.

Research indicates that high-income households typically use more clean water than low-income households do. Chovves (2012) noted that a household's access to clean water is largely influenced by its socioeconomic status. According to Nyanza (2018), as well as studies by Basu et al. (2017) and Ahmad et al. (2016), income is a significant factor in determining water access. Haziq and Panesai (2017) found that in Kandahar, family income had a considerable impact on water usage. Low-income households often depend on government-supplied tap water and seek free sources due to financial constraints, which can jeopardize water quality. Gunatilake (2015) emphasized that price, income, and education are crucial factors influencing the demand for safe drinking water.

RQ1. What is the effect of water tariffs on the accessibility to clean water in Lira district?
RQ2. What is the effect of Willingness to pay for Water Services on Accessibility to Clean Water?
RQ3. How does Household income influence accessibility to clean water in Lira district?

3. METHODOLOGY

3.1 Research Design

The study utilized a mixed-method design, combining qualitative and quantitative approaches through a convergent parallel design. This included a cross-sectional survey and qualitative interviews (Creswell & Creswell, 2018). By leveraging the strengths of both data types, the research provided a comprehensive understanding of water tariff structures and access to clean water, fulfilling the study objectives. The qualitative data also captured crucial perspectives and behaviors that are essential for this study but could not be quantified.

3.2 Study Population

The study focused on 5,520 households in Lira City's Central division, affected by water accessibility issues. Based on the 2014 census, the estimated population in 2020 was approximately 27,600 (Lira District Local Government, 2020; UBOS, 2014). Although

exact household data was unavailable, using an average household size of 5 people suggested around 5,520 households (27,600 / 5). This figure is an estimate, and the actual number may vary. The study included four participant groups: water vendors and local community leaders for Focused Group Discussions (FGDs), and local authorities and technocrats involved in water management in Lira City for Key Informant Interviews (KIIs). However, reliable population estimates for these groups were not available.

3.3 Sample Size and Selection

The expected sample size for the survey was 316 households which was guided by recommendations from Cochran (1997) at a confidence level of 95% and an error margin of 5%. The chosen sample size of 316 households provided sufficient statistical power for robust data analysis and reliable conclusions about access to clean water in Lira City. The qualitative component involved a purposive sampling approach to target a total of 34 decision-makers and policy actors, which included; A Focused group of 16 Water Vendors and 16 community leaders, 2 technocrats from Lira City Council office.

Cluster random sampling, as suggested by Kish (1965) and Lohr (2010), enabled unbiased household selection and enhanced the generalizability of findings. The Lira Central division was organized into five administrative parishes, which served as clusters for randomly chosen households. This approach aimed to obtain a representative sample reflecting Lira City's diverse geographical and demographic characteristics. Additionally, purposive sampling, based on Patton (2002) and Creswell (2009), captured a wide range of perspectives, focusing on participants with relevant knowledge to enhance the study's internal validity.

3.4 Data Collection Methods

The study utilized both quantitative and qualitative data collection methods. Quantitative data was collected using a questionnaire survey, and qualitative data through key informant interviews and focus group discussions. The qualitative data captured perspectives and behavioral aspects that cannot be quantified and yet are vital to the study.

3.4.1 Questionnaire Survey

The questionnaire survey was used to collect responses on respondents' opinions and experiences on water tariff structures, and clean water accessibility. The rationale for the selection of this method was that it is inexpensive, time-saving, and allows easy analysis of results. Saris & Gallhofer, (2014), and it enabled the researcher to get responses from a relatively large population within a specified time limit.

3.4.2 Focus Group Discussion (FGD)

This study employed focus group discussions (FGDs) to gather data on water pricing and accessibility to clean water, engaging key stakeholders like water vendors and community leaders. FGDs facilitated an interactive platform for sharing experiences and insights. The semi-structured format allowed for both predefined questions and open discussions, aligning with the study's mixed-method approach to explore the complexities of local water issues. The qualitative data collected from these discussions enriched the understanding of factors influencing water pricing and accessibility.

3.4.3 Key Informant Interviews

The purpose of key informant interviews was to collect information from a wide range of people including community leaders, professionals, or residents who have first-hand knowledge about the sector or a community. These community experts, with their particular knowledge and understanding, provided insight into the nature of the subject matter and give relevant recommendations. These Interviews were conducted face-to-face by the researcher. A semi-structured interview guide of questions and probes was used, and an audio of each interview was recorded and transcribed verbatim.

3.5 Data Collection Tools

For this study, the questionnaire adopted a close-ended format, utilizing a 5-point Likert scale for measurement, where 5 indicates "strongly agree," 4 corresponds to "agree," 3 signifies "neutral", 2 represents "disagree," and 1 indicates "strongly disagree." This Likert scale enabled a nuanced assessment of respondents' perspectives on various statements. The questionnaire aimed to evaluate the extent to which participants agree or disagree with statements related to the study's focus, which thereby provided valuable insights into the magnitude of respondents' opinions and perceptions.

The focus group discussion (FGD) guide helped organize conversations with community leaders about water pricing and access to clean water. It aimed to gather detailed insights into their experiences and opinions through open-ended questions that encouraged discussion. Probing questions explored specific topics that emerged.

In the key informant interviews, The interviewer utilized a structured set of questions as a guide for the discussion. However, there was a strong emphasis on welcoming deviations from the guide to foster a more dynamic and engaging conversation. (Silverman,

2013). This approach allowed the interviewer to include additional questions about unexpected but relevant topics that arose during the conversation, while skipping sections that did not pertain to the participant or study.

3.6 Data Quality

To evaluate the content validity of the instruments, a formula known as the Content Validity Index (CVI) was employed, as proposed by Amin (2005). This process ensured that the research instruments, encompassing both quantitative and qualitative data collection tools, were robust and valid hence providing confidence in the accuracy and reliability of the findings.

A pilot test of the questionnaire was conducted to ensure accuracy, dependability, and the questionnaire's efficacy in data collection. To assess reliability, the study utilized the Cronbach Alpha Coefficient formula, as recommended by Amin (2005). The Cronbach alpha coefficient of 0.7 was obtained hence indicating reliability. The interpretation of the reliability results followed this guideline, which ensured that the study instruments were dependable and consistent in measuring the intended constructs.

The quality of the qualitative data collected was ensured through triangulation of audio recordings, peer debriefing, and member checking with the research assistants, which ensured the credibility and conformability of the findings.

3.7 Data Analysis

3.7.1 Quantitative data analysis

The quantitative data analysis of the study involved the use of Microsoft Excel to perform descriptive statistics and cross-tabulation analysis, providing insights into the relationships between water tariffs, willingness to pay, household income, and access to clean water in Lira City, Uganda. Descriptive statistics summarized the key characteristics of the dataset, including respondents' demographic profiles and their perceptions of water-related variables, using measures like frequency distributions, and relative percentages. This analysis revealed the extent to which households found water tariffs affordable and how these tariffs affected their access to clean water. Cross-tabulation analysis was employed to explore the relationships between categorical variables, such as income levels and perceptions of tariff affordability, uncovering significant patterns and associations across different subgroups.

3.7.2 Qualitative data Analysis

The qualitative data analysis for this study utilized the thematic framework analysis method, due to its suitability in analyzing textual data, specifically interview transcripts. This method enabled a comprehensive examination of themes across multiple cases hence facilitating the comparison and contrast of data while maintaining a contextual connection to individual or group perspectives (Gale et al., 2013). The analysis commenced after the completion of all interviews, with participants assigned numbers or pseudonyms for organizational purposes. The audio recordings were transcribed and read twice for familiarization before coding into themes, each with identified subthemes. A secondary coding scheme was established. To ensure consistency and reliability, a validation meeting was conducted to review the coded data.

4. RESULTS

4.1 Demographic Characteristics of Respondents

The demographic characteristics are summarized in Table 1 below, which reveals a diverse population within Lira City. A total of 316 respondents participated in the study, with a slight majority being female (55.38%). The most represented age group is 25-34 years (46.20%), indicating a predominantly young population. The educational attainment of respondents varies, with the majority having completed secondary education (32.28%), while a smaller portion has no formal education (7.59%). Employment status data shows that nearly half of the respondents are self-employed (44.94%), suggesting a high level of entrepreneurial activity or limited formal employment opportunities. Household sizes vary widely (1 to 20 members), with most households consisting of 3 members (19.62%).

Table 1: Demographic Distribution of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	175	55.38%
	Male	141	44.62%
Age groups	18-24	38	12.03%
	25-34	146	46.20%
	35-44	70	22.15%
	45-54	38	12.03%

	55-64	14	4.43%
	65 and above	10	3.16%
Location	Ireda east parish	76	24.05%
	Ireda west parish	48	15.19%
	Railway parish	60	18.99%
	Senior quarters parish	62	19.62%
	Te-obia parish	70	22.15%
Education level	Bachelor's degree	39	12.34%
	Master's degree	6	1.90%
	No formal education	24	7.59%
	Primary education	96	30.38%
	Secondary education	102	32.28%
	Vocational training	49	15.51%
Household size	1-5	204	64.56%
	6-10	94	29.75%
	11-15	16	5.06%
	16-20	2	0.63%
Primary water source	Borehole/well	73	23.10%
	Private (tap) Connection	78	24.68%
	Protected Spring	11	3.48%
	Public tap or Stand pipe	151	47.78%
	Rainwater harvesting	1	0.32%
	River/stream	2	0.63%
Household income (monthly)	Less than 100,000 UGX	54	17.09%
	100,000 - 300,000 UGX	119	37.66%
	300,001 - 500,000 UGX	78	24.68%
	500,001 - 1,000,000 UGX	45	14.24%
	More than 1,000,000 UGX	20	6.33%

Source; Compiled by Author

4.1.1 Water Source and Access

The quantitative data indicates that the most common primary water sources for households in Lira City are public taps or standpipes (47.82%), followed by private tap connections (24.68%) and boreholes/wells (23.10%). These statistics reflect a heavy reliance on communal water points, which is consistent with qualitative findings from both FGDs and KIIs. Participants emphasized that communal sources are often preferred due to the high costs associated with private connections, particularly among lower-income households. For example, one water vendor noted, "Many households prefer public taps because they can't afford the installation and monthly fees of private connections." This reliance on communal sources underscores the economic constraints faced by many households in the region.

Additionally, qualitative insights complement these findings, revealing that many residents prefer boreholes due to the perceived better taste and safety of the water, despite the inconvenience. As noted in the FGDs, *"Many people in our community prefer the taste of borehole water, and during the rainy season, they collect rainwater instead of using tap water.*" This preference for alternative sources, despite the availability of public taps, highlights the role of cultural perceptions and the perceived value of water sources in shaping access patterns.

4.2 The Influence of Water Tariffs on Access to Clean Water in Lira City, Uganda

The study employed a descriptive analysis of the quantitative data collected from households classified as water users to assess the effect of water tariffs on access to clean water in Lira City. Feedback from respondents was meticulously quantified and presented as percentages in Table 2, illustrating the various levels of agreement with key aspects related to the affordability of water tariffs and their influence on access to clean water.

Specifically, Table 2 highlights the proportion of respondents who strongly agreed, agreed, disagreed, or strongly disagreed with different statements concerning the impact of tariff affordability. Furthermore, the percentage of respondents who provided neutral responses was noted, reflecting their ambivalence or uncertainty regarding these issues.

Table 2: Perceived Influence of Water Tariffs and Affordability on Access to Clean Water

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The current water tariffs are affordable for my household.	12.3%	49.7%	10.1%	17.1%	10.8%
Higher water tariffs make it difficult for my household to access clean water.	22.8%	42.1%	10.4%	19.0%	5.7%
Reducing water tariffs would improve my household's access to clean water.	42.1%	46.5%	6.3%	3.8%	1.3%
Changes in water tariffs significantly affect my household's water consumption patterns.	16.1%	43.7%	22.2%	14.9%	3.2%
The water tariff levels are well aligned with the quality of water services provided.	7.0%	50.3%	14.6%	13.3%	14.9%
We have had to cut back on other essential expenses to afford water.	12.3%	48.7%	7.6%	26.6%	4.7%
The current water tariffs are within our household budget.	9.8%	55.7%	12.3%	11.1%	11.1%
My household struggles to afford water at the current water tariff rates.	17.4%	27.5%	12.3%	37.3%	5.4%
Lowering water tariffs would significantly improve our access to clean water.	38.9%	54.1%	3.8%	2.5%	0.6%
The affordability of water tariffs influences our water usage.	17.7%	50.0%	19.6%	10.8%	1.9%
High water tariffs are a barrier to accessing sufficient clean water.	28.2%	52.5%	10.4%	6.3%	2.5%

Source; Compiled by Author

The quantitative findings show a clear association between water tariff levels, affordability, and access to clean water as illustrated in Table 2 above, with 64.9% of respondents indicating that higher tariffs hinder their access. Additionally, 88.6% of respondents believed that reducing water tariffs would improve their access. These figures are reinforced by qualitative data, where a key informant, pointed out that *"The current water tariffs are very high for the customers, especially for those with unstable incomes."* The increase in tariffs over the past few years has led to a reduction in water access, with many households resorting to alternative, less safe water sources like boreholes and unprotected wells.

The qualitative data also revealed that some residents restrict their water consumption due to the high costs, a point corroborated by the quantitative finding that 59.8% of respondents adjust their water usage based on tariff changes. This adjustment in consumption patterns highlights the price elasticity of demand for water services in Lira City. Additionally, While 57.3% of respondents believed that the current tariff levels were aligned with the quality of services provided, this perception did not alleviate the financial strain experienced by many households. The qualitative data revealed that even households with a stable income often opt for alternative water sources when tariffs rise, also indicating a price elasticity in water demand that challenges the sustainability of high tariff levels in a low-income context.

4.3 The Influence of Willingness to Pay for Water Services on Access to Clean Water in Lira City, Uganda.

The study carried out a detailed descriptive analysis of data collected from households. It aimed to comprehensively evaluate how the willingness to pay for water services influences access to clean water in Lira City. By examining the financial commitment of these households, the research highlights the relationship between willingness to pay and the availability of safe water, shedding light on critical factors that affect water accessibility in the region.

The respondents' feedback as illustrated in Table 3 below was quantified as percentages, reflecting those who strongly agreed or agreed as being willing to pay for water services, thereby enhancing their access to clean water. Conversely, those who disagreed or strongly disagreed indicated an unwillingness to pay, which hindered their access to clean water. Additionally, the percentage of respondents who offered neutral responses highlighted their indecision regarding these issues.

Table 3: Willingness to Pay for Water Services

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I am willing to pay more for a reliable water supply.	5.4%	48.4%	9.8%	26.6%	9.8%
My household is prepared to pay higher tariffs for uninterrupted water supply.	3.8%	39.6%	8.9%	36.4%	11.4%
My willingness to pay for water services is influenced by the quality of the water provided.	7.9%	58.2%	11.4%	16.5%	6.0%
I would pay more for water if it was delivered closer to my home.	9.5%	52.2%	13.9%	19.0%	5.4%
My household is prepared to pay higher tariffs for uninterrupted water supply.	3.8%	39.6%	8.9%	36.4%	11.4%
The current water tariffs are a fair reflection of the service quality.	2.5%	40.2%	20.3%	20.9%	16.1%
Our household prioritizes water expenses over other utility bills.	22.8%	44.0%	16.1%	14.2%	2.8%

Source; Compiled by Author

Willingness to pay for water services is closely tied to the perceived quality, reliability, and proximity of water sources as illustrated in Table 3 above. Quantitative data revealed that 53.8% of respondents were willing to pay more for a reliable water supply, with a significant portion emphasizing the importance of service quality (66.1%) and reliability (43.4%). This suggests that households in Lira City place a high value on consistent and high-quality water services.

Qualitative findings reinforce this sentiment, with participants expressing frustration over unreliable water services. One respondent noted, *"We would gladly pay more if we could depend on the water supply daily. It is frustrating to pay and still deal with dry taps."*

However, the data also indicate that not all households are willing or able to pay more, particularly those in lower-income brackets. As Table 3 shows, 36.4% of respondents were unwilling to pay higher tariffs for uninterrupted water supply, likely due to existing affordability challenges. This finding highlights the need for balancing service improvements with pricing structures that consider the financial constraints of lower-income households.

4.4 The influence of household income on access to clean water in Lira City, Uganda

The cross-tabulation method was utilized to analyze the quantitative data for the study, focusing on the impact of household income on access to clean water in Lira City, Uganda. This approach facilitated an examination of the relationship between household income and affordability, allowing for a deeper understanding of their influence on access to clean water an aspect that was not immediately evident from the collected data.

Responses from participants across various income groups were categorized into three distinct categories. The percentage of respondents who strongly agreed or agreed that water tariffs were affordable is denoted as "Affordable." Conversely, the percentage of respondents who strongly disagreed or disagreed regarding the affordability of water tariffs is labelled as "Not Affordable." Lastly, the percentage of respondents who were uncertain about the affordability of water tariffs is represented as "Neutral."

Table 4: Cross-tabulation of Income Groups and Perceptions of Water Tariff Affordability

Income Group (UGX)	Affordable	Neutral	Not Affordable
Less than 100,000 UGX	54.6%	11.8%	33.6%
100,000 - 300,000 UGX	51.9%	18.5%	29.6%
300,001 - 500,000 UGX	62.8%	6.4%	30.8%
500,001 - 1,000,000 UGX	84.4%	4.4%	11.1%
More than 1,000,000 UGX	80.0%	5.0%	15.0%

Source; Compiled by Author

The study's cross-tabulation analysis illustrated in Table 4 above further underscores the connection between income levels and the affordability of water tariffs. Among households earning less than UGX 100,000 per month, 33.6% found water tariffs unaffordable, leading to reduced access to clean water. This finding suggests that low-income households are disproportionately

affected by water tariffs, a theme echoed in the qualitative interviews. A key informant pointed out, *"Income levels are a major factor; many low-income households simply cannot afford to pay their water bills and face frequent disconnections."*

Interestingly, the quantitative data also revealed that even among higher-income households, some struggle with water tariffs. As shown in Table 4, 15.0% of households earning more than UGX 1,000,000 reported difficulties in affording water services. This unanticipated finding suggests that factors beyond income, such as service quality or local pricing disparities, may also influence perceptions of affordability. This is supported by qualitative data where participants mentioned that the perceived value of water services sometimes does not align with the cost, leading to dissatisfaction even among wealthier households.

5. DISCUSSIONS

The study set out with three primary objectives aimed at understanding key factors affecting access to clean water in Lira City, Uganda. First, it sought to explore how water tariffs influence individuals' ability to obtain clean water. Second, it aimed to investigate the influence of willingness to pay for water services on access to clean water. Lastly, the study examined how household income levels influence access to clean water. The results and findings from this research are detailed below;

The findings revealed that the affordability of water tariffs is a critical factor influencing access to safe water. Many households are faced with challenges in managing their water expenses alongside other essential needs, leading to a trade-off that affects their overall well-being. This challenge aligns with previous studies that highlight the issue of affordability as a significant barrier to accessing clean water, particularly in urban settings within developing countries..

The research further demonstrated that as water prices increase, low-income households are disproportionately affected, often resorting to unsafe water sources or reducing their water consumption, which can lead to health risks and diminished quality of life. These findings underscore the importance of considering water tariff structures in policy decision-making, ensuring that they are designed to strike a balance between equity and efficiency in water service delivery, thus facilitating better access for all residents, particularly the most vulnerable populations. This also highlights the need for comprehensive approaches that address both tariff regulation and broader socio-economic factors in urban water management, reaffirming the insights from UN-Water (2015).

The willingness of consumers to invest in water services is significantly shaped by a variety of factors, including the quality of the water provided, the reliability of the service, and the accessibility of nearby water sources. Research indicates that individuals are more inclined to pay higher rates for water services when they can see tangible enhancements in the quality of the water or experience greater convenience in accessing it (Whittington et al., 2009). Notably, a considerable portion of respondents indicated a readiness to pay extra for improved services. This finding underscores the critical need to align tariff structures with enhancements in service delivery, as doing so not only boosts customer satisfaction but also increases the overall willingness to pay for these essential services.

The study's findings provide compelling evidence that aligns with the existing body of literature exploring the intricate relationship between water tariffs and individuals' access to clean water. In a variety of low- and middle-income countries (LMICs), extensive research has demonstrated a concerning pattern: as water tariffs increase, they tend to disproportionately burden low-income households. This financial strain often results in a decreased ability to access essential water services, leading to potential public health crises and exacerbating economic inequalities (Smiley, 2016). In the specific context of Lira City, the data gathered from lower-income households paints a vivid picture of the challenges they face. A notable percentage of respondents expressed significant hardships in managing their water bills, indicating that current tariff levels are not only unsustainable but also contribute to their overall financial instability. This finding underscores the need to reassess water pricing strategies. Further reinforcing these results, previous studies have highlighted the importance of establishing affordable pricing mechanisms as a means to ensure equitable access to water. By creating a pricing structure that acknowledges the economic realities faced by lower-income households, policymakers can help bridge the gap in access to this vital resource (Komives et al., 2005). Such measures are crucial for fostering a more inclusive approach to water resource management that benefits all members of the community.

CONCLUSION AND RECOMMENDATIONS

The study highlights the vital importance of three interconnected factors; affordability, water quality, and proximity in determining water access in Lira City. It emphasizes that without addressing these elements, many residents may struggle to secure reliable access to clean water. Affordability is crucial, as high costs can limit access for low-income families, making it difficult for them to meet basic water needs. Water quality is another essential aspect, as unsafe or contaminated water can lead to serious health issues, undermining public health initiatives and exacerbating healthcare costs. Proximity of water points involves the physical

availability of water sources and infrastructure, which is often a challenge in urban areas where populations are dense, and resources can be unevenly distributed.

To tackle these challenges effectively, the study suggests that policymakers implement targeted and informed interventions which include targeted subsidies to improve water accessibility for vulnerable populations and enhance efficiency in service delivery. It also underscores the need for strong regulatory frameworks, increased transparency, and active community participation in the tariff determination processes, which will help reduce inequalities. By focusing on these key areas, policymakers can work towards achieving more equitable access to clean water for all residents, ultimately leading to improved public health outcomes and a better overall quality of life in Lira City.

Declaration of competing interest

The authors declare that, to their best knowledge, no competing interests.

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