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IMPROVING WATER QUALITY MANAGEMENT, WATER EQUITY, AND NON-REVENUE WATER IN GHANA

Component 2 Report: Water Equity and Tariffs

February 2024

This report is made possible by the support of the American People through the United States Agency for International Development (USAID). The content of this report is the responsibility of Tetra Tech and does not necessarily reflect the views of USAID or the United States government.

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ACRONYMS AND ABBREVIATIONS

GHS	Ghanaian Cedi
GPS	Geographic Positioning System
GWCL	Ghana Water Company Limited
HWISE	Household Water Insecurity Experiences Scale
IBT	Increased Block Tariff
km	Kilometers
LIA	Low-Income Areas
LICSD	GWCL's Low-Income Customer Support Department
m^3	Cubic Meters
NRW	Non-Revenue Water
PURC	Public Utility Regulatory Commission
UN	United Nations
UNICEF	United Nations Children's Fund
URBAN WASH	Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization
WSP	Water Safety Plan
WTP	Willingness to Pay
WUA	Water User Association

EXECUTIVE SUMMARY

Growing populations have strained Ghana's urban water systems, leaving approximately 40 percent of urban residents unable to access safely managed water. Wealth disparities underlying these access challenges contribute to insufficient household water security and health inequities. Subsidizing water costs to promote affordability, though, challenges Ghana Water Company Limited (GWCL), Ghana's national urban water supplier, to sustain cost recovery through other means. This activity sought to assess the interplay of water pricing, household affordability, and utility financial viability, with the goal of co-designing interventions to expand water access equitably and sustainably.

In collaboration with GWCL, we selected two cities for this assessment: Kumasi and Tamale. Evaluation methods included a household survey, interviews with local leaders and water managers, focus-group discussions in low-income communities, a review of historical tariff setting, a cost-revenue analysis, and financial viability projection modeling.

From the household survey, we found that connection fees of 1,500–2,000 Ghanaian cedis (GHS) (meant to only cover GWCL's materials and installation costs) are largely unaffordable for underserved populations in both Kumasi and Tamale. Lowering the connection fee or embedding it in monthly charges would help extend service coverage among low-income populations. Further, the lifeline volume of 5 cubic meters (m^3) per month cannot adequately cover basic water needs considering average household sizes in Kumasi (4 members) and Tamale (eleven members). Further, piped water connections are typically shared by multiple households in both cities. The full residential tariff of GHS 8.36/m^3, which applies to customers whose use exceeds the lifeline volume, is not affordable to 26 percent of households in Kumasi and 85 percent of households in Tamale. Raising the lifeline volume to accommodate basic household needs or removing the volume cap for low-income households would make piped water more universally affordable. To cover such equity measures, tariff increases among the wealthiest residential customers and institutional customers should be considered, weighing potential revenue gains with implementation complexity and costs.

GWCL is not financially sustainable in Kumasi and Tamale when considering infrastructure depreciation. Although average tariffs covered operating costs exclusive of depreciation in 2022, they covered just over half of operating costs when considering infrastructure depreciation. Increasing commercial and industrial tariffs would likely have limited effect because these customers make up a small fraction of total revenue in the study cities. Tariff increases among residential and institutional customers can cover equity measures but cannot close the financial gap. Aggressive efficiency improvements and non-revenue water (NRW) reductions are required to improve financial viability. Additionally, GWCL should explore opportunities for government or donor funding to help cover infrastructure depreciation, as the current level of debt likely prohibits further borrowing.

The Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene (URBAN WASH) project discussed these recommendations with GWCL and the USAID Ghana Mission and co-created detailed action plans to address equity and financial viability in Kumasi and Tamale as well as urban Ghana more broadly.

1.0 INTRODUCTION

1.1 BACKGROUND

Ghana's urban population has more than tripled over the last three decades, rising from approximately 5 million in 1990 to more than 18 million in 2021 (Ghana Water Company Limited [GWCL] 2022). This rapid urbanization has outpaced expansion of urban water infrastructure such as treatment plants and underground pipe networks (Maoulidi 2010). Despite development progress and more ambitious water service level targets over the past few decades, approximately 40 percent of Ghana's urban residents still lack access to safely managed water (i.e., water from an improved source on premises, available when needed, and free of contamination) (World Health Organization [WHO]/United Nations Children's Fund [UNICEF] 2020).

Water access inequities stem from persistent wealth inequality and perpetuate health disparities (Adutwum, Alhassan, and Abobi 2022). Disaggregated water coverage data reveals wealth disparities across regions (Ghana Statistical Service 2019; Monney and Antwi-Agyei 2018). Within Ghana, the Northern region contains the greatest population segment relying on unimproved or surface water sources, while conditions in the Ashanti (cultural capital) and Greater Accra (geopolitical capital) regions offer at least basic water services to a higher percentage of the population (WHO/UNICEF 2020).

The government-owned national utility, GWCL operates 97 urban water schemes throughout the country. GWCL's measures to promote water equity include an increasing block tariff structure, which is set by the Public Utility Regulatory Commission (PURC) and applies to all urban water systems nationwide (PURC 2022). In select cities, GWCL has introduced connection subsidies in low-income areas (LIAs). However, balancing cost recovery with affordability continues to challenge the national service provider (GWCL 2022). Amplifying factors include a background of inherited debt, high energy costs, and an ongoing economic crisis in Ghana associated with high inflation and downgraded credit scores (Naadi 2023).

GWCL's total treated water production accounts for only 60 percent of water demand in urban areas, leading to intermittent rationing, especially during the dry season (GWCL 2022). Climate change has led to longer periods of dry weather, which compromises surface water availability. Flooding from heavy precipitation, along with manmade pollution in the watershed, stress water quality. Insufficient water treatment infrastructure hampers GWCL's ability to produce potable water at full capacity, while aging and leaking distribution systems suffer from high physical water losses. When adding in commercial losses, estimates of non-revenue water (NRW) are as high at 46 percent, meaning that GWCL is able to sell only about half of the produced water (GWCL 2022).

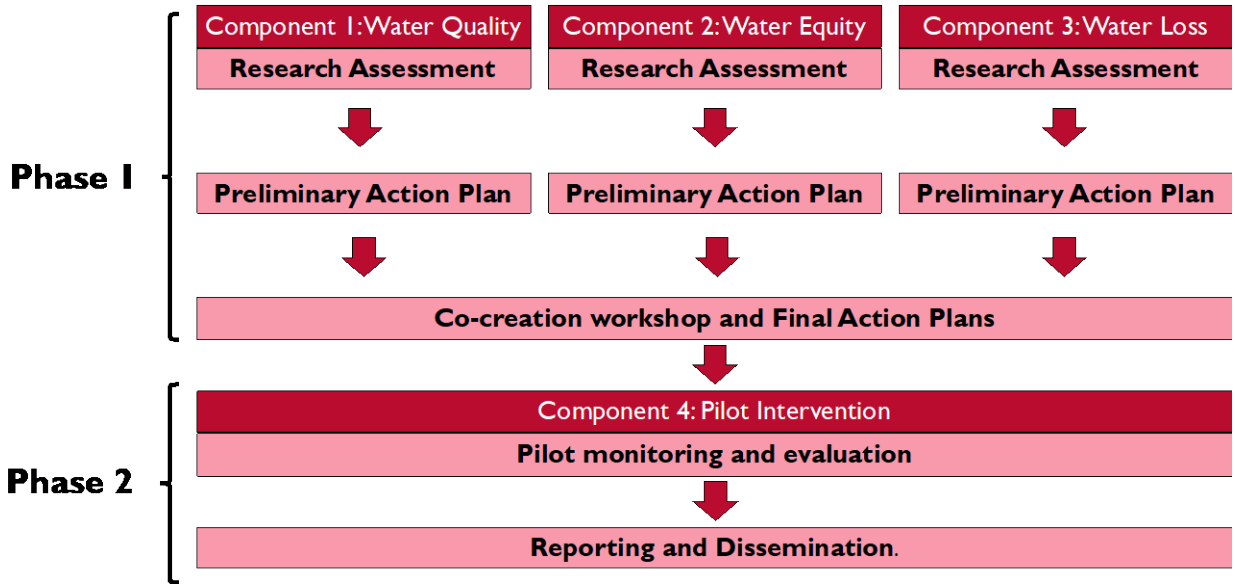
The lowest-income households often have limited access to safe drinking water, in part due to the costs associated with piped water connections (Franceys 2005; Adams and Vásquez 2019). The richest households often purchase sachet (bagged) water or have piped connections into the dwelling or yard, whereas the middle class relies increasingly on public standpipes or private wells, and the poorest households tend to use untreated surface or groundwater (Ghana Statistical Service 2018). Intermittent treated water service delivery and water rationing commonly push affected households to make alternate arrangements or store water, which can further compromise microbial water quality among low-income consumers (Twerefou et al. 2015). The Coronavirus Disease 2019 (COVID-19) pandemic and its effects on household income decreased purchasing power (USAID 2020a), while household expenditures on food, transport, and housing grew disproportionately (Dontoh 2023).

1.2 ACTIVITY PURPOSE

On July 5, 2022, the Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene (URBAN WASH) project, a centrally funded activity of USAID's Bureau for Resilience and Food Security, received a request from USAID/Ghana to conduct research and pilot new interventions to help address **three core challenges faced by the urban water sector in Ghana: improving water quality, ensuring equity, and reducing NRW**.

This study takes a phased approach in two cities (Kumasi and Tamale) (Figure 1). Phase 1 consists of initial assessments on water quality management, water equity, and NRW, leading to the co-development of action plans with GWCL. Findings from Phase 1 will inform Phase 2 of the activity, which includes a pilot of intervention(s) in collaboration with GWCL.

Figure 1: Study Framework Targeting Water Quality, Equity, and Losses



1.3 RESEARCH QUESTIONS

This report focuses on the assessment of water equity and tariffs, which was designed to address the research questions listed in Table 1.

Table 1: Component 2 Research Questions Examining Water Equity, Tariffs, and Financial Viability in Urban Ghana

Topic	Research Questions
Affordability[1]	• To what extent do GWCL's connection fees and tariff structures promote affordable water access for the poor and vulnerable in the target cities? • To what extent are underserved populations able to pay for GWCL services? • What tariff/cross-subsidy arrangements for service connections and water tariffs are consistent with customers' willingness and ability to pay?

[1] "Affordability" means a household's financial and economic costs for a service do not threaten the household's ability to meet other needs and the costs fall within established thresholds as a proportion of household income (UNICEF and WHO 2021). In this report, we use "affordability" and "ability to pay" interchangeably.

Topic	Research Questions
Financial viability[2]	• To what extent do GWCL's tariff structures support GWCL's financial sustainability in the target cities? • What tariff/cross-subsidy arrangements are most financially viable given GWCL's financial performance?
Opportunities for improving equity[3] and financial viability	• What options for improving water equity and affordability (e.g., revising tariff structures, cross-subsidy arrangements) support GWCL's financial viability and align with customers' willingness and ability to pay?

1.4 INTENDED AUDIENCE AND USES

The primary audiences for the research findings are GWCL and USAID/Ghana. The research team has engaged with GWCL staff in Tamale and Kumasi as well as GWCL's national headquarters as part of data collection and analysis. The assessment results will provide GWCL with evidence to guide decisions regarding pilot interventions to improve urban water service delivery. Targeted, time-bound pilot interventions to address water quality management, water equity, and NRW will be identified in collaboration with GWCL staff and designed to support existing GWCL initiatives. Similarly, the outcomes of the pilots will inform USAID/Ghana's future investments in urban water programming. Secondary audiences include Ghana's Ministry of Sanitation and Water Resources; the local Metropolitan, Municipal, and District Assemblies (MMDAs); and other urban water project implementers in Ghana and nearby countries.

[2] "Financial viability" means an organization can generate sufficient revenues to cover the capital, operations, and maintenance expenses of maintaining acceptable levels of service in the long term, (Soppe, Janson, and Piantini 2018).

[3] "Water equity" indicates access to water services is affordable for all and is not disproportionally lower among low-income households when compared to middle- and high-income households.

2.0 STUDY CITIES

The URBAN WASH team and GWCL selected two cities for this activity: Kumasi and Tamale. Initially, GWCL provided a list of priority cities with known challenges regarding water quality, equity, and/or NRW. Through a desk review and onsite visits, URBAN WASH then selected two cities that offered adequate geographical coverage (at least one northern Ghanaian city, in accordance with USAID/Ghana's Country Development Cooperation Strategy); sufficient population and water distribution system size; city-level GWCL representatives demonstrating interest in and availability for the proposed activity; available data; and adequate personal safety for researchers. In general, Kumasi has a stronger economy relative to Tamale.

2.1 WATER SYSTEMS

The city of Kumasi uses surface water from the Ofin River (primary source) and Owabi River (secondary source; Table 2). The main GWCL treatment plant (Barekese, approximately 130,000 cubic meters [m^3]/day) is located about 19 kilometers (km) from Kumasi, while the secondary treatment plant (Owabi) produces much less treated water (approximately 10,000 m^3/day) and is located 10 km from Kumasi. The city of Tamale similarly uses surface water from the White Volta River (Table 2). The primary operating treatment plant (Dalun, approximately 35,000 m^3/day) will eventually be supplemented by a second treatment plant under construction. Both cities pump water into a single reservoir, after which flow is essentially driven by gravity.

Table 2: Characteristics of Urban Water Systems in Kumasi and Tamale

Characteristic	Ashanti North and South Regions (Kumasi)	Northern Region (Tamale)
Water source(s)	Surface water (Ofin and Owabi Rivers)	Surface water (White Volta River)
Production	Approximately 129,500 m^3/day	Approximately 35,000 m^3/day
Population	3,630,000	701,000
Number of customers	101,327	46,843
Type of customers • Residential • Standpipes • Industry/commerce • Institutions/government	 85% 1% 10% 4%	 92% 2% 5% 2%
Service coverage in metropolitan area[1] (% of households served)	46%	58%
Volume billed (m^3, 2021)	22,664,601	6,015,969
Length of distribution network	Over 1,000 km	500 km
Number of staff[2]	510	244
NRW (2021)	50–54%	45%
Metering ratio	>90%	>90%
Operating revenue (2022)	158,000,000 Ghanaian cedis (GHS)	GHS 49,000,000

1 Estimate derived from URBAN WASH household survey in Kumasi and Tamale.
2 Includes the distribution; commercial; and technology and innovation departments.

2.2 WATER TARIFFS AND FEES

The Public Utilities Regulatory Commission (PURC) regulates and oversees provision of electricity, water, and natural gas services in Ghana. It provides guidelines for setting rates and reviews, adjusts, and

approves water tariffs proposed by public utilities. The guidelines establish that tariffs should ensure full cost recovery of reasonable costs and financial viability of utilities (PURC 2022). The approach for cost estimates is forward-looking based on projections for the ensuing three-year tariff period. Additionally, the regulatory framework allows utilities to request quarterly adjustment of tariffs. The quarterly review seeks to track and incorporate changes in key factors used in determining the tariff. In theory, the objective is to maintain tariffs adjusted to the real cost of services and to ensure that utilities do not under- or over-recover. The tariffs set by PURC apply to GWCL utilities nationwide, irrespective of their actual local operating costs and of income levels among the local population.

GWCL's tariffs include two components: a static monthly service charge per connection and a variable volumetric tariff based on the amount of water used. Both tariff components are highest for commercial customers, with the intention to cross-subsidize services for residential and institutional customers (Table 3). Commercial customers include small businesses, industry, bottled water and drinks producers, sachet water providers, and ports and harbors. In 2023, their tariffs were approximately three times the regular residential tariff and double the institutional tariff (Table 3).

Residential tariffs reflect an intention to promote social fairness, with a lower "lifeline" tariff applying to customers using less than 5 m^3 of water per month (Table 3). Once consumption surpasses that volume, the customer's entire consumption, including the first 5 m^3, is charged at the regular residential tariff. We note that the lifeline volume was 20 m^3 per month prior to 2015 but was reduced in recent years to boost revenue.[4] The lifeline tariff (GHS 4.72/m^3 in September 2023) costs approximately half of the regular residential tariff (GHS 8.36/m^3 in September 2023). A lower tariff also applies to public standpipe customers, who receive a lower service level, less convenient than on-premises water supply (Table 3).

Table 3: GWCL's National Water Tariffs as of September 2023 across Customer Categories

Category of Customer		Volumetric Tariff (GHS/m^3)	Service Charge per Connection (GHS/month)
Residential	<5 m^3 per month (lifeline)	4.72	10
	>5 m^3 per month	8.36	10
	Standpipes	5.66	20
Industry/commerce	Sachet water providers	22.26	100
	Bottled water and drinks providers	25.30	250
	Other commercial	25.30	20
	Industrial	25.30	250
	Ports and harbors	33.09	500
	Bulk supply	8.02	50
Institutions/government	Institutions and government	12.14	20

Unlike tariffs, PURC does not play a role in determining connection fees. GWCL has discretion in setting connection fees. Connection fees are similar across customer categories (unlike tariffs) but vary based on distance to the water main. They correspond to the actual cost of connecting a plot to the piped system, which according to GWCL varies between GHS 1,500 and 2,000.

In past years, GWCL's Low-Income Customer Support Department (LICSD) experimented with a connection subsidy in select LIAs of Accra and Kumasi. These programs, which were supported by international donors over defined periods, reduced the connection fee to GHS 200–1,200 and

[4] There may also have been a perception that the higher lifeline volume was benefiting the wealthy.

benefitted over 10,000 households in LIAs across both cities. URBAN WASH is evaluating the Accra subsidy program as part of another research activity.

3.0 METHODS

To address the research questions, we performed mix-methods assessments from the community and institutional perspectives. The **community assessment** included a city-wide household survey, interviews with community leaders in LIAs, and focus group discussions with GWCL customers and non-customers in LIAs. The **institutional assessment** involved interviews with PURC and GWCL staff, a review of the regulatory framework and other secondary sources, a cost-revenue analysis, and modelling of financial viability under different scenarios.

3.1 COMMUNITY ASSESSMENT

We designed the community assessment to investigate potential equity issues relative to water services in Kumasi and Tamale and evaluate affordability constraints among low-income households.

To characterize household water consumption behaviors as well as willingness and ability to pay, we surveyed 301 households in Kumasi and 305 households in Tamale between May and August 2023. Our target of approximately 300 households per city was dictated by budget constraints and allowed estimating population percentages (e.g., percent of population with access to on-premises piped connections) with a ±6 percent margin of error and 95 percent confidence. We selected households randomly to represent the overall city population broadly, including LIAs within and beyond reach of the existing distribution systems (Appendix A). In each section of the city (all 11 administrative districts in Kumasi and all 6 utility zones in Tamale), we aimed to survey multiple households proportional to the total population. According to these geographic targets, we generated random geographic positioning system (GPS) points using the *R* software and instructed enumerators to select four households randomly per GPS location. In case of discrepancies between the target and the actual number of surveys conducted in each geographic section, we corrected for those during data analysis. The statistics presented in this report are therefore population-representative estimates.

Survey questions covered household demographics and monthly expenditures, type of water services (GWCL or alternative sources), perceptions of water security, and willingness to pay for piped connections and higher tariffs. We also included questions from the EquityTool (EquityTool, 2024) to evaluate asset wealth, which allowed our team to categorize respondents into three groups: bottom two quintiles (poorest 40 percent), middle two quintiles (ranking between 40 percent and 80 percent), and top quintile (wealthiest 20 percent). We analyzed quantitative household survey data using *R*. We were unable to collect reliable information on water consumption volumes and therefore do not report these data here.

To complement the household survey and better understand the perspective of low-income communities, we collected qualitative data through interviews and focus group discussions (Table 4). We analyzed qualitative data from transcripts in Excel using deductive coding (i.e., searching for information related to a predetermined list of themes), followed by inductive coding (i.e., allowing additional themes to emerge from the transcripts).

Table 4: Summary of Qualitative Interviews and Focus Group Discussions

	Kumasi	Tamale	Accra
Community	• Community leaders (n = 3) • Female focus groups1 (n =2) • Male focus group (n = 1) • Water User Associations[2] (n = 3)	• Community leaders (n = 5) • Female focus group (n = 1) • Male focus group (n = 1)	N/A

	Kumasi	Tamale	Accra
GWCL	• Regional chief managers (n = 3) • Commercial managers (n = 2) • Low-income customer service department representative in Ashanti North (n = 1)	• Regional chief manager (n =1) • Commercial manager (n = 1)	• Head of low-income customer service department • Senior financial expert
PURC	N/A	N/A	• Director of Water Services and Performance Monitoring • Staff in charge of regulatory audit, technical monitoring, water quality, and research (n = 4)

1 We conducted gender-disaggregated focus groups because perspectives on affordability and barriers to access water services may differ between men and women.

2 Volunteer groups that GWCL established to serve as community liaisons during past implementation of pro-poor connection subsidies.

3.2 INSTITUTIONAL ASSESSMENT

The institutional assessment aimed to examine GWCL's financial viability in Ashanti and Northern regions, the extent to which current tariffs levels cover operating costs, and illustrative scenarios for improving equity and cost recovery. Examining GWCL's financial viability (i.e., beyond the Ashanti and Northern regions) was beyond the scope of this study.

To obtain information related to GWCL's overall finances and pro-poor subsidy programs, we engaged regional and national GWCL staff members as well as PURC representatives with multiple follow-ups (Table 4). The national office shared regional-level income statements for 2021 and 2022; and regional offices shared detailed commercial information disaggregated by customer category for the same period.[5] We also reviewed activities undertaken by GWCL's LICSD to target financial aid for customers in need.

We examined current and past tariffs as well as the Proposal for Tariff Review presented by GWCL to PURC in April 2022 (GWCL 2022). Our analysis of tariffs included two components: i) comparing tariff increases since 2019 with inflation and currency depreciation, and ii) computing effective tariffs per cubic meter of water billed[6] (overall and for each category of customers).

Using GWCL's 2021–2022 income statements, we compared annual operating costs with revenues for each city and derived cost recovery ratios. We also computed operational costs per cubic meter of water billed, with and without considering infrastructure depreciation, and compared these costs with effective tariffs. This analysis allowed us to estimate the financial gap between what is required to operate the service and what is currently covered by tariffs.

To examine opportunities for improving financial viability, we modeled costs (production, distribution, administrative) and revenues across four illustrative scenarios. These scenarios allowed us to explore potential impacts of a range of measures, including tariff changes among residential and institutional customers, increases in service coverage, and efficiency improvements (i.e., reductions in NRW, energy usage, and staff costs). We discussed these scenarios qualitatively with GWCL personnel. We computed

5 Data from prior years was not available.

6 Effective tariff (GHS/m^3) = Approved tariff (GHS/m^3) x Volume produced (m^3)/Volume billed (m^3)

5-year projections in Excel using 2020–2022 financial and commercial data as a starting point. These included 2021–2022 regional income statements, 2020–2022 national financial statements, 2022 NRW, and 2022 billed volume and revenue across customer categories. We compared the utility's projected financial performance under each scenario with the current situation extrapolated to 2027 ("business as usual" scenario). The models allowed us to assess a) whether plausible tariff increases could achieve cost recovery of operating costs when considering infrastructure depreciation, and b) the impacts of new pro-poor measures on the financial bottom line.

3.3 ETHICAL CONSIDERATIONS

The team collected written informed consent from all study participants, loaded quantitative and qualitative data onto password-protected computers, and did not communicate personally identifiable information to local stakeholders. The results present only summary statistics and statements. The team will remove all personal identifiers before uploading data to USAID's Development Data Library. The Council for Scientific and Industrial Research of Ghana (CSIR), an Institutional Review Board located in Ghana, approved these data collection and sharing protocols.

3.4 LIMITATIONS

Although our household survey aimed to be population-representative, we over-sampled inner-city areas and under-sampled peripheral areas. To minimize the impact of these sampling discrepancies on our conclusions, we applied correction factors when computing all household-level statistics presented in this report. In practice, this meant applying a weight larger than one to all households in under-represented areas, and a weight smaller than one to households living in over-represented areas. This approach is commonly used in nationwide surveys, such as the Demographic and Health Survey to compute population-representative estimates (USAID n.d.). Additionally, we note that GWCL selected some of the low-income communities in our survey, interviews, and focus group discussions. While this helped ensure that the research captured GWCL's priority areas of interest, this may have undermined the representativity of findings.

To examine differences in socioeconomic status among surveyed households, we used the EquityTool wealth index, which is one of several proxies for household economic wellbeing based on asset ownership. The correlation we observed between wealth indices and reported household expenditures (Figures 3 and 5) validated the use of this proxy. However, we recognize that the proxy is not an absolute representation of household income and poverty status. To explore another potential proxy of economic status, we consulted with GWCL to categorize survey locations into LIAs and non-LIAs (Appendix A). Data on household expenditures however did not validate this binary geographic categorization, and we did not use the data in this report.

Our survey included questions to elicit *stated* willingness to pay for water services (using the double-bounded dichotomous choice method (Mitchell and Carson 2013). These data provide estimates of demand at different price points, but they are not as robust as data from *revealed* willingness to pay experiments that involve real financial transactions. Prior studies showed that stated willingness to pay can be lower than actual willingness to pay (Peletz et al. 2021; 2020). Additionally, the double-bounded dichotomous choice method is prone to anchoring bias, whereby the hypothetical price points proposed in survey questions influence the respondents' stated willingness to pay (Green et al. 1998). Unsurprisingly, we found evidence of anchoring in our willingness-to-pay data.

Relative to the institutional assessment, the most significant limitation was limited data availability at national, regional, and district levels. First, we requested 5 years of institutional data but only received robust data for 2 years (2021–2022). Second, the most comprehensive financial information, including extensive consolidated financial statements, was only available at the national level (i.e., for GWCL as a

whole). In contrast, regional-level income statements only included revenues, operating costs, and infrastructure depreciation and lacked financial expenses and outstanding debt because GWCL accounts for financial expenses at the national level only and does not "pass them on" to the regions. Consequently, we were unable to examine the impact of debt and associated expenses at the regional level, although they represent a significant burden for GWCL (see Section 4.2.4). Lastly, financial records were not available at district level. We therefore relied on regional-level records, which captured districts outside of Kumasi and Tamale metropolitan areas.

Finally, we note that our assessment of affordability focused on connection fees and residential tariffs. We did not closely examine the affordability of water services at standpipes, which were used by only 3 percent of households in Kumasi and 9 percent in Tamale. We also note that our survey did not include questions on household ethnicity.

4.0 RESULTS

4.1 AFFORDABILITY

- To what extent do GWCL's connection fees and tariff structures promote affordable water access for the poor and vulnerable in the target cities?
- To what extent are underserved populations able to pay for GWCL services?
- What tariff/cross-subsidy arrangements for service connections and water tariffs are consistent with customers' willingness and ability to pay?

4.1.1 KUMASI

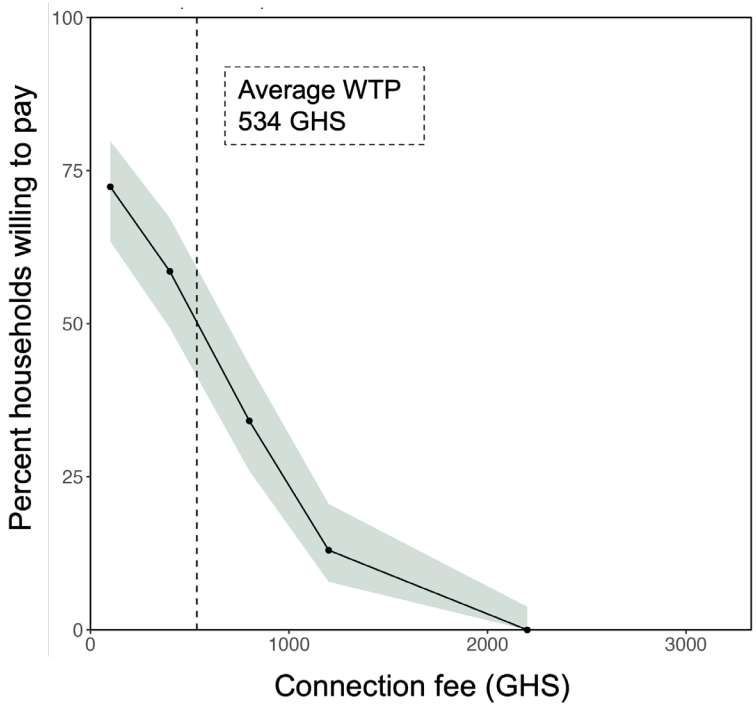
Connection Fees

Just over a third of surveyed households in Kumasi had access to a piped water connection: 33 percent had a connection on premises and an additional 6 percent relied on a neighbor's connection (total: 39 percent).[7] The rest cited the lack of infrastructure (i.e., absence of water mains to connect to) as the primary reason for not having a piped water connection, but willingness-to-pay results also pointed to insufficient demand at current price points. Only 9 percent of non-customer households were willing to pay the full connection fee of GHS 1,500 (Figure 2). In contrast, 58 percent were willing to pay a reduced connection fee of GHS 400 (Figure 2). Average willingness to pay was around GHS 530 and showed no substantial differences across wealth quintiles, which suggests that affordability is not the only barrier to increasing on-premises water access in Kumasi.[8] With the existing willingness to pay, groups of three to four households might elect to pay for a water connection, but individual households are unlikely to do so.

7 Access to on-premises water connections was more limited among households in the poorest category (23 percent) compared to households in the wealthiest category (59 percent).

8 For example, wealthier households may have limited interest in piped connections if they can afford drilling their own boreholes. Affordability constraints are however likely more prominent among poor households: paying the full connection fee of GHS 1,500 would require putting aside 3–4 percent of their usual monthly expenditures for 2 years. While this may seem a small number, this would come on top of the 5 percent they already allocate to water and sanitation and would encroach on other priority expenditures such as food, medical, and housing.

Figure 2: Willingness to Pay for GWCL's Connection Fee among Non-Customers in Kumasi (n = 123, Owners Only)



The survey also asked non-customers how much they would be willing to pay if the connection fee was not a one-off payment but rather a monthly charge. On average, they stated being willing to pay GHS 12/month (less than 1 percent of the monthly household budget) with no substantial differences between wealth quintiles. This amount is only 20 percent higher than the current service charge (GHS 10/month; Table 3). For a single household, the increment would not allow GWCL to recover connection costs for decades. However, if four households sharing a connection all paid this amount, their monthly payment in excess of the service charge would allow GWCL to recover the connection costs in four to five years.

Lifeline Volume

Households belonging to the poorest category (i.e., the poorest 40 percent) in Kumasi had 4 members on average according to our survey. For a household of this size, basic water needs of 50 liters per person per day, as estimated by the World Health Organization (WHO), would equate to 6 m^3 per month and would thus exceed the lifeline volume of 5 m^3 per month. The average poor household in Kumasi would therefore not benefit from the lifeline tariff if relying solely on GWCL for meeting water needs. Further, multiple households, three on average among poor households according to our survey, often share piped water connections, in which case water consumption would most certainly exceed the lifeline volume.

The lifeline volume of 5 m^3 per month can only cover basic needs (as estimated by WHO) for households of 3 members or less, which only represent 38 percent of poor households in Kumasi according to our survey. Consequently, most residential customers relying solely on GWCL for water supply would typically struggle to consume less than 5 m^3 per month and to benefit from the lifeline tariff. In summary, as currently designed, the lifeline tariff does not specifically support the poor; instead, it favors households with few members or those who have other water sources, irrespective of their income.

GWCL's commercial records indicated that 30 percent of residential customers in Kumasi benefitted from the lifeline tariff. This proportion is not surprising as it corresponds to the proportion of households with less than three members, which are the most likely to not exceed the lifeline volume. Interestingly, these customers had an average consumption of 2 m^3 per month, a very low volume[9] indicating that they either require less water than estimated by WHO, that they rely on additional water supplies to meet their needs, or that their meters are inaccurate. The household survey found that close to a third of GWCL customers (29 percent) relied on additional water sources to meet domestic needs; therefore, all three interpretations are plausible.

Tariffs

Considering all expense categories, households in our survey reported spending an average of about GHS 2,300 per month in the bottom two wealth quintiles, GHS 3,000 per month in the following 2 quintiles, and GHS 4,200 per month in the highest wealth quintile. Based on the most conservative definition of affordability, a household should not allocate more than 3 percent of expenditures to water (Andres et al. 2020).[10] At GWCL's regular domestic tariff of GHS 8.36/m^3, 26 percent of surveyed households would exceed the affordability threshold if consuming 50 liters per person per day (the low-end of WHO's estimate for meeting basic needs). Among households in the poorest category, this proportion would reach 34 percent (versus 16 percent among the wealthiest households) (Figure B.1, Appendix B). Reducing their tariff to GHS 4.72/m^3 (the current lifeline tariff) would bring down the proportion of poor households for whom basic water expenses are unaffordable from 34 percent to 18 percent.

Households in the poorest category had the lowest water expenditures (Figure 3). This is primarily because poor households consumed less packaged water (only 50 percent reported drinking packaged water compared to 72 percent among midrange households and 88 percent among the wealthiest). Poor households also possibly consumed lower water volumes overall, though our data limitations did not allow confirmation. The survey revealed that current water expenditures[11] of GWCL customers slightly exceed the affordability threshold, averaging at 4–5 percent of total expenditures. This finding applied across wealth quintiles (Figure 3), though the implications were likely more severe for poor households. We found that compared to the wealthiest households, food was by far the most reduced expenditure (Figure 3), suggesting that water costs, which are largely inelastic, may encroach on their food budget.

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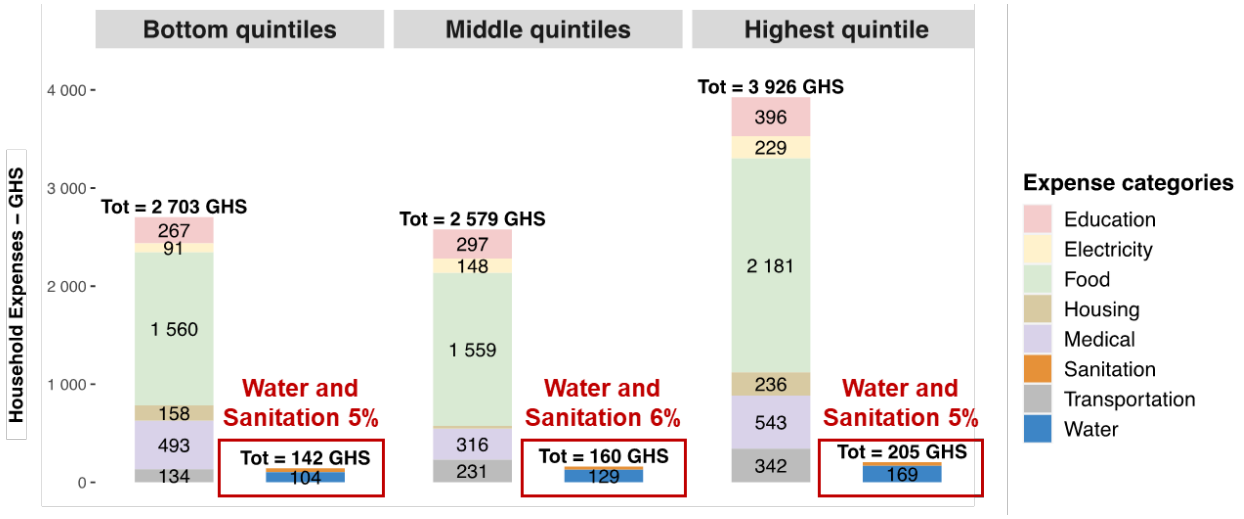
9 This volume would provide 50 liters per person per day (WHO's low-end estimate of basic water needs) only for one-member households, which were a minority in our survey (7 percent in Kumasi). Given household sizes in our survey, a monthly consumption of 2 m^3 requires consuming no more than 30 liters per person per day.

10 However, we note that there is no consensus on this threshold across international organizations, some of them using 5 percent (Andres et al. 2020).

11 These findings include expenditures for all water sources (i.e., GWCL tariffs as well as packaged water, used by two-thirds of GWCL customers, and water from other sources, used by close to one third of GWCL customers).

Figure 3: Average Monthly Household Expenditures among GWCL Customers in Kumasi



Despite spending more on water than is theoretically affordable, some customers still faced water insecurity. According to the Household Water Insecurity Experiences (HWISE 4) Scale for low- and middle-income countries (Young et al. 2021), 15 percent of GWCL customers in our survey were water insecure. For example, 17 percent reported having worried at least sometimes in the past month about not having enough water to fulfil their needs.

Non-customers reported spending less on water compared to GWCL customers[12]: GHS 78/month among the poorest, GHS 105/month among midrange households, and GHS 155/month among the wealthiest (i.e., GHS 14–26 less than GWCL customers; Figure 3). If non-customers became GWCL customers and reallocated current water expenditures to GWCL tariffs, only half of them would be able to get 50 liters per person per day[13]. In other words, a large proportion of non-customers would struggle to pay GWCL's monthly tariffs if they became customers.

In conclusion, GWCL's regular residential tariff is not universally affordable in Kumasi.[14] Additionally, concerns over poor water quality, and to a lesser extent unreliable water supply, result in the majority of households consuming water from other sources (such as sachet water), which can exacerbate water affordability issues.

Cross-Subsidies

Survey data revealed limited opportunities to cross-subsidize tariffs or connection fees among residential customers. GWCL customers in the top 3 wealth quintiles (i.e., the wealthiest 60 percent) were willing to pay an additional GHS 9/month on average to support service improvements, which would represent a moderate 6 percent increment compared to their current water expenditures. The small willingness to pay may reflect a lack of trust in GWCL's ability to improve the quality of services and that

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12 This may be because non-customers consume less water and/or because they rely on cheaper water sources (e.g., boreholes). Our survey did not allow identifying which of these two explanations prevailed.

13 For each non-customer in our survey, we computed 0.050 m^3 per person per day x the number of household members x 30 days per month x GHS 8.36/m^3 and compared this amount with current monthly water expenditures. For half of surveyed non-customers, the computed amount exceeded current water expenditures, indicating that they would likely struggle to meet their basic needs at the regular residential tariff.

14 We note that by extension, this means that water from standpipes is equally unaffordable. Although GWCL's bulk tariff at standpipes is GHS 5.66/m^3 (Table 3), the retail price practiced by standpipe vendors is often at least GHS 0.2 per 20 liters, equating to GHS 10/m^3.

improvements would not displace the deep-rooted use of sachet water, which limits households' budget for piped water services.

For illustrative purposes, the corresponding revenue increase in the combined Ashanti North and South regions could finance:

- Approximately 4,900 new subsidized connections per year in areas with existing water mains (assuming a subsidy of GHS 1,000 per connection),[15] or
- Expanding the lifeline volume to 10 m^3 per month for 11,000 households (excluding the costs of identifying these households and administering a targeted subsidy).[16]

4.1.2 TAMALE

Connection Fees

Close to half of surveyed households in Tamale (48 percent) had access to a piped water connection, a slightly higher proportion than in Kumasi. However, unlike in Kumasi, on-premises access was less common (19 percent) than access via a neighbor's connection (29 percent).[17] The remaining half of households cited both the lack of infrastructure and financial constraints as the reasons for not having a piped water connection. Willingness-to-pay results confirmed financial barriers: only 17 percent of non-customers were willing to pay the full connection fee of GHS 1,500 (Figure 4). In contrast, 96 percent were willing to pay a reduced connection fee of GHS 400 (Figure 4). Average willingness to pay among non-customers was GHS 903, a noticeably higher amount than non-customers in Kumasi. Higher willingness to pay for connections in Tamale is particularly striking as incomes are typically lower (e.g., Figures 3–5), which may be because Tamale has fewer alternative water sources (e.g., the water table is very deep) and drinking sachet water is not the norm (practiced only by 8 percent of households, compared to 62 percent in Kumasi), therefore demand for municipal treated water is higher. Another explanation may be that prior subsidy campaigns in Kumasi may have set expectations of lowered connection fees.

Willingness to pay in Tamale was nevertheless far below the full connection fee of GHS 1,500–2,000, irrespective of the wealth category (GHS 829 among the poorest, GHS 863 among midrange households, and GHS 993 among the wealthiest)[18]. This indicates that unless multiple households purchase a connection together, the majority of unserved households would likely not elect to connect to the piped network in the absence of subsidies.

If the connection fee was a monthly charge rather than a one-off payment, non-customers stated being willing to pay GHS 35/month (1–2 percent of the monthly household budget), with no substantial differences between wealth quintiles. Unlike in Kumasi, this amount is substantially higher than the

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[15] If 60 percent of GWCL's approximately 76,000 billed residential customers in Kumasi all paid an additional GHS 9/month, this would bring an additional revenue of approximately GHS 4.9 million per year.

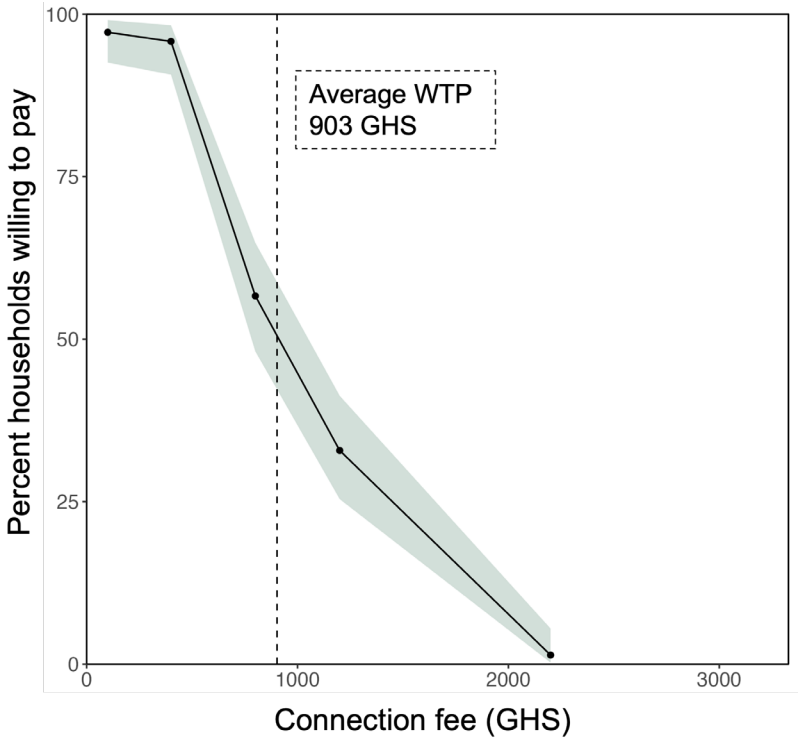
[16] Considering September 2023 tariffs, increasing the lifeline volume to 10 m^3/month would cost GHS 437 per customer per year. The GHS 4.9 million increase in annual revenue estimated above would thus cover approximately 11,000 customers.

[17] Wealth-based disparities were even more pronounced in Tamale than in Kumasi: access to on-premises connections was 6 percent in the poorest category compared to 50 percent in the wealthiest category.

[18] Unlike in Kumasi, poorer households had lower willingness to pay than wealthier households, indicating that affordability was a greater barrier to on-premises water access than in Kumasi. Further, paying the full connection fee would require poor households to put aside approximately 4 percent of their monthly expenditures for two years, which would come on top of the 6 percent they already allocate to water and sanitation and would be unaffordable.

current service charge of GHS 10/month (Table 3); the increment would allow GWCL to recover connection costs in 4–5 years (or less if multiple households sharing a connection all pay this amount).[19]

Figure 4: Willingness to Pay for GWCL's Connection Fee among Non-Customers in Tamale (n = 143, Owners Only)



Lifeline Volume

In Tamale, surveyed households in the poorest category (i.e., the poorest 40 percent) had an average of 11 members.[20] For a household of this size, meeting basic water needs (50 liters per person per day) would require 16.5 m^3 per month, in far exceedance of the lifeline volume. Further, the average connection shared by four households would require 66 m^3 per month to meet basic water needs.

Among the poorest households in Tamale, only 3 percent had 3 members or less, the household size for which the lifeline volume meets basic water needs. Consequently, if households relied on GWCL exclusively for their water supply, the vast majority would not benefit from the lifeline tariff. In contrast, GWCL's commercial records indicated that as many as 47 percent of residential customers benefit from the lifeline tariff, with an average consumption of only 2 m^3 per month. This low level of consumption[21] is consistent with the fact that the vast majority of GWCL customers in Tamale (83 percent) rely on additional water sources to meet their needs as a result of intermittent piped water supply.

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19 An alternative would be to add the increment to the monthly bill rather than the monthly service charge.

20 Larger household sizes in Tamale compared to Kumasi was broadly consistent with data from the 2017 Ghana Living Standard Survey, accordingly to which households in the Ashanti region had an average of 3.2 members compared to 5.8 members in the Northern region.

21 This volume would only meet water needs for one-member households, which were a minority in our survey (1 percent in Tamale).

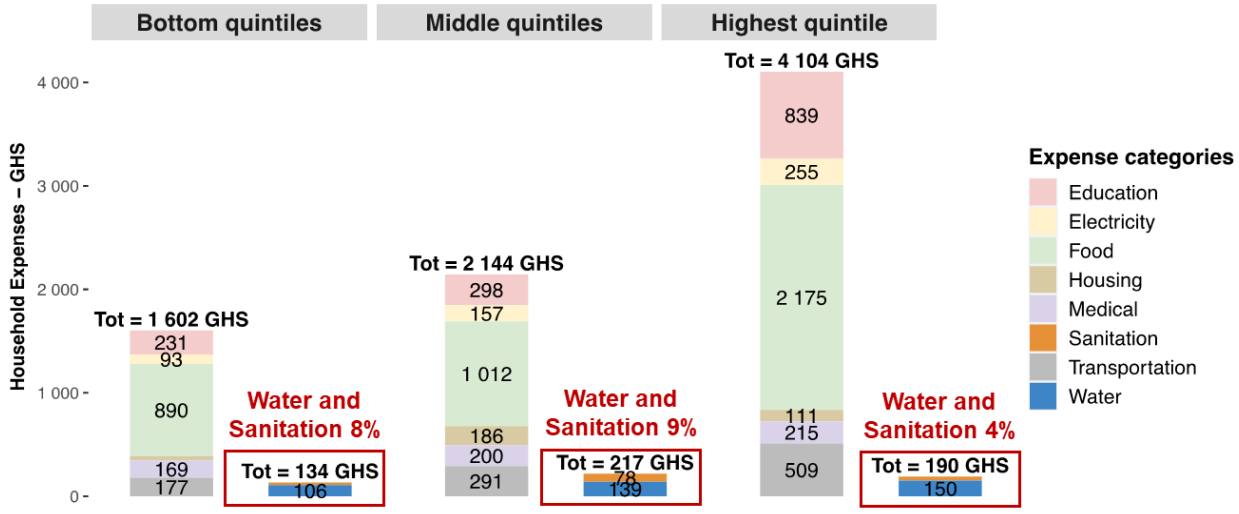
In summary, although close to half of GWCL's residential customers in Tamale benefit from the lifeline tariff, most households have other sources of water (as a result of insufficient piped water supply), which is not an indication that the lifeline volume is sufficiently inclusive.

Tariffs

Considering all expense categories, households reported spending an average of about GHS 1,700/month in the bottom two wealth quintiles, GHS 2,300 GHS/month in the following two quintiles, and GHS 4,000/month in the highest wealth quintile. At GWCL's regular domestic tariff of GHS 8.36 /m^3, only 15 percent of surveyed households would be able to consume 50 liters per person per day (the low end of WHO's estimate for meeting basic needs) while remaining below 3 percent of household expenditures, a typical threshold for assessing affordability (Andres et al. 2020). Among the poorest category of households, this proportion would drop to an alarming 3 percent (Figure B.2, Appendix B), further illustrating that GWCL's regular residential tariff is unaffordable for low-income households in Tamale. Addressing affordability issues in Tamale would require substantial reductions in tariffs. For example, applying the much lower tariff of GHS 4.72/m^3 (the lifeline tariff) may not be sufficient as it would only increase the proportion of poor households able to keep basic water expenses under the affordability threshold from 3 percent to 26 percent. More aggressive tariff reductions among the poor would likely be needed.

Similar to Kumasi, poor households in Tamale had the lowest water expenditures, likely as a result of not consuming packaged water for drinking (compared to 41 percent of households in the wealthiest category). Among GWCL customers in our survey, average water expenditures amounted to 6 percent of total expenditures for the poorest and midrange households and 3 percent for the wealthiest category (Figure 5). Water expenditures were comparable across wealth categories in contrast to food and education expenditures, which were two or threefold higher among the wealthiest households (Figure 5). This finding reflects that water expenses are inelastic and likely encroach on food and education expenditures in poor households. However, high water expenditures among GWCL customers are not simply a reflection of unaffordable water tariffs since the vast majority (83 percent) relied on additional water sources to cope with intermittent services.

Figure 5: Average Monthly Household Expenditures among GWCL Customers in Tamale



Despite spending more on water than is theoretically affordable, most customers faced alarming levels of water insecurity. According to the HWISE 4 Scale (Young et al. 2021), 83 percent of GWCL customers in our survey were water insecure. For example, 56 percent reported having worried at least

sometimes in the past month about not having enough water to fulfil all of their needs. Even more concerning is the fact that 26 percent stated having sometimes lacked sufficient water to drink in the past month.

Non-customers had lower water expenditures than GWCL customers:[22] GHS 81/month among the poorest, GHS 121/month among mid-range households, and 121 GHS/month among the wealthiest (i.e., GHS 18–29 less than GWCL customers; Figure 5). If non-customers became GWCL customers and reallocated their current water expenditures to GWCL tariffs, only a third of them would be able to get 50 liters per person per day[23] and a quarter would get 75 liters per person per day. In other words, most non-customers would not be able to meet their water needs at current tariffs and would have to greatly restrict their water usage.

Cross-Subsidies

Survey data revealed greater opportunities to cross-subsidize tariffs or connection fees among residential customers in Tamale than in Kumasi. GWCL customers in the top three wealth quintiles (i.e., the wealthiest 60 percent) were willing to pay an additional GHS 58/month on average to support service improvements, which would represent a sizable increase (41 percent) in their current water expenditures (substantially higher than Kumasi's 6 percent) and likely reflects a much more desperate need for better services than in Kumasi. For illustrative purposes, the corresponding revenue increase could finance:

- Approximately 13,500 new subsidized connections per year in areas with existing water mains (assuming a subsidy of GHS 1,000 per connection),[24] or
- Expanding the lifeline volume to 15 m^3 per month for 20,000 households, excluding the costs of identifying these households and administering a targeted subsidy.[25]

4.1.3 CONCLUSIONS

Most underserved populations in Kumasi and Tamale were unwilling to pay connection fees of GHS 1,500–2,000, likely reflecting affordability constraints as well as limited interest in piped connections among specific populations (e.g., wealthier households in Kumasi). Average willingness to pay for piped connections was around GHS 500 in Kumasi and GHS 900 in Tamale. Higher willingness to pay for GWCL services in Tamale likely reflects a more pressing need for reliable and treated water supply as fewer alternative water sources exist than in Kumasi. Additionally, access to on-premises piped water was lower in Tamale (19 percent) than in Kumasi (36 percent), although overall access to piped water was comparable when considering neighbor's connections. Reducing or removing the one-time connection fee could be compensated by a higher monthly service charge or temporarily higher tariffs, which is more probable in Tamale than Kumasi.

The lifeline volume of 5 m^3 per month cannot adequately cover customers' basic water needs, particularly in Tamale where the average household has 11 members. Households with over 3 members likely need more than 5 m^3 of water per month. Further, GWCL's regular residential tariff (GHS

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22 This may be because non-customers consume less water and/or because they rely on cheaper water sources (e.g., wells, surface water). Our survey did not allow identifying which of these two explanations prevailed.

23 For each non-customer in our survey, we computed 0.050 m^3 per person per day * the number of household members * 30 days per month * GHS 8.36/m^3 and compared this amount with current water expenditures.

24 If 60 percent of GWCL's approximately 32,500 billed residential customers in Tamale all paid an additional GHS 58 /month, this would bring an additional revenue of approximately GHS 13.5 million per year.

25 Considering September 2023 tariffs, increasing the lifeline volume to 15 m^3/month would cost GHS 655 per customer per year. The GHS 13.5-million increase in annual revenue estimated above would thus cover approximately 20,000 customers.

8.36/m³) is not affordable to 26 percent of households in Kumasi and 85 percent in Tamale since it would not allow them to consume 50 liters per person per day (the low end of WHO's estimate for basic needs) while maintaining water expenditures under 3 percent of total expenses. In both cities (particularly in Tamale), higher tariffs among the wealthiest customers could help finance connection and/or tariff subsidies among low-income households.

The majority of households in Kumasi and Tamale currently face excessive financial strain to meet their water needs, with water accounting for 4–6 percent of total expenditures. However, this situation is not only a result of unaffordable tariffs but also unreliable water supply and concerns over poor water quality, resulting in the majority of households consuming water from other sources.

4.2 FINANCIAL VIABILITY

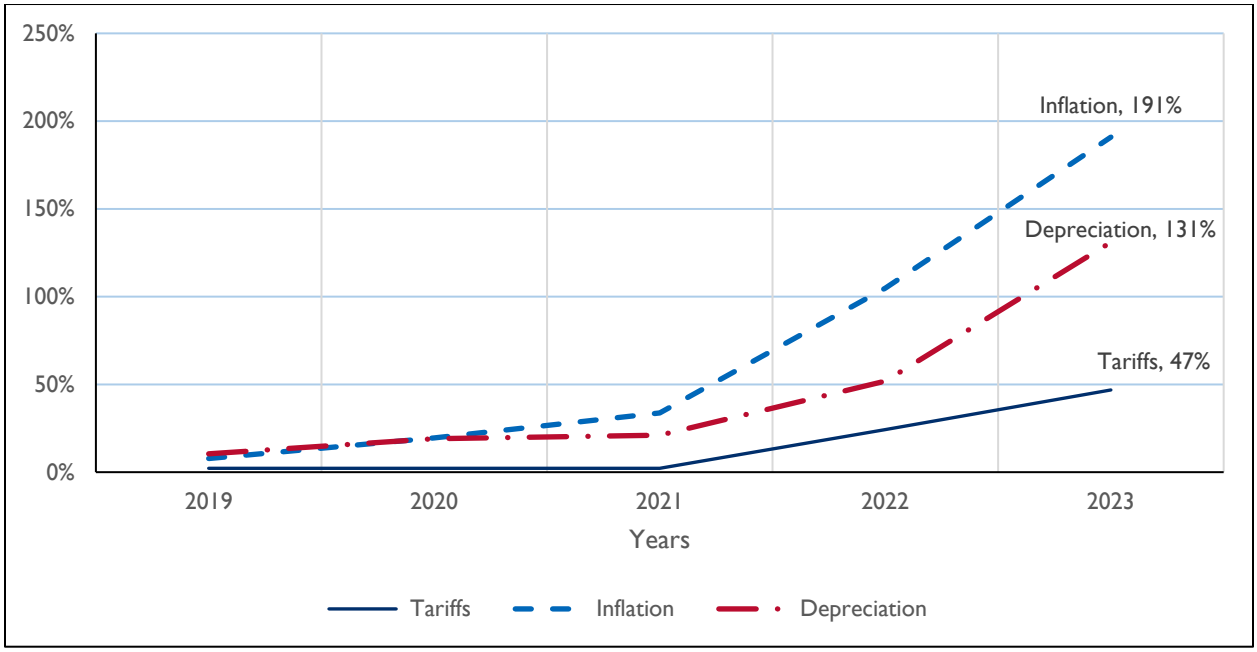
- To what extent do GWCL's tariff structures support GWCL's financial sustainability in the target cities?
- What tariff or cross-subsidy arrangements are most financially viable, given GWCL's financial performance?

4.2.1 PAST TARIFF ADJUSTMENTS

There is often a substantial difference between the tariff adjustments that GWCL requests and what PURC grants. For example, for the most recent major tariff review in 2022, GWCL requested a tariff increase of 334 percent whereas PURC only granted 21.6 percent.[26] Tariff increases have taken both uniform (applied across all categories of customers) and variable forms (Appendix C). PURC considers inflation and currency depreciation of the Ghanaian cedi against the US dollar as part of both major and quarterly tariff reviews. Still, the period 2019–2023 showed a consistent and increasing lag between tariff increases (47 percent) and inflation (191 percent), while the cedi depreciated against the dollar (131 percent; Figure 6).

[26] The increase requested by GWCL was estimated as the revenue required to cover operating costs, infrastructure depreciation, financial expenses (debt servicing), and exchange rate fluctuation. Following their own estimates of GWCL's requirements and considering affordability, PURC only granted a 21.6 percent increase, which primarily covered operating costs. For more information, see Appendix C, Tables C2–C4.

Figure 6: Cumulative Tariff Increases in 2019–2023 Compared to Inflation and Depreciation of the Ghanaian Cedi to US Dollar



4.2.2 KUMASI

Financial Balance Sheet

We examined financial viability using 3 income statements for Ashanti Production, Ashanti South, and Ashanti North (example in Table D.1, Appendix D), using data from 2021 and 2022, the two periods for which GWCL shared information. Ashanti Production covers water delivery costs, while Ashanti North and Ashanti South capture customer billing and revenue collection. All three statements include expenditures for operating costs. The consolidated income statement covering the 3 regions appears in Table 5. Without infrastructure depreciation, 2022 revenues covered operating costs, resulting in an operating margin of 10 percent and a cost recovery ratio of 111 percent. In contrast, 2021 saw an operating deficit of −5 percent and a cost recovery ratio of 96 percent (Table 5). The improvement from 2021 to 2022 was due to revenue increasing by 21 percent, while operating costs only increased by 4 percent. The large revenue increase resulted partly from the end of the free water mandate issued by the Government of Ghana during the COVID pandemic, which curtailed GWCL's revenue through mid-2021,[27] and in part from tariff adjustments in the third quarter of 2022 (+21.6 percent, Appendix C).

Table 5: 2021–2022 Consolidated Income Statements for the Ashanti Region (Kumasi), in Millions of Ghanaian Cedis

Category	2021	2022
Revenue		
Billed revenue	129.32	156.78
Other revenue	1.61	1.22

[27] The financial data we received from the regions did not show the reimbursement made by the Government of Ghana for revenue lost during the free water mandate. Therefore. we were unable to evaluate whether the reimbursement compensated GWCL in full.

Category	2021	2022
Operating revenue	130.93	158.00
Operating Costs		
Personnel	45.44	51.94
Electricity	34.45	40.95
Repairs and maintenance	9.64	9.71
Chemicals	19.33	17.49
Others	28.02	22.83
Total operating costs	136.88	142.93
Margin (before infrastructure depreciation)	(5.95)	15.08
Infrastructure depreciation	165.84	167.27
Net Loss	(171.79)	(152.20)

When we consider infrastructure depreciation, the picture deteriorates. Net losses were 132 percent of revenues in 2021 and 98 percent of revenue in 2022. Cost recovery ratios, considering depreciation, were 43 percent in 2021 and 51 percent in 2022 (Table 5). We note that the infrastructure depreciation costs are particularly high, exceeding both annual revenue and total operating costs (Table 5). According to financial statements, GWCL's overall depreciation rate across its asset base was 4.6 percent in 2022. Most of GWCL's assets have a lifespan ranging between 15 and 75 years and thus depreciate at average annual rates between 1.3 percent and 6.7 percent.

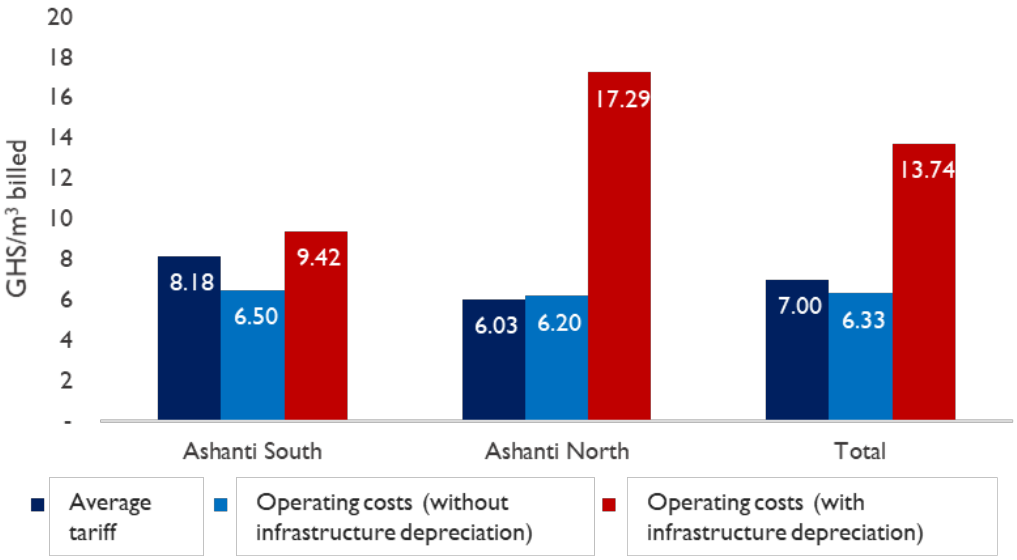
Tariff Structure

Although GWCL applies the same volumetric tariffs nationwide, the average tariff billed varies between regions because the proportion of billed customers falling in each tariff category (e.g., residential, institutional, commercial) differs. Commercial and industrial customers have by far the highest tariffs (Table 3) and can therefore influence the overall average billed. In 2022, for example, the average tariff billed was higher in the Ashanti South region (GHS 8.18/m^3) than the Ashanti North region (GHS 6.03/m^3), because commercial and industrial customers make up a higher proportion of total water consumption in Ashanti South (Table D.2, Appendix D).

However, in both regions this proportion is relatively small: 18 percent in Ashanti South and 5 percent in Ashanti North (Table D.2, Appendix D), which greatly limits the ability of commercial and industrial tariffs to cross-subsidize residential and institutional tariffs. This is apparent in the fact that the contribution of commercial and industrial customers to utility revenue is not much higher than the volume they consume: only 3 percent higher in Ashanti North and 11 percent higher in Ashanti South (Table D.2, Appendix D). The tariff cross-subsidy would have stronger impacts in locations with higher commercial and industrial activity and where these customers make up a larger fraction of total water consumption.

To compare utility costs with tariffs, we normalized operating costs by volume of water billed (Figure 7). This view reinforces that average tariffs cover consolidated operating costs per cubic meter without infrastructure depreciation but only half of operating costs when depreciation is included. Most of the deficit comes from the Ashanti North region (Figure 7). Reviewing tariffs by customer category, all tariffs except the lifeline and public standpipe tariff cover the operating costs without infrastructure depreciation (Figure D.1, Appendix D). When depreciation is included, only the tariff for industry and commerce comes close to approaching operating costs, covering 94 percent.

Figure 7: Average per-Unit 2022 Tariffs[28] Compared to Operating Costs for Kumasi



Given its magnitude, the gap between tariffs billed and operating costs, including infrastructure depreciation, cannot be covered with tariff increases alone. Adjusting tariffs to match operating costs, including depreciation, would require almost doubling tariffs (Figure 7), which is unrealistic. Increasing tariffs for commercial and industrial customers would have limited effectiveness, considering that they only make up a small fraction of total revenue (29 percent in Ashanti South and 8 percent in Ashanti North, Table D.2, Appendix D). Tariff increases may also lead customers to self-supply with their own boreholes, a concern noted in the Ashanti North NRW Strategic Plan, 2022. A small increase in residential tariffs for the wealthiest customers may be possible (Section 4.2.1) but would not entirely close the financial gap and would bring implementation complexity.

4.2.3 TAMALE

Financial Balance Sheets

Similarly, we examined financial viability of the Northern region using income statements for 2021 and 2022. In 2022, revenues exceeded operating costs, not considering infrastructure depreciation, with an operating margin of 8 percent and a cost recovery ratio of 109 percent (Table 6). Revenues in 2022 increased by 43 percent from 2021, while operating costs only increased by 4 percent, improving on results from 2021 when the Northern region ran a deficit of −26 percent and had a cost recovery ratio of 80 percent. As in the Ashanti regions, improvement in revenues is partially explained by the end of the free water mandate in mid-2021 and partially by the large tariff increase in the third quarter of 2022 (+21.6 percent, Appendix C).

However, including infrastructure depreciation shows a more alarming situation. Net losses were 144 percent of revenues in 2021 and 76 percent of revenue in 2022. Cost-recovery ratios, including depreciation, were 41 percent in 2021 and 57 percent in 2022. Similar to Kumasi, infrastructure depreciation costs are very high, nearing operating costs and surpassing revenue (Table 6).

[28] Here we present average tariffs billed, which is the sum of consumption x tariff for each customer category, divided by total consumption.

Table 6: 2021–2022 Consolidated Income Statements for the Northern Region (Tamale), in Millions of Ghanaian Cedis

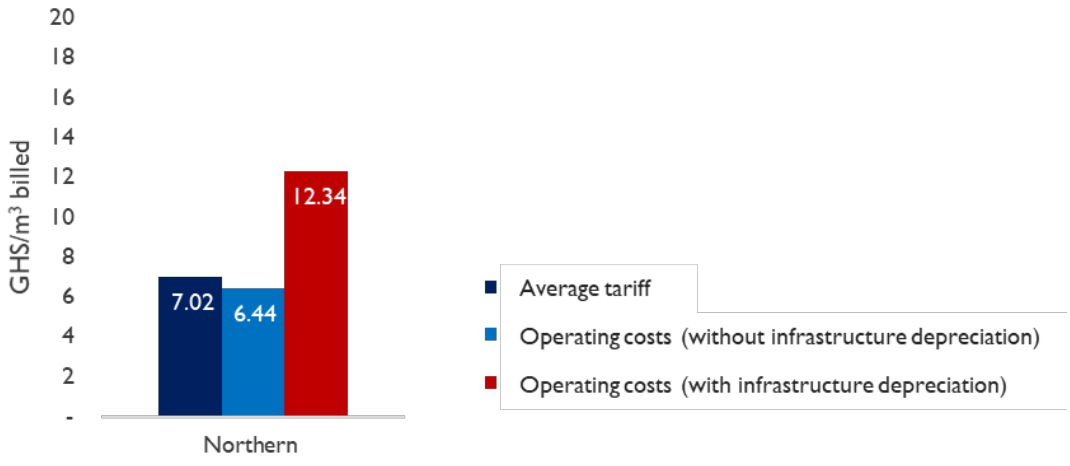
Category	2021	2022
Revenue		
Billed revenue	33.90	48.13
Other operational revenue	0.21	0.59
Total operating revenue	34.10	48.72
Operating Costs		
Personnel	13.35	15.89
Electricity	9.92	9.56
Repairs and maintenance	3.34	3.92
Chemicals	2.04	6.32
Others	14.23	8.98
Total operating costs	42.89	44.67
Margin (before infrastructure depreciation)	(8.79)	4.05
Infrastructure depreciation	40.27	40.96
Net Loss	(49.06)	(36.91)

Tariff structure

The average tariff in the Northern region was GHS 7.02/m³ in 2022. Similar to Ashanti North, commercial and industrial customers represented a small proportion of water consumption (6 percent) and had a limited contribution to revenue (10 percent), limiting their ability to cross-subsize other customers (Table D.3, Appendix D).

The average tariff covers operating costs per cubic meter without infrastructure depreciation but only cover 58 percent when considering depreciation (Figure 8). Similar to Ashanti regions, all except the residential lifeline and public standpipe tariffs cover the operating cost without depreciation. When infrastructure depreciation is included, the only tariff that approaches full operating cost recovery (88 percent) is that for industrial and commercial customers (Figure D.2, Appendix D).

Figure 8: Average per-Unit 2022 Tariffs Compared to Operating Costs for Tamale



As in Kumasi, the results suggest tariffs are insufficient for long-term financial sustainability, and the gap with operating costs (when considering infrastructure depreciation) is too large to be addressed with tariff increases alone. To match operating costs with infrastructure depreciation, tariffs would have to increase by 75 percent (Figure 8), which is unrealistic. Increasing commercial and industrial tariffs would have limited effect in the Northern region given that these customers only make up 10 percent of revenue (Table D.3, Appendix D) and may turn these customers away from GWCL and toward greater reliance on other sources such as private boreholes.[29] Increasing residential tariffs for wealthiest customers may be possible (Section 4.2.2) but would not entirely close the financial gap.

4.2.4 DEBT

The above analyses do not capture debt-related expenses, which GWCL accounts for at the national level as opposed to the regional level. Notably, GWCL has substantial debt, including some in foreign currency, and thus is subject to fluctuation (Table D.4–D.6, Appendix D). GWCL's capital position has deteriorated over time because of its persistent low-cost recovery ratio. Total liabilities relative to revenue almost doubled between 2020 and 2022, going from a ratio of 2.5 to 4.7. Indebtedness increased from 52 percent of assets in 2020 to 88 percent in 2022.

4.2.5 CONCLUSIONS

The current tariff structure does not support GWCL's long-term financial sustainability in Kumasi or Tamale. Average tariffs cover just over half of operating costs when considering infrastructure depreciation, which occurs at an annual rate of 4.6 percent.

Increasing commercial and industrial tariffs would likely have limited effect in Kumasi and Tamale. Although these tariffs are designed with the goal of cross-subsidizing residential and institutional customers, they cannot close the revenue gap in Kumasi and Tamale because commercial and industrial customers consume only a small share of the water supplied by GWCL and thus make up a small fraction of total revenue. Increasing residential tariffs among the wealthiest customers (e.g., the top 60 percent) may be possible but would not suffice to close the financial gap.

Measures beyond tariff adjustments should be considered to close the gap between billed revenue and operating costs, such as coverage expansions and improvements in operational efficiency.

4.3 OPTIONS FOR IMPROVING EQUITY AND AFFORDABILITY

- What options for improving water equity and affordability (e.g., revising tariff structures, cross-subsidy arrangements) support GWCL's financial viability and align with customers' willingness and ability to pay?

4.3.1 SCENARIOS

To explore opportunities for GWCL to improve financial viability and affordability in Kumasi and Tamale, we tested four scenarios and projected their financial impacts over five years. These scenarios are illustrative. Their goal is to broadly compare the impact of different measures on financial performance. They include several simplifying assumptions, and readers should interpret simulation results as a first approximation. For example, our scenarios apply the same measures in Kumasi and Tamale, but in practice, may require more nuanced, location-specific measures.

The scenarios were as follows:

[29] Increasing commercial and industrial tariffs may have greater impacts in other regions where these customers make up a substantial fraction of consumption (e.g., in Accra). This could in turn indirectly benefit the Northern or Ashanti regions if GWCL uses the surplus of highly industrialized regions to subsidize regions with lower industrial consumption.

1. **"Business as usual":** Represents no changes from known 2023 conditions.
2. **With efficiency and coverage gains:** Starts with Scenario 1 and adds reductions of NRW, personnel costs, and energy use, each 1 percent annually (i.e., 5 percent overall).[30] This scenario also assumes that residential service coverage increases by 20 percent by 2027, resulting in a larger customer base.
3. **With targeted tariff changes:** Starts with Scenario 2, extends the lifeline volume to 10 m3 per month for the poorest 40 percent of households,[31] increases the institutional tariff and the regular residential tariff by 30 percent,[32] and maintains the tariff for industry and commerce unchanged.[33] This scenario assumes that the regular residential tariff would apply to i) all non-poor customers from the first cubic meter, and ii) poor customers beyond 10 m^3.
4. **With wider tariff changes:** Starts with Scenario 3 and adds a 30 percent increase in the lifeline tariff, which would allow the average household in the poorest category to consume 10 m^3 per month while keeping water expenditures around 3 percent of total expenditures in both cities.

Other model assumptions include:

- For the "business as usual" scenario, expenditures increase at the annual growth rate of the last three years of GWCL (at national level) and performance indicators remain at current levels. For example, projections did not assume improvements in service quality that would result in increased household consumption of piped water and less reliance on alternative sources.
- From 2024 onwards, GWCL's revenues will increase at a slower pace than inflation, as has been the case in past years. Infrastructure depreciation will increase at the same annual rate as from 2021 to 2022, which implies that the assets will reevaluate at same pace.
- Scenarios 2, 3, and 4 include a 20 percent gain in service area coverage (an important aspect of improving equity in water access). The model however does not capture the capital costs of any required infrastructure expansion because i) increasing coverage without major infrastructure expansion would be possible in both cities, as current service areas are not saturated, and ii) customers (or donors in the case of pro-poor subsidy programs) would cover connection costs. In case of infrastructure expansions, the model would have to include additional capital and infrastructure depreciation costs.
- Scenarios 3 and 4 include targeted tariff adjustments, but we did not capture the administrative costs of identifying eligible households. We also made the simplifying assumption that these tariff adjustments would have no impact on consumption volumes and therefore no impact on operating costs.

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30 Personnel costs represent a large share of operating costs (36 percent) followed by energy costs (20 percent). Our scenarios assumed a 1 percent annual reduction in these costs and NRW, which is modest but plausible. For example, given the ongoing energy crisis in Ghana, higher reductions in energy costs may not be realistic.

31 This assumption was based on the observation that the regular residential tariff is unaffordable to households in the bottom two quintiles, particularly in Tamale (see Section 4.1). However, GWCL could apply the subsidy more conservatively only to the lowest quintile or to different subcategories (e.g., by income, by geographic location) depending on the chosen criterion.

32 This illustrative increase is compatible with willingness to pay among non-poor customers in Tamale (+41 percent on average) but not in Kumasi, where customers had a much lower willingness to pay (+7 percent on average; Section 4.1).

33 As mentioned in Section 4.2, commercial and industrial tariffs are already well above operating costs. Additionally, this customer category only makes up a small fraction of total revenue, so a tariff increase would have little effect.

- In all scenarios, we computed billed revenue, as opposed to collected revenue, to illustrate the full potential of tariff increases. This approach also matches more closely with actual regional-level income statements, which reflect billed (and not collected) revenue.

4.3.2 PROJECTIONS BASED ON SCENARIOS

With the "Business as Usual" scenario (scenario 1), the financial situation further deteriorates over the years in both cities: by the end of the fifth year, tariffs no longer cover operating costs without infrastructure depreciation (Tables 7–8; Table E.1, Appendix E), and both cities face substantial operating deficits (35 percent in Kumasi and 32 percent in Tamale, Table 9). In Scenario 2 (with efficiency and coverage gains), the financial situation would still be fragile, with substantial net losses (Tables 7–8; Table E.2, Appendix E) and persisting, though lower, operating deficits (6 percent in Kumasi and 5 percent in Tamale; Table 9).

Table 7: Financial Projections for Ashanti Region (Kumasi) under Four Different Scenarios, in Millions of Ghanaian Cedis

Category		Year 5 Projections			
	2022	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Revenue	158.0	186.6	227.1	304.3	324.2
Operating cost	142.9	252.3	240.3	240.3	240.3
Margin (before infrastructure depreciation)	15.1	(65.7)	(13.2)	64.0	83.9
Infrastructure depreciation	167.3	174.6	174.6	174.6	174.6
Net Loss	(152.2)	(240.3)	(188)	(110.6)	(90.7)

Table 8: Financial Projections for Northern Region (Tamale) under Four Different Scenarios, in Millions of Ghanaian Cedis

Category		Year 5 Projections			
	2022	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Revenue	48.7	59.9	72.1	88.2	94.7
Operating cost	44.7	79.4	75.8	75.8	75.8
Margin (before infrastructure depreciation)	4.0	(19.4)	(3.7)	12.4	19.0
Infrastructure depreciation	41.0	44.6	44.6	44.6	44.6
Net Loss	(36.9)	(64.0)	(48)	(32.2)	(25.6)

Table 9: Operating Margins (i.e., without Considering Infrastructure Depreciation) and Net Margins (with Infrastructure Depreciation) in Ashanti Region (Kumasi) and Northern Region (Tamale) under Four Scenarios

Category	Ashanti (Kumasi)		Northern (Tamale)	
	Operating Margin	Net Margin	Operating Margin	Net Margin
Current situation (2022)	10%	-96%	8%	-76%
5-Year Projections				
Scenario 1. "Business as usual"	-35%	-129%	-32%	-107%
Scenario 2. Efficiency and coverage gains	-6%	-83%	-5%	-67%
Scenario 3. With targeted tariff changes	21%	-36%	14%	-36%
Scenario 4. With wider tariff changes	26%	-28%	20%	-27%

With the proposed tariffs, monthly bills for 10 m^3 consumption for customers in the lifeline category would go from GHS 94 GHS to GHS 57 under Scenario 3 and to GHS 72 under Scenario 4. Both scenarios would improve affordability if accurately targeted at the most vulnerable households. Comparing Scenario 3 with Scenario 2 shows that expanding the lifeline volume would have no negative impact on financial performance if compensated by a tariff increase among wealthier customers and institutional customers. In fact, net losses are lower in Scenario 3 compared to Scenario 2 (Tables 7–8), and both cities have an operating margin (21% in Kumasi and 14% in Tamale, as opposed to a deficit in Scenario 2; Table 9). The primary challenges for these approaches would be i) how to best identify households to receive the lifeline tariff (e.g., using income thresholds, geographic location, proxy means tests) to fairly represent socioeconomic status without adding too much administrative burden or costs to implement (Poulin et al. 2022); and ii) to ensure that when several households share a single connection, the lifeline volume is applied per household as opposed to per connection.

Even though the financial performance would improve in Scenarios 3 and 4, revenues would still not suffice to cover all operating costs when considering infrastructure depreciation (Tables 7–8; Tables E.3–E.4, Appendix E). These scenarios show that even with efficiency gains, coverage expansion, and tariff increases for residential and institutional customers, the net deficit persists by 2027. When infrastructure depreciation is included, revenues would not be enough, and the net margins would still be negative (Table 9). Comparing Scenarios 3 and 4 shows that increasing the lifeline tariff does not noticeably improve financial performance with operating margins remaining largely unchanged (Table 9).

Additional, external funding would be needed to cover depreciation and infrastructure investment (Tables 7–8; Table E.3 and E.4, Appendix E). Depreciation is associated with assets, some of which are priced in foreign currency and therefore have a replacement value changing as a result of currency fluctuation. Even though information on the relative proportion of domestic and imported assets is not available, we expect that part of infrastructure depreciation changes with currency fluctuation, which has been volatile in the last years and which is outside of GWCL's control. If the trend continues, infrastructure depreciation is expected to keep growing.

4.3.3 CONCLUSIONS

In both Kumasi and Tamale, adjustments such as tariff increases and efficiency gains are required to ensure that revenue continues to cover operating costs exclusive of infrastructure depreciation (and avoid increasing debt). However, even when combined with modest efficiency gains, tariff increases cannot bridge the financial gap when considering infrastructure depreciation. Other strategies, including more aggressive efficiency gains than those modelled here, will be needed to address the considerable persisting gap between revenues and operating costs when considering infrastructure depreciation.

Targeted tariff increases could nevertheless pay for additional equity measures. For example, expanding the lifeline volume to 10 m^3 for 40 percent of the poorest residential customers, which would alleviate some affordability issues, would have no negative impact on financial performance if compensated by a tariff increase among the wealthiest residential customers and institutional customers. Further modelling would be required to identify the optimal tariff structure that maximizes affordability and equity while not interfering with financial viability (Appendix F).

5.0 RECOMMENDATIONS AND NEXT STEPS

5.1 RECOMMENDATIONS

Several immediate and longer-term opportunities to improve water service equity and financial viability arose from this study. URBAN WASH discussed and refined these recommendations with GWCL management and other stakeholders. Additional details on these recommendations are provided in separate city-level action plans.

A gradual implementation of the recommendations should be considered to ensure buy-in and sufficient planning time among all the necessary stakeholders (PURC, GWCL, donors, customers).

Tariffs and Fees

- Consider replacing the volume-capped lifeline tariff with a pro-poor differential tariff whereby low-income households pay a lower tariff irrespective of their total consumption and higher-income households pay a higher tariff irrespective of their total consumption. This would require a robust method to identify low-income households, which may come with high administrative costs.
- Further examine who currently benefits from the lifeline tariff. Our survey data suggests that beneficiaries are likely households with few members and/or those that rely heavily on other water sources for their domestic needs. Further examination of GWCL billing records would help confirm or nuance this hypothesis.
- If GWCL maintains the volume-capped lifeline tariff, conduct further modelling to estimate the financial impacts of new modalities that would improve equity, such as: i) expanding the volume to better respond to basic household needs; ii) in cases when several households share a connection, applying the lifeline volume per household and not per connection; and iii) changing the tariff structure such that the lifeline volume is always billed at the lifeline tariff, irrespective of total consumption.
- Investigate total water consumption volumes among different categories of households. Households in Kumasi and Tamale possibly use lower volumes than the 50 liters per capita per day recommended by the WHO. The modelling efforts mentioned above would require collecting robust information on typical consumption volumes.
- Examine possible changes to standpipe water tariffs to increase their affordability among households without piped connections.
- Increase residential and institutional tariffs to compensate for the above equity measures. Apply mathematical models to identify the optimal tariff structure that maximizes affordability and equity while not interfering with financial viability. This would allow using more nuanced assumptions and exploring a wider range of options (see examples in Appendix F) than the illustrative scenarios presented here. Such tariff and/or fee increases will be more acceptable to consumers if preceded by tangible improvements in service reliability and water quality.
- Maintain relative tariffs for industrial and commercial customers. Increasing tariffs for industrial and commercial customers would have little effect on revenue given that these customers represent a minor share of total consumption. Tariff increases may also incentivize them to find alternative water sources.
- Lower the connection fee for the poorest households and/or allow paying for the connection fee over time as part of the monthly service charge or bill. Consider increasing the connection fee of institutional and commercial customers to compensate.

- Adjust tariffs quarterly to match real increases in operating costs considering inflation and depreciation of the Ghanaian cedi. The periodic adjustment will protect the level of tariff from currency fluctuations, maintaining value in real terms.

Strategic Planning

- Improve performance indicator tracking to achieve efficient operating costs and NRW reduction as well as to justify future tariff increases.
- Efficiency gains must be more aggressive to make a difference. For example, reducing energy usage by 20 percent and labor costs by 10 percent would reduce operating costs by 7 percent. NRW still remains at high levels, yet the regions do not have sufficient funds to implement sustained, robust improvements.
- Increase funding for preventive maintenance and repairs to slow the depreciation rates of water infrastructure, which is especially important in the Ashanti region where physical losses make up 82 percent of NRW.
- Identify funding sources to cover infrastructure depreciation, such as government and donor support, as tariffs alone cannot cover depreciation even in optimistic scenarios.
- Increase service coverage in areas with existing infrastructure and consider investing in network expansion to grow the customer base subscribing to GWCL services. In Tamale, this will also require increasing GWCL's production capacity, which is currently a limiting factor for expanding coverage.

Policy Advocacy

- Work with PURC to establish a social category with an explicit targeting method for screening and identifying appropriate subsidy recipients.
- Work with PURC to revise the tariff structure by replacing the volume-capped lifeline tariff with a pro-poor differential tariff, whereby high-income customers pay a higher tariff to cover connection and consumption subsidies among low-income customers.
- Work with PURC to establish appropriate performance incentive agreements and accountability measures so GWCL can demonstrate efficient operation and better justify needed tariff increases.
- Tariffs should maintain their value in real terms, so periodic adjustments must address changes in the currency that affect the real value (inflation or exchange rate). Additionally, major tariff adjustments (done every three-year period) must fully reflect changes in the operating costs.
- Work with government ministries to determine alternatives to cost-recovery through tariffs alone (e.g., through national government budgeting processes, tax revenue, or utility bundling). Given the financial burden that loans cause GWCL and the fact that factors outside GWCL affect some debt, URBAN WASH may need to identify solutions outside GWCL, such as donors or the Ghanaian government, to alleviate the financial responsibilities associated with the loans.

5.2 NEXT STEPS

Drawing on the evidence from Components 1–3, URBAN WASH will collaborate with GWCL to select intervention(s) for piloting under Component 4 of the program and identification of appropriate performance indicators to measure the achievements of the pilot intervention(s).

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APPENDIX A: SURVEY AREAS

Table A.1: List of Communities Captured in the Household Survey

Category	Kumasi	Tamale
Low-income areas (LIAs) *(as determined in consultation with Ghana Water Company Limited [GWCL] in Kumasi and Slum Dwellers International in Tamale)*	Aburaso, Achiase*, Agogo, Alabar, Anloga Junction, Aponsakwa, Asabi, Asawase, Ashtown, Asokore Mampong, Atafua, Atonsu, Breman, Daku, Dompoase, Edwenase, Emena, Esaso, Feyiasi, Kokode*, Mpatasee, Oforikrom, Parkoso*, Sepetimpom, Susanso, Tafo, Zongo	Bamvim*, Bilpela, Choggu West, Dabokpa Residential, Jakarayili, Koblimahagu*, Mbanayili*, Nalung, North Lamashegu, Nwozie, Nyerizee, Zogzugu, Zuujung, Tua
Other areas	Aboabo No1, Abompe, Abrepo, Adum, Asafo, Asukwa, Asuoyebo, Bantama, Bompata, Bomso, Buabai, Dekyemsu, New Tafo, Nyaheso, Suame	Aboabo, Changli, Chanzeni, Dohinayili, Fazehini, Gbambayaa, Gumbehene, Kasalgu, Kpawpumo, Kukuo, Kumbungu, Maleshegu, Nyamando, Sabonjida, Sagnarigu, Salamba, Tishigu, Wamale, Yilonayili, Zion

*GWCL prescribed these communities.

APPENDIX B: AFFORDABILITY OF BASIC WATER NEEDS

Figure B.1: Proportion of Surveyed Households in Kumasi That Would Exceed the 3 Percent Affordability Threshold or Not if Consuming 50 Liters per Person per Day at Ghana Water Company Limited's [GWCL's] Regular Residential Tariff of 8.36 Ghanaian Cedis (GHS)/m³

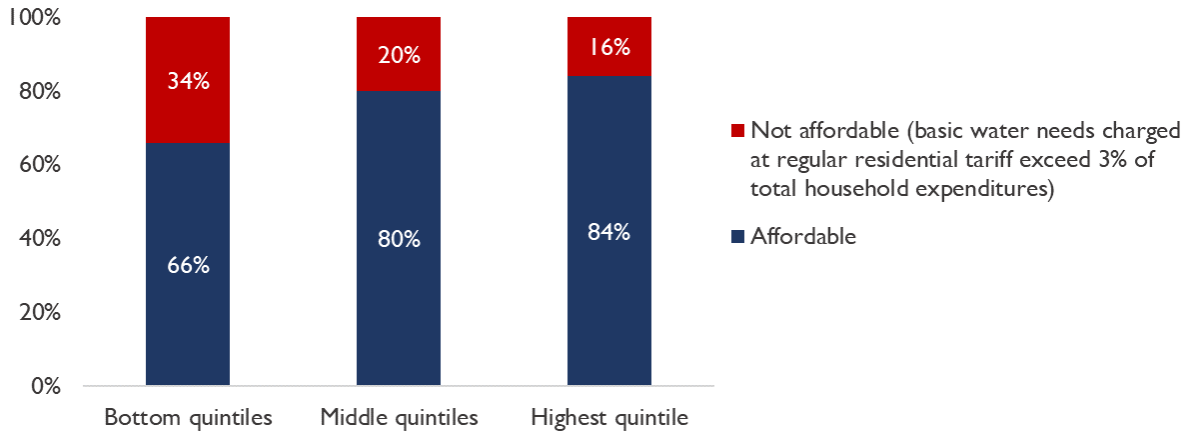
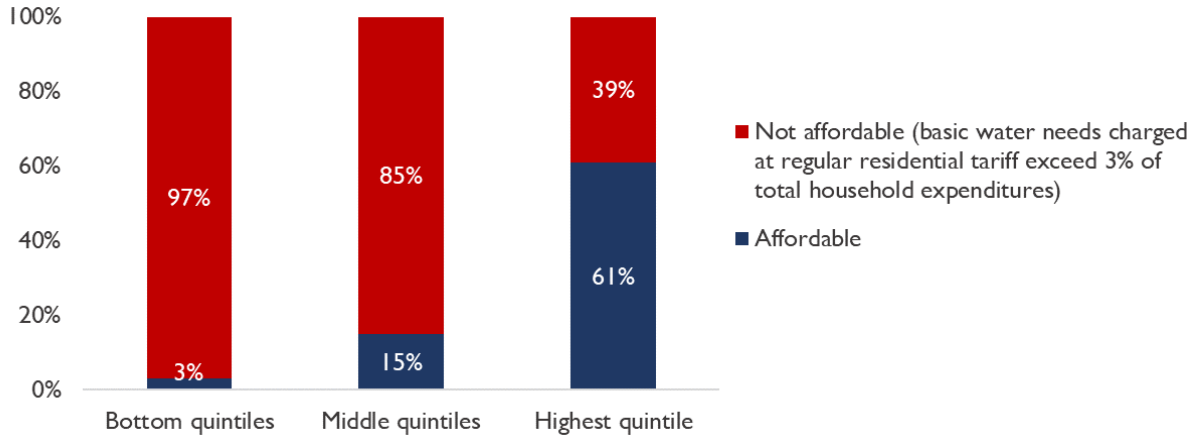


Figure B.2: Proportion of Surveyed Households in Tamale That Would Exceed the 3 Percent Affordability Threshold or Not if Consuming 50 Liters per Person per Day at GWCL's Regular Residential Tariff of GHS 8.36/Cubic Meters (m³)



APPENDIX C: TARIFF HISTORY

Table C.1: The Schedule for Quarterly Water Tariff Review from 2019 to 2023 Records Several Types of Approved Tariff Rate Increases

Year	Quarter	PURC-Approved Increases (Amount and Type)	
2023	Third Quarter	1.2%	No increase for lifeline tariff
	Second Quarter	9.1%	Variable increase among customers
	First Quarter	8.3%	Variable increase among customers
2022	Fourth Quarter	0.0%	
	Third Quarter	21.6%	Uniform increase
2021	First Quarter	0.0%	Service charge for all customers was created
2020	Fourth Quarter	0.0%	
	Third Quarter	0.0%	
	Second Quarter	0.0%	
	First Quarter	0.0%	
2019	Fourth Quarter	2.2%	Uniform increase

APPENDIX D: FINANCIAL VIABILITY

Table D.1. Disaggregated 2022 Income Statement for the Three Ashanti Regions (Kumasi), in Millions of Ghanaian Cedis (GHS)

Category	Ashanti Production	Ashanti South	Ashanti North	Total
Revenue				
Billed revenue	-	82.26	74.52	156.78
Other operational revenue	-	0.92	0.30	1.22
Total operating revenue	-	83.18	74.82	158.00
Operating Costs				
Personnel	17.18	16.59	18.17	51.94
Electricity	40.69	0.19	0.07	40.95
Repairs and maintenance	8.08	5.07	4.34	17.49
Chemicals	9.71	-	-	9.71
Others	7.49	6.74	8.59	22.83
Total operating costs	83.15	28.59	31.18	142.93
Margin (before infrastructure depreciation)	(83.15)	54.59	43.64	15.08
Infrastructure depreciation	28.78	16.72	121.77	167.27
Net gain or loss	(111.94)	37.87	(78.13)	(152.20)

Table D.2: The Share of Customers, Consumption, and Revenue per Category of Customers in Ashanti Regions (Kumasi) in 2022

Category	Customers Billed	Volume of Water Billed	Billed Revenue
Ashanti South Region (Kumasi)			
Residential	75%	51%	39%
Standpipe	1%	1%	0%
Industry/commerce	16%	18%	29%
Institutions and government	9%	31%	32%
Total	100%	100%	100%
Ashanti North Region (Kumasi)			
Residential	92%	71%	67%
Standpipe	1%	3%	2%
Industry/commerce	6%	5%	8%
Institutions and government	1%	21%	23%
Total	100%	100%	100%

Figure D.1: Average 2022 Tariffs per Customer Category in Ashanti Regions (Kumasi) Compared to Operating Costs per Cubic Meter (m³), with and without considering the Cost of Infrastructure Depreciation

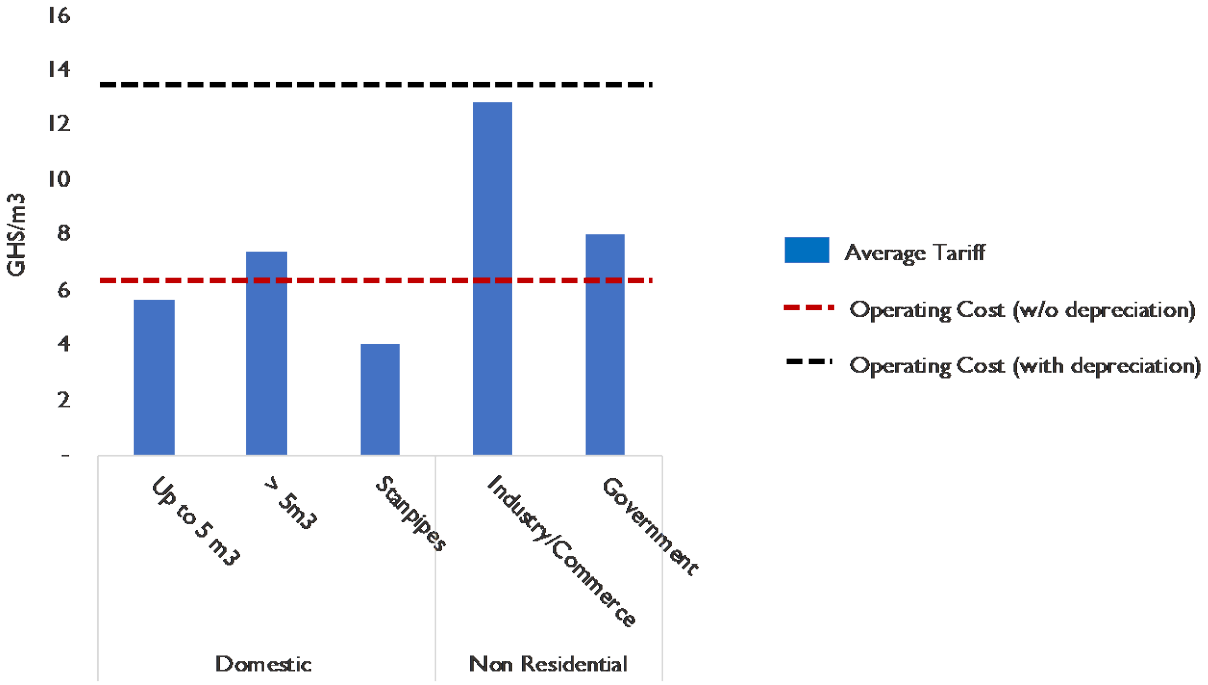


Table D.3: Share of Different Customer Categories in Water Consumption and Revenue in the Northern Region (Tamale) in 2022

Category	Customers Billed	Volume of Water Billed	Billed Revenue
Northern Region (Tamale)			
Residential	92%	58%	53%
Standpipe	2%	6%	3%
Industry/commerce	5%	6%	10%
Institutions and government	2%	30%	34%
Total	100%	100%	100%

Figure D.2: Average 2022 Tariffs per Customer Category in Northern Region (Tamale) Compared to Operating Costs per Cubic Meter with and without considering the Cost of Infrastructure Depreciation

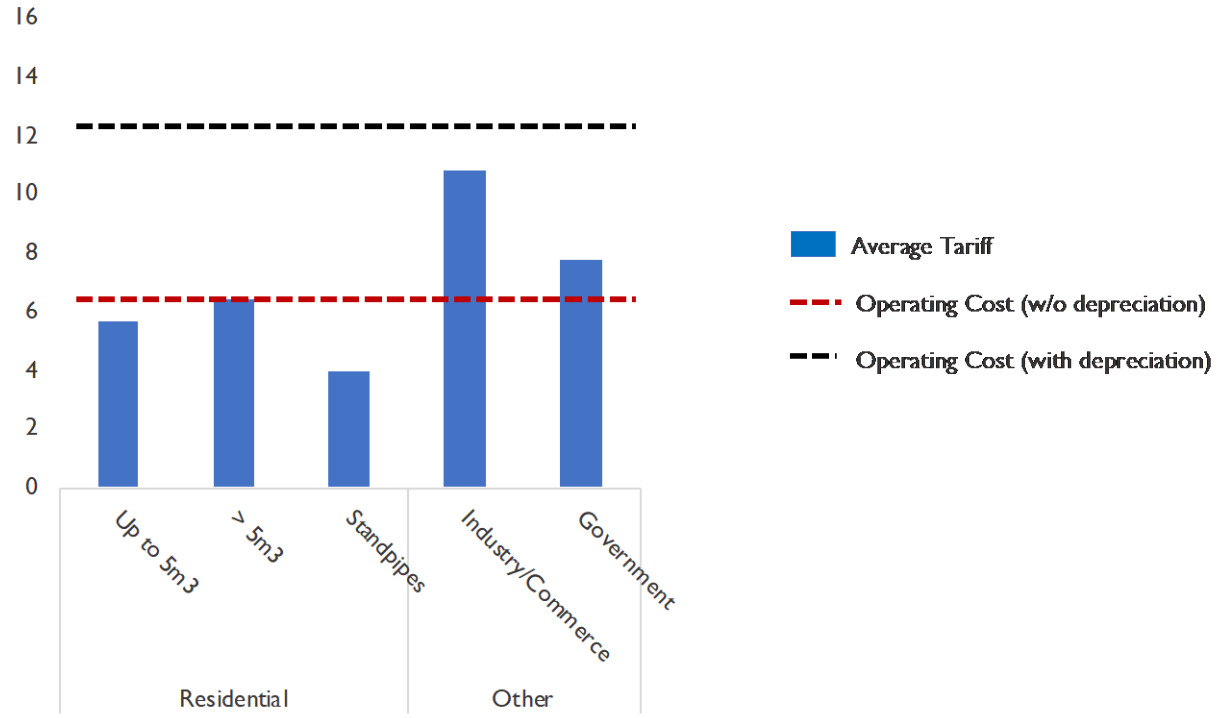


Table D.4: Income Statements of GWCL Nationwide in 2020–2022, in Millions of Ghanaian Cedis

Category	2020	2021	2022
Revenue			
Billed revenue	1,310.06	1,205.21	1,335.39
Other operational revenue	35.10	50.82	90.40
Total operating revenue	1,345.15	1,256.02	1,425.79
Operating Costs			
Personnel	289.89	323.48	369.06
Electricity	292.62	319.66	263.93
Repairs and maintenance	206.86	220.79	254.81
Chemicals	81.96	49.07	95.76
Others	194.14	200.27	465.01
Total operating costs	1,065.46	1,113.27	1,448.56
Margin (before infrastructure depreciation)	279.69	142.75	(22.78)
Infrastructure depreciation	793.86	828.61	880.99
Financial expenses	87.58	80.03	95.11
Exchange loss on borrowing	291.21	462.51	2,297.26
Loss before other revenue/non-operating expenses	(939.11)	(1,323.15)	(3,310.67)
Transfer from revaluation surplus	756.58	743.66	825.95
Net gain or loss	(182.54)	(579.48)	(2,484.72)

Table D.5: Balance Sheet of GWCL Nationwide in 2020–2022, in Millions of Ghanaian Cedis

Balance Sheet GWCL	2020	2021	2022
Assets			
Non-current assets	11,626.99	11,296.30	10,827.33
Current assets	1,007.67	957.35	1,092.73
Total assets	12,634.67	12,253.65	11,920.06
Liabilities			
Long-term liabilities	3,322.92	3,702.48	6,659.42
Current liabilities	3,199.91	3,356.15	3,845.02
Total liabilities	6,522.82	7,058.63	10,504.44
Equity and Reserves			
Total equity	6,111.85	5,195.02	1,415.62
Total liabilities and equity	12,634.67	12,253.65	11,920.07

Table D.6: GWCL Indicators from the Balance Sheet

Indicators from the Balance Sheet	2020	2021	2022
Liabilities/assets	0.52	0.58	0.88
Equity to assets	0.48	0.42	0.12
Long-term liabilities/revenues	2.47	2.95	4.67

APPENDIX E: FINANCIAL PROJECTIONS

Table E.1: Income Statement Projected to 2027 under the "Business as Usual" Scenario, in Millions of Ghanaian Cedis

Category	Northern		Ashanti	
	2022	Year 5 Projection	2022	Year 5 Projection
Revenue				
Billed revenue	48.1	59.2	156.8	185.2
Other operational revenue	0.6	0.7	1.2	1.4
Total revenue	48.7	59.9	158.0	186.6
Operating costs				
Personnel	15.9	29.1	51.9	95.0
Electricity	9.6	15.0	41.0	64.3
Repairs and maintenance	3.9	6.6	17.5	29.5
Chemicals	6.3	9.3	9.7	14.3
Others	9.0	19.4	22.8	49.2
Total operating costs	44.7	79.4	142.9	252.3
Margin (before infrastructure depreciation)	4.0	(19.4)	15.1	(65.7)
Infrastructure depreciation	41.0	44.6	167.3	174.6
Net loss	**(36.9)**	**(64.0)**	**(152.2)**	**(240.3)**

Table E.2: Income Statement Projected to 2027 under the "Efficiency and Coverage Gains" Scenario, in Millions of Ghanaian Cedis

Category	Northern		Ashanti	
	2022	Year 5 Projection	2022	Year 5 Projection
Revenue				
Billed revenue	48.1	71.4	156.8	225.7
Other operational revenue	0.6	0.7	1.2	1.4
Total revenue	48.7	72.1	158.0	227.1
Operating Costs				
Personnel	15.9	31.4	51.9	102.6
Electricity	9.6	11.0	41.0	47.2
Repairs and maintenance	3.9	6.6	17.5	29.5
Chemicals	6.3	6.0	9.7	8.7
Others	9.0	20.8	22.8	52.4
Total operating costs	44.7	75.8	142.9	240.3
Margin (before infrastructure depreciation)	4.0	(3.7)	15.1	(13.2)
Infrastructure depreciation	41.0	44.6	167.3	174.6
Net loss	**(37)**	**(48)**	**(152)**	**(188)**

Table E.3: Income Statement Projected to 2027 Assuming Efficiency and Coverage Improvements, Expansion of the Lifeline Volume to 10 Cubic Meters per Month, and a 30 Percent Increase in Residential and Institutional Tariffs, in Millions of Ghanaian Cedis

Category	Northern		Ashanti	
	2022	Year 5 Projection	2022	Year 5 Projection
Revenue				
Billed revenue	48.1	87.5	156.8	302.8
Other operational revenue	0.6	0.7	1.2	1.4
Total revenue	48.7	88.2	158.0	304.3
Operating Costs				
Personnel	15.9	31.4	51.9	102.6
Electricity	9.6	11.0	41.0	47.2
Repairs and maintenance	3.9	6.6	17.5	29.5
Chemicals	6.3	6.0	9.7	8.7
Others	9.0	20.8	22.8	52.4
Total operating costs	44.7	75.8	142.9	240.3
Margin (before infrastructure depreciation)	4.0	12.4	15.1	64.0
Infrastructure depreciation	41.0	44.6	167.3	174.6
Net loss	**(36.9)**	**(32.2)**	**(152.2)**	**(110.6)**

Table E.4: Income Statement Projected to 2027 Assuming an Additional 30 Percent Increase in the Lifeline Tariff, in Millions of Ghanaian Cedis

Category	Northern		Ashanti	
	2022	Year 5 Projection	2022	Year 5 Projection
Revenue				
Billed revenue	48.1	94.0	156.8	322.8
Other operational revenue	0.6	0.7	1.2	1.4
Total revenue	48.7	94.7	158.0	324.2
Operating Costs				
Personnel	15.9	31.4	51.9	102.6
Electricity	9.6	11.0	41.0	47.2
Repairs and maintenance	3.9	6.6	17.5	29.5
Chemicals	6.3	6.0	9.7	8.7
Others	9.0	20.8	22.8	52.4
Total operating costs	44.7	75.8	142.9	240.3
Margin (before infrastructure depreciation)	4.0	18.9	15.1	83.9
Infrastructure depreciation	41.0	44.6	167.3	174.6
Net loss	**(36.9)**	**(25.6)**	**(152.2)**	**(90.7)**

APPENDIX F: CONSIDERATIONS FOR OPTIMIZING TARIFFS

	Current Situation	Option A (in Scenario 3)	Option B	Option C (Standard Increased Block Tariff)
Institutional customers	12.14 Ghanaian cedis (GHS)/m^3	+30% for all	+30% for all	+30% for all
Lifeline volume	5 m^3	10 m^3	No threshold	15 m^3
Lifeline tariff	GHS 4.72/m^3 but would only apply if total consumption is < 5 cubic meters (m^3)	Tariff unchanged but would apply to the first 10 m^3 of poor households (i.e., true increased block tariff [IBT] but for the poor only)	Tariff unchanged but would only apply to the poor (i.e., flat rate for the poor)	Tariff unchanged but would apply to the first 10 m3 of everyone, independent of their total consumption (i.e., true IBT for everyone)
Regular residential tariff	GHS 8.36/m^3 would apply to entire consumption if consumption exceeds 5 m^3 (i.e., not a true IBT)	+30% would apply to all consumption of non-poor households and to consumption above 10 m^3 for poor households	Unchanged for midrange household. +50% for the wealthiest (i.e., the top 20%)	+30% would apply to everyone beyond 10 m^3 There could also be a third band above a certain amount (e.g., 30 m^3) with an even higher tariff.
Comments	• Lifeline volume can only meet the needs of households with 3 members or less. Most households therefore exceed the lifeline volume and pay the regular tariff. • The regular tariff is unaffordable to 70% of households in Kumasi and 93% in Tamale.	• Lifeline volume can meet the needs of households with 6 members or less, which is better but still not enough for Tamale. • The new residential tariff would be approximately affordable in Kumasi (75 liters per day per person would be 4% of total expenditures for the average midrange household and 3% for the average wealthy household), even though people said they were not willing to pay this much. • The tariff would be less affordable in Tamale, where the average household size is much larger. At 50 liters per day per person, water expenditures would be consistent with willingness to pay but would be 8% of total expenditures for the average midrange household).	• There would be no more concerns about lifeline volume not meeting basic household needs. • There would be risk that this would not encourage water conservation, particularly in Kumasi. In Tamale, the risk would be small in practice, because 75 liters per day per person would be GHS 117 per month for the average household in Tamale (i.e., 6% of total expenditures). Spending more would likely be cost-prohibitive.	• There would be fewer concerns about lifeline volume not meeting basic needs. • There would be fewer concerns about regular tariff not being affordable to the middle class since their first 15 m^3 would be billed at the lifeline tariff. • Some of these measures could be compensated by a third tariff block.