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PRO-POOR CONNECTION SUBSIDIES TO IMPROVE WATER ACCESS IN GHANA

Final Inception Report

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ACRONYMS

CBT	Community-Based (or participatory) Targeting
CONIWAS	Coalition of Nongovernmental Organizations in Water and Sanitation
CSIR	Council for Scientific and Industrial Research
DHS	Demographic and Health Survey
FGD	Focus Group Discussion
GAMA	Greater Accra Metropolitan Area Sanitation and Water Project
GHS	Ghanaian Cedi
GPOBA	Global Partnership on Output-Based Aid
GPS	Global Positioning System
GSA	Ghana Standards Authority
GWCL	Ghana Water Company Limited
GWOPA	Global Water Operators' Partnerships Alliance
IBT	Increasing Block Tariff
IRB	Institutional Review Board
IRC	Resource Center Network
JMP	Joint Monitoring Programme
KNUST	Kwame Nkrumah University of Science and Technology
LEAP	Livelihood Empowerment Against Poverty
LICSD	Low-Income Customer Support Department
LICSU	Low-Income Customer Support Unit
LIUC	Low-Income Urban Community
LMIC	Low- and Middle-Income Country
MMDA	Metropolitan, Municipal, and District Assembly
MoU	Memorandum of Understanding
MSWR	Ministry of Sanitation and Water Resources
NDPC	National Development Planning Commission
NGO	Nongovernmental Organization
PMT	Proxy Means Testing

PPI	Poverty Probability Index
PURC	Public Utilities Regulatory Commission
QA/QC	Quality Assurance/Quality Control
SCF	Social Connection Fund
SWA	Sanitation and Water for All
TREND	Training, Research, and Networking for Development
TWG	Technical Working Group
UNICEF	United Nations Children's Fund
URBAN WASH	Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene
USAID	United States Agency for International Development
USD	United States Dollars
UWP	Urban Water Project
WASH	Water, Sanitation, and Hygiene
WFP	World Food Programme
WHO	World Health Organization
WSSDP	Water Sector Strategic Development Plan
WTP	Willingness to Pay
WUA	Water User Association

1.0 INTRODUCTION

1.1 BACKGROUND

In the Accra metropolitan area, about half of the population has a household piped water connection while the rest rely on community standpipes and boreholes (Twerefou et al. 2015; Joint Monitoring Programme [JMP] 2021). This is well below the government's stated aim for 70 percent of urban/peri-urban households to have access to piped water by 2030 (Sanitation and Water for All [SWA] 2022). Fewer than 30 percent of households in low-income informal settlements and peri-urban areas have access to piped services (Franceys 2005; Training, Research, and Networking for Development [TREND] 2020). There is broad consensus among Ghanaian water, sanitation, and hygiene (WASH) stakeholders for the need to improve water service delivery in low-income communities, most recently documented in the 2012-2025 Water Sector Strategic Development Plan (WSSDP) (Ghana Ministry of Water Resources, Works, and Housing 2014).

Water connection subsidies offer an avenue to increase piped connections among low-income urban populations but remain underexplored in the literature. Connection subsidies offer one-time reductions in price for new customers to connect to the system while consumption subsidies aim to reduce the cost of using a service on a continuing basis (e.g., by lowering volumetric tariffs). Extensive literature on consumption subsidies reinforces the importance of reducing barriers to access water in addition to reducing barriers for consuming water and underscores the need to pay more attention to the role of connection subsidies. (Andres et al. 2019; Banerjee and Morella 2011; Komives et al. 2005).

In Accra, Ghana Water Company Limited (GWCL) began piloting water connection subsidies in low-income urban communities (LIUCs) of the metropolitan area around 2017 under the World Bank-funded Greater Accra Metropolitan Area (GAMA) project (GWCL 2022c; Jammi n.d.). This was shortly after GWCL created the Low-Income Customer Support Unit (LICSU), which was responsible for developing and implementing policies and programs to improve water service provision among the urban poor through partnerships with funding agencies (Global Water Operators' Partnerships Alliance [GWOPA] 2021). By 2019, the GAMA project had successfully installed over 10,000 new piped connections in LIUCs, more than double the initial target. Following GAMA's success, GWCL continued extending donor-subsidized connections in Accra's LIUCs. Following GAMA, there has been three additional projects, funded by WaterWorX, UN-Habitat, and United Nations Children's Fund (UNICEF). Combined, all the projects have installed over 16,000 new subsidized connections within Accra's LIUCs (GWCL 2022c). The following sections summarize learnings and knowledge gaps based on these efforts.

1.2 ACTIVITY PURPOSE AND RESEARCH QUESTIONS

The Urban Resilience by Building and Applying New Evidence in Water, Sanitation, and Hygiene (URBAN WASH) is a five-year United States Agency for International Development (USAID) research and learning activity (2021–2026) funded by the Bureau for Resilience and Food Security and led by Tetra Tech. URBAN WASH generates evidence through applied research to promote sustainable, equitable, and climate-resilient WASH policies and programming in urban and peri-urban areas. **A primary goal of URBAN WASH is to address knowledge gaps of service providers and government institutions in USAID priority countries and to strengthen the evidence base for decision making.**

Under URBAN WASH, Tetra Tech and the Aquaya Institute are leading applied research on a pro-poor subsidy program that is scalable, financially sustainable, and effective at reaching the most vulnerable.

In 2023, discussions between URBAN WASH and GWCL demonstrated an opportunity for a research partnership to elucidate and disseminate lessons from GWCL's recent water connection subsidy projects and inform future iterations of GWCL's pro-poor programs and potentially similar programs in other countries. Resulting discussions with GWCL and conversations with WASH stakeholders in Ghana shaped a research agenda with the following priority questions:

1. ***Impact*:** To what extent did connection subsidies increase water access and improve livelihoods among households in targeted LIUCs?[1]
2. ***Finances*:** (A) To what extent did the subsidized connections impact GWCL's revenue collection efficiency? (B) How much funding would be required to expand and sustain the program city-wide, and what strategies could fill the funding gap while lowering reliance on donor funding?
3. ***Strategies for future programs*:** (A) What barriers do the urban poor, particularly women, renters, or marginalized groups, face in accessing connection subsidy projects? How can program implementation be adjusted to lower these barriers? (B) What barriers does GWCL face in administering the subsidy projects and what strategies could address these institutional challenges?

1.3 INTENDED AUDIENCE AND USES

The primary audiences for the research findings are GWCL and USAID. The findings will provide GWCL with an evidence base to scale-up subsidy implementation, maximize impacts, and institutionalize an approach that sustainably improves access to piped water in LIUCs.

Secondary intended audiences include the Ghana Public Utilities Regulatory Commission (PURC) and the Ministry of Sanitation and Water Resources (MSWR), as well as donors and nongovernmental organizations (NGOs) supporting pro-poor water access in Ghana and internationally. Findings will inform MSWR and PURC in updating pro-poor policies and guide funding toward an institutionalized program with GWCL.

For the sector at large, this study will be the first impact evaluation of pro-poor water connection subsidies and will provide lessons on the multiple dimensions of program implementation, including targeting methods and funding strategies.

1.4 ORGANIZATION OF REPORT

This inception report summarizes existing literature on pro-poor water subsidies (Section 2), followed by a description of Ghana's pro-poor water delivery policies and approaches (Section 3). Section 4 presents hypotheses associated with the proposed research questions. Sections 5 through 8 elaborate the research study design, data collection and analysis procedures, and data management. Engagement

[1] This research question does not state targeting effectiveness explicitly based on feedback from GWCL to avoid tensions with their funders, but URBAN WASH's interest in targeting effectiveness is implicit in the phrase "impacts amongst households in target communities" (as opposed to "impacts amongst beneficiary households"). The proposed wording is also consistent with the existing Memorandum of Understanding (MoU), which was negotiated with GWCL in December 2022/January 2023. Also note that there is a possibility to discuss adding water quality testing to further test impacts.

and dissemination are described in Section 9, activity management in Section 10, and monitoring and evaluation in Section 11. Project timelines are in Section 12, supplemented by a COVID-19 contingency plan in Section 13, and the budget in Section 14.

2.0 LITERATURE REVIEW

Although multiple sectors, including water supply, commonly employ subsidies as instruments to address unequal access to services, their design, use, and resulting impacts vary highly. **Economists often criticize subsidies for introducing pricing distortions that may lead to inefficiencies and increase the cost of a product or service and harm consumers.** Furthermore, previous evaluations demonstrate that particular types of subsidies perform poorly in terms of targeting or benefiting the desired category of consumers (Komives et al. 2005). This raises important questions regarding who benefits from subsidies and how subsidies can be designed to ensure greater access to services for the poor.

2.1 TYPES OF SUBSIDIES

In the water sector, subsidies fit into two categories: consumption versus connection and targeted versus untargeted (Table 1). Consumption subsidies aim to reduce the cost of consuming a service on a continuing basis (e.g., by lowering volumetric tariffs) and benefit existing customers. Connection subsidies are one-time reductions in price for new customers to connect to the system. Both categories of subsidies can be targeted or untargeted. Targeted subsidies attempt to benefit a particular group of consumers, while untargeted subsidies are offered across-the-board to all consumers, such as the general underpricing of a service.

Targeted subsidies can incorporate implicit and explicit targeting methods. Implicit targeting is the unintentional result of a pricing practice (e.g., a flat fee or tolerance of illegal connections), whereas explicit targeting represents a conscious attempt to reduce costs for a certain type of consumer. There are a variety of methods to explicitly target subsidies. Quantity targeting theoretically allows customers to select the price they pay by tying it to the direct use or consumption of a service. For example, a customer consuming a larger monthly volume of water would pay a higher tariff per unit consumed. Similarly, service-level targeting relates to the tier of service a consumer chooses to use (e.g., public standpipes provide water at a lower price than networked household connections). Apart from self-selection, the government or a utility can administer subsidies to particular groups explicitly through a variety of selection methods, including categorical (e.g., veterans, senior citizens), geographical (households in a specific location), income-based via means testing, or community-based (Komives et al. 2005).

Table 1. Typologies of consumption and connection subsidies

	Untargeted	**Implicit Targeting**	**Explicit Targeting** *(Self-selection through quantity or service level consumed)*	**Explicit Targeting** *(Administrative selection)*
Consumption	Universal price subsidies (non-cost recovery prices)	Uniform tariff, low collection rates, tolerance of illegal connections	Increasing block tariffs (IBTs), public taps with lower tariffs	Geographical selection, means testing, community-based
Connection	No connection fee (since a utility bears a cost when connecting households to the network, the utility is subsidizing all new	Flat connection fees (households further away from the water main benefit from an implicit subsidy, as the utility's cost of	Reduced fee for households providing labor/materials	Social connections (only available to specific groups of households, selected via one of the

	Untargeted	Implicit Targeting	Explicit Targeting *(Self-selection through quantity or service level consumed)*	Explicit Targeting *(Administrative selection)*
	customers by not charging a fee)	connection is higher as distance increases)		methods mentioned above)

Adapted from Komives et al. 2005.

2.2 SUBSIDY TARGETING

A common approach to **evaluating the performance of subsidy targeting** methods is to compare undercoverage and leakage rates, also known as errors of exclusion and errors of inclusion. Errors of exclusion (undercoverage) refer to the proportion of poor households that are not included in the subsidy program and errors of inclusion (leakage) refer to the proportion of nonpoor households who are classified as poor and benefit from the subsidy (Wodon 2012). Generally, narrower or more accurate targeting methods are associated with higher costs of administration (Komives et al. 2005; Andres et al. 2019). The tradeoffs between targeting methods are discussed in further detail in the following sections.

2.2.1 PERFORMANCE OF INCREASING BLOCK TARIFFS

The most prevalent subsidies in the water sector are IBTs, which represent a form of quantity targeting. IBTs apply higher unit prices to higher volumes of consumption and are used by over 80 percent of utilities across Latin America, South Asia, East Asia, and Africa (Komives et al. 2005). Data from 45 African utilities collected in 2011 showed that 39 employed some form of an IBT (Banerjee and Morella 2011). However, there is broad consensus and growing empirical evidence that IBTs perform poorly as a subsidy mechanism to target the poorest populations (Andres et al. 2019; Banerjee and Morella 2011; Komives et al. 2005; Boland and Whittington 1998). A recent study by the World Bank analyzed networked water supply subsidies in 10 countries and found that an average of 56 percent of the subsidy reaches the wealthiest quintile of the population, while only six percent of the subsidy reaches the poorest quintile. The authors attributed this poor performance to two access factors: (i) the poorest communities are typically located in areas not serviced by networks, and (ii) when they are within a networked service area, they may be unable to afford connection and/or consumption charges and they therefore do not connect to the network (Andres et al. 2019). Similarly, an empirical study of consumption subsidies in Nairobi found that households in the lowest wealth quintile received only 15 percent of the total subsidies delivered. Additionally, the overall structure failed to implement an effective cross-subsidy, since over 80 percent of all households fell within the lowest two blocks of the tariffs. Accordingly, most users, regardless of wealth, received the subsidy, with very few users paying the higher volume tariffs that were meant to cross-subsidize the lower volume tariffs. Additionally, the poorest urban residents were more likely to share a connection among several households and therefore exceed the first, subsidized tariff block (Fuente et al. 2016).

Other factors that limit the performance of IBTs (Box 1) include the presence of a minimum consumption charge, which is often found in Latin America. An empirical study in Nicaragua showed that, on average, IBTs provided smaller subsidies to the poor than to other subsidy recipients due to fixed charges or minimum consumption values for every consumer, regardless of income (Komives et al. 2005). IBTs penalize high-density housing communities or compounds where multiple households share a connection (and therefore consume more water overall), which is more typical in low-income areas. They also rely on the assumption that households will adjust their

consumption behavior as they gain greater knowledge of the costs associated with higher consumption. However, it can be difficult for households to monitor their own piped water consumption in practice, particularly when multiple households share a meter (Bayliss, Newborne, and Tucker 2012).

Box 1. Summary of Challenges with IBTs

- IBTs do not reach the poorest communities located outside of networked service areas or those unable to afford upfront connection charges.
- Poor households do not necessarily consume less water than non-poor households, which impacts the targeting effectiveness of the subsidy and benefits wealthy consumers.
- In practice, few consumers fall in the highest tariff block, impacting the long-term financial sustainability of cross-subsidizing consumers in lower tariff blocks.
- Minimum consumption charges reduce the size of the subsidy that poor households can benefit from.
- IBTs penalize high-density housing, which is typical in low-income areas where multiple households share a connection and consume higher volumes of water.
- IBTs require consumers to monitor their own consumption, which can be difficult in practice.

Banerjee and Morella (2011) suggest that connection subsidies are a viable alternative to IBTs. Their targeting performance could be better than consumption subsidies if they are designed to reach the majority of households not presently connected, but living in areas where service is provided (Banerjee and Morella 2011). Additionally, **targeting subsidies using means-testing methods** can offer improvements in both connection and consumption subsidy performance in contexts where there is adequate income variation to justify targeting (Fuente et al. 2016).

2.2.2 PERSPECTIVES ON OTHER TARGETING METHODS

Narrower targeting of all subsidies can offer improvements in subsidy performance, but it comes at a higher administrative cost for governments or utilities, and a higher personal cost for beneficiaries, as they may have to offer their time and/or transportation to be screened for the subsidy benefit (Komives et al. 2005; Andres et al. 2019). Table 2 details the costs, advantages, and risks of different administrative targeting methods.

In summary, geographic and categorical targeting methods are easier to administer, but geographical targeting risks overlooking wealth disparities within a community and categorical targeting depends on the effectiveness of the chosen proxies (Trémolet, Kolsky, and Perez 2010; Dershem et al. 2013). Community-based (or participatory) targeting (CBT) and means-tested targeting are more complex. **CBT requires communities to identify poor households themselves**, since community members' knowledge of a household's situation can be more reliable or nuanced than information provided in a survey. However, this approach is difficult to apply at scale and is susceptible to risks such as the exclusion of less powerful community members (e.g., ethnic minorities or recent immigrants), and/or the inclusion of non-poor households selected by powerful local leaders (World Food Programme [WFP] 2015). The likelihood of these risks can increase in urban areas where population density and lack of social cohesion can complicate who or which structures represent "community" (Abbonizio 2021).

Means-tested targeting relies on the financial situation of households or proxies and can take various forms. Income-based means testing uses reported financial information, such as income reported to tax authorities. This data is often either non-existent or difficult to obtain in low- and middle-income countries (LMICs). **Proxy means testing (PMT)** is more common in such contexts and relies on predicting a household's poverty status based on proxy indicators of wealth such as housing material, assets owned, and water access. (Bayliss, Newborne, and Tucker 2012). Some well-known proxy means-tested subsidy programs include the Chilean water subsidy, which has been in place since 1990, and similar programs in Argentina and Paraguay. Although the targeting performance of means-tested subsidies is often better than other types of targeting, the administrative costs are much higher (Komives et al. 2005). Notably, the Chilean water subsidy scheme is part of a national program used to distribute multiple public subsidies, including and beyond water. This spreads out the administrative costs of the scheme across services and sectors (Gomez-Lobo and Contreras 2003). Developing a PMT requires conducting time-consuming household surveys and statistical analysis of the collected data. Furthermore, it is typically more difficult to mobilize community or political support due to the process' complexity (Dershem et al. 2013). Common PMTs include the Demographic and Health Survey (DHS) wealth index and the Poverty Probability Index (PPI), both of which rely on statistical analysis of household survey responses (Poverty Probability Index 2023; DHS n.d.). Another recently developed PMT is the EquityTool, which is a short, country-specific questionnaire consisting of a subset of the DHS questions (Chakraborty et al. 2016; Equity Tool n.d.). The Government of Ghana also employs a national PMT to administer the Livelihood Empowerment Against Poverty (LEAP) program, which is a social cash transfer program targeting low-income and vulnerable households (Ministry of Employment and Social Welfare 2012).

Cook et al. (2020) found that **means-tested programs were used in about 25 of the 77 water and sanitation customer assistance programs** they analyzed (32 percent), including in countries such as Cameroon, South Africa, Argentina, and Cambodia. A third of these means-tested programs used proxies for income, with the most common proxies being household assets, size, and type of residence (Cook et al. 2020). A number of studies have attempted to address the time and cost challenges associated with proxy-means testing by developing shorter surveys using statistical analysis (Chakraborty et al. 2016; Poverty Probability Index 2023), and/or by employing machine-learning techniques (Poulin et al. 2022). The Indian government is streamlining its subsidy and social service targeting by using a nationwide biometric identification system and ID (Aadhar) card. But this system has also been criticized as an invasion of privacy and a security risk (Cook et al. 2020). The system has also been riddled with data management problems leading to an inability to correctly authenticate cards (Ikeda 2022).

Table 2. Summary of advantages and disadvantages associated with subsidy targeting types

Targeting Type	Definition	Advantages	Disadvantages	Examples
Categorical Targeting	Households selected based on specific characteristics (Komives et al. 2005)	Easy to understand and implement (Dershem et al. 2013)	High errors of inclusion and exclusion, and depends on the selected category's correlation with poverty (Dershem et al. 2013)	Veterans, single-headed households, differently abled, etc.
Geographic Targeting	Households located within areas identified as low-income communities (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019).	Low cost and simple to implement (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019).	Completely homogeneous neighborhoods are rare, so there is a high likelihood of including non-poor households or excluding poor households (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019). Landlords could capture this subsidy if tenants pay for water as part of rent, therefore excluding low-income renters (Cook et al. 2020).	*Kenya*: MajiData is an online database for the country's water sector that contains data on more than 1800 urban low-income areas in over 200 cities and towns. (Andres et al. 2019).
Community-based Targeting	Community members or organizations select poor households within their community to receive the subsidy through a participatory approach where members agree on a definition of poverty (Trémolet, Kolsky, and Perez 2010; Bayliss, Newborne, and Tucker 2012).	Community members' knowledge of a household's situation can be more reliable or nuanced than information provided in a survey (Trémolet, Kolsky, and Perez 2010; WFP 2015).	Subjective, and could include non-poor households or exclude poor households based on the bias of powerful community leaders, which can be difficult to control (Trémolet, Kolsky, and Perez 2010; WFP 2015).	*Bangladesh*: Village members prepared lists of households in extreme poverty (Trémolet, Kolsky, and Perez 2010). *Northern Ghana:* Rural village members identified vulnerable households that could not feed themselves throughout the year or included a vulnerable person, to receive vouchers for toilet subsidies (Trimmer et al. 2022).
Income-based means testing	Households are selected to receive a subsidy based on reported income levels (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019)	More accurate than other targeting methods (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019)	Data is often unavailable in developing countries (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019). Could exclude households that change poverty status unless data is constantly updated. Also excludes seasonal	*Thailand*: Health services were provided based on reported household income; doctors verified income level during patient visits (Bitrán and Muñoz 2000).

Targeting Type	Definition	Advantages	Disadvantages	Examples
			income (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019). Households might not openly share income information to avoid the stigma of being poor (Chakraborty et al. 2016).	
PMT	Households are selected based on their poverty status as predicted by proxy indicators of wealth, such as education levels, health, types of assets owned, etc. (Komives et al. 2005; Dershem et al. 2013)	Better performing than geographical and categorical targeting methods (Komives et al. 2005). Data can be observed and verified (Dershem et al. 2013). Considers permanent income rather than seasonal income (Bitrán and Muñoz 2000)	Time-consuming to construct and expensive to implement (Komives et al. 2005). Difficult to capture change in poverty status over time (Trémolet, Kolsky, and Perez 2010).	Chile's *ficha* CAS scoring system is a two-page form that is used for determining the eligibility of households for a wide range of government programs. The form collects detailed information on housing conditions, material assets, occupations, educational levels, dates of birth, and incomes. Points are allocated to households based on the information provided. It is updated every three years (Komives et al. 2005).

2.3 PAYMENT MODALITIES AND ADMINISTRATIVE BARRIERS FOR PIPED CONNECTIONS

In addition to unaffordable costs, there are several other factors precluding poor households from connecting to networks. **One of these factors is a lack of diverse payment options (e.g., installment plans)**, since many poor households struggle to build up enough cash to pay total costs upfront or in a lump-sum (Kayaga and Franceys 2007). At least two studies of urban poor households in Jakarta (Bakker et al. 2008) and Maputo (Jimenez-Redal, Parker, and Jeffrey 2014) cite the lack of flexible payment options as a barrier to uptake of piped water connections. In Maputo, the study concluded that households in low-income neighborhoods were more likely to purchase connections if they could be financed over several months (Jimenez-Redal, Parker, and Jeffrey 2014). Findings from a study of piped water adoption in Morocco similarly suggests that access to credit and the ability to pay over time enables households to invest in piped water connections (Devoto et al. 2011). Despite the Morroco study, there are very few rigorous analyses of how payment modalities impact access to piped water, particularly regarding improving the performance of connection and consumption subsidies.

Additional costs beyond the connection fee increase barriers to connection, and therefore access. For example, in Uganda, the utility requires that households pay a consumption deposit at the time of connection, because the utility perceives a risk in low-income customers' ability to pay future water bills. However, this policy imposed an additional cost barrier for low-income households interested in individual connections (Kayaga and Franceys 2007). Therefore, it is important for evaluations of connection subsidies to consider the full costs of connection, including additional fees.

Administrative requirements, such as land ownership or landlord approval, create additional barriers for poor households to obtain water connections. Utility policies requiring proof of property ownership from homeowners who apply for a connection often bar the poor living in insecure conditions, who may lack formal land titles (Komives et al. 2005). In some cases, even when land tenure might be secure, low-income renters struggle to obtain consent from landlords to gain access to services, another common administrative requirement for connection (Kayaga and Franceys 2007). The relative uptake of subsidies among renters versus owners, and female-headed versus male-headed households is poorly documented.

Finally, the time required to apply for a new connection is a potential barrier to increasing access. In Morocco, for example, Devoto et al. found that simplifying the application process for obtaining a private connection by sending staff to the doorstep increased the proportion of respondents applying for a connection from 10 percent to 69 percent (Cook et al. 2020). While there is significant discussion in the literature on time costs associated with subsidy targeting methods, there is less attention on potential gains from improving a utility's application procedures. In addition to reducing the time costs, utilities should also consider if their processes are non-discriminatory, paying attention to gender of the applicant, socially vulnerable groups, single-headed households, the elderly, and differently abled residents who may face greater barriers to applying for a connection due to lack of time or ability.

2.4 FUNDING SUBSIDIES

A mix of revenue from tariffs, taxes, and transfers funds water services. Taxes often fund subsidies, but transfers from international donors or private charities can also provide funding for subsidies. Another option is cross-subsidization, such as when present or future users pay more than the cost of service to subsidize lower tariffs for low-income households. This is viable when a sufficiently

large proportion of the customer base can afford tariffs exceeding the cost-reflective price (Andres et al. 2019; Davis 2020).

In LMICs, strict cross-subsidization is less common, with water subsidies often being funded by government and/or development partners who reimburse the service provider for losses (Andres et al. 2019; Davis 2020). The World Bank's connection subsidy grants through the Global Partnership on Output-Based Aid (GPOBA) program are one example of third-party donor financing and have been implemented in Cameroon, Kenya, the Philippines, Brazil, and Indonesia (Cook et al. 2020).

In some cases, the government can facilitate cross-subsidization across services by using revenues from services such as energy, telecom, or solid waste management to cover the deficit from lower water tariffs. However, there are few examples of this in practice among LMICs (Andres et al. 2019). Governments can also choose to provide funding directly through income support, service vouchers, or tax credits, which can be used by low-income households to help pay cost-reflective utility bills (Komives et al. 2005; Davis 2020). Ukraine and Latvia, for example, have implemented cash transfer programs to help households pay for utility service. In these contexts, coverage levels are already high, and the principal goal is to maintain affordability as prices rise to become cost reflective (Komives et al. 2005).

Each option for funding subsidies brings its own incentives and risks for governments, service providers, and consumers (Table 3). Any option that requires government funding risks a lack of continuity if subsidies must be approved in a national or local budget every year. Subsidies administered by the service provider and funded by higher paying customers create a disincentive for the service provider to serve lower-income households, since higher-income households generate more surplus revenue (Davis 2020). Furthermore, cross-subsidies require estimates of cost-recovery charges across the entire customer base, which can be complex. If there is an imbalance between subsidy recipients and cross-subsidizers, the utility risks running into deficits (Andres et al. 2019).

In general, financing strategies should be as transparent and predictable as possible to ensure that intended users, particularly women, girls, and other vulnerable groups in low-income households, are benefitting as planned. Budgets should also be closely monitored to ensure that program outcomes are being met and that programs are achieving their gender equality and social inclusion-sensitive goals (SWA 2021).

Table 3. Summary of risks from different funding sources (Komives et al. 2005; Andres et al. 2019; Andres et al. 2021; Davis 2020)

	Government Funds (Taxes)	Transfers from Development Partners	Cross-Subsidies (Tariffs)
Risk to Government	Public funds are scarce and there is an opportunity cost associated with using funds for one sector over another.	Volatility in transfers, over which the government has less control, can undermine sectoral planning and growth.	The government risks losing the political backing of higher income users if they do not support cross-subsidies.
Risk to Service Provider	In the case of supplier-side subsidies, when the government is supposed to transfer funds for a subsidy directly to the utility, volatility or changes in government funding leave the utility with debt.	The utility loses some autonomy in designing its own policies, especially in cases of increased indebtedness.	Inaccurate estimates of cost-recovery charges across the customer base create an imbalance between subsidy recipients and cross-subsidizers and lead to deficits.

	Government Funds (Taxes)	Transfers from Development Partners	Cross-Subsidies (Tariffs)
Risk to Consumers	In the case of demand-side subsidies (e.g., cash transfers), changes in government funding or inability of government transfers to keep pace with rising costs leaves consumers without the ability to pay for services.	The government/utility feels accountable to donors rather than to citizens.	The utility is incentivized to provide service to higher-income customers who generate more revenue.

2.5 RECENT CONNECTION SUBSIDY PROGRAMS IN LMICS

Connection subsidies are less prevalent than consumption subsidies but could offer greater benefits in areas where the water network's coverage is low (Komives et al. 2005). While there is no global dataset tracking these types of subsidies, Cook et al. (2020) sheds light on some recent examples. The study compiles and categorizes 77 nontariff customer assistance programs in water supply and sanitation across the globe, of which about 20 programs, or 27 percent deliver assistance through connection subsidies (Table 4) (Cook et al. 2020).

Table 4. Recent connection subsidy programs in LMICs, adapted from Cook et al. 2020

Country	City/State	Targeting Method	Funding Source	Characteristics of Program
Cambodia	Phnom Penh (city)	Means testing	Unknown	Connection subsidy depended on family income; provided discount of 30%, 50%, 70%, or 100% of connection fee.
Indonesia	Surabaya (city)	PMT	GPOBA	Three types of subsidies: (1) in-fill, (2) expansion, (3) bulk/master meters; household paid 42% ($33) of connection fee; beneficiaries targeted by three eligibility criteria: (i) building size, (ii) road width, and (iii) formal electricity capacity. These criteria were chosen after surveying 10,000 households, based on what would be verifiable and minimize errors of inclusion. Subsidy payment made to utility three months after beneficiary gained access.
Philippines	Manila (city)	Geographic	GPOBA	If the majority of a community's households were officially certified (in accordance with national government directives for poverty surveys) as "indigent" by the respective Barangay leader, the community was targeted for subsidized connections.
Morocco	Various	Geographic	GPOBA	Poorest neighborhoods in urban Morocco were targeted (160 of the most disadvantaged communities). Prepaid by operators and reimbursed by United States dollars (USD) 7 million grant.

Country	City/State	Targeting Method	Funding Source	Characteristics of Program
India	Andhra Pradesh (state)	Geographic	State-funded; National Slum Development Programme	50% group connection subsidy (one connection for 10 people), about USD 115, for those living in one of the 800 slum neighborhoods across the State of Andhra Pradesh.
Cameroon	Unknown Areas		GPOBA	90% connection subsidy for 40,000 low-income households. Households making a daily income less than $0.40 were targeted.
Cote d'Ivoire	Abidjan (city)		Cross-subsidies through tariffs	1980s Policy; 90% of all new connections qualified for subsidy and it drastically increased number of people who have access. Excluded many of the poorest by requiring that subsidy recipients either (1) have proof of housing tenure, (2) live outside of reach of network, or (3) live within 12 meters of a water main.
Kenya	Nairobi (city)	Geographic	GPOBA	Each housing compound had about 6–10 dwellings that were connected on a first come, first serve basis. To sign-up for a connection the household paid $18; 50% of cost covered and the rest was repaid in staggered amounts on the monthly bill; household paid the one-time connection fee upfront.

2.6 EXISTING KNOWLEDGE GAPS

Water connection subsidies remain underexplored compared to consumption subsidies. Given that the literature on consumption subsidies, particularly IBTs, reinforces the importance of access in addition to consumption, connection subsidies deserve further study and understanding.

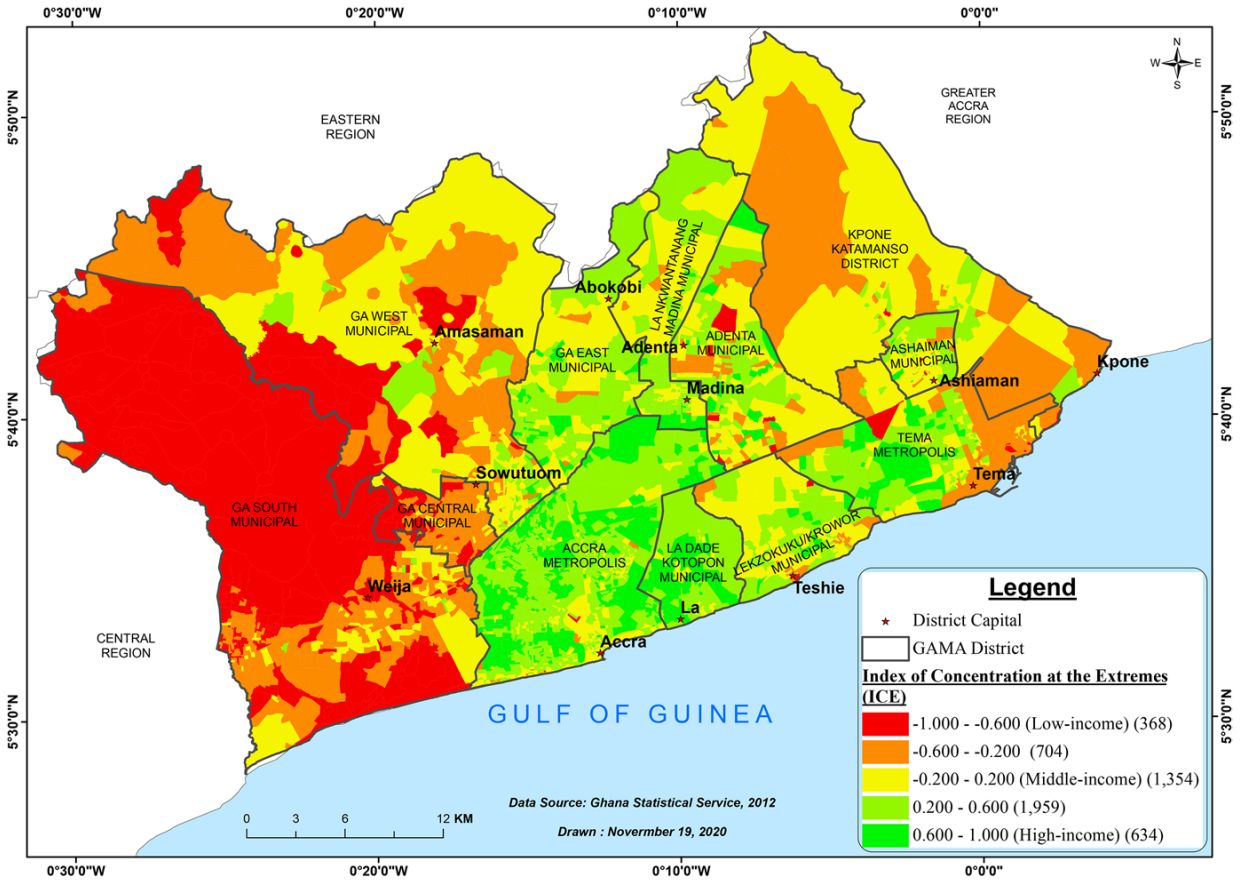
Few studies quantify the benefits of water subsidies, particularly networked water subsidies, in terms of improved livelihoods and cascading benefits, particularly for women and girls (Table 6). There is well-established literature on the importance of safe water and sanitation services for human health, welfare, and productivity. In particular, many studies link improvements in water supply to improved health, including reductions in diarrhea, which kills over 0.8 million people every year (World Health Organization [WHO] 2022a). Increasing evidence also links on-premises water access with higher levels of water safety, such that the UNICEF/WHO JMP now defines safely managed sources—the highest level of water safety—as water sources located on premises, available when needed, and free from microbial, arsenic, and fluoride contamination (WHO 2015). Recent studies have also suggested that households with access to water on-premises, through in-compound or household taps linked to piped networks, also have expanded capacity for productive uses (e.g., gardening), improved hygiene practices, and a lower waterborne disease burden (Geere and Hunter 2020). Access to water on premises also reduces time spent collecting or fetching water from an alternate source (Moriarty and Butterworth 2003). Improved health and time savings can have cascading impacts by improving the productivity and incomes of households, improving educational opportunities for children, and reducing healthcare costs. Given the highly gendered nature of household responsibilities, with women and girls bearing the time costs for collection of water and indirect costs of caring for the sick, improved water access has strong implications for reducing gender disparities (Bayliss, Newborne, and Tucker 2012; Slaymaker et al. 2007).

The impact of subsidy programs is also highly dependent on how the subsidy is targeted, implemented, and financed, as described in the previous sections. Since there is no one-size-fits-all approach to designing and financing subsidies, the following chapter will elaborate on the connection subsidy projects existing in Ghana and the context within which they were designed and funded, to illuminate further opportunities for filling existing knowledge gaps.

3.0 GHANA CONTEXT

The Greater Accra region, with a population of 5,456,000 in 2021, contains 29 metropolitan, municipal, and district assemblies (MMDAs), including the Accra and Tema metropolitan assemblies. Ghana's urban population has been growing at 3.1 percent annually, and 51 percent of Ghanaians lived in urban areas according to the 2010 Census (Ghana Statistical Service 2014; Ghana Statistical Service 2023). While the incidence of poverty in Greater Accra is low, with only 6.6 percent of the population falling below the official poverty line, there is significant geographic variation (Figure 1) (Ghana Statistical Service 2015).

Figure 1. Map of Greater Accra metro area showing poverty variance given by the index of concentration at the extremes, a measure of spatial social polarization (Tetteh et al. 2022)



3.1 DEFINING LOW-INCOME URBAN COMMUNITIES

There is no comprehensive map or survey of LIUCs in Accra. While Slum Dwellers International and the People's Dialogue have conducted mapping projects in informal settlements and slums, their data is not readily available or consolidated into a single map. Figure 1 uses disaggregated consumption data from the Ghana Living Standards Survey 6 to map at the enumeration area level but does not define communities.

However, a LIUC has been defined, according to TREND's GAMA report from 2020, as satisfying all or some of the following criteria:

- The permanent urban community (formal or informal) has an unplanned layout or has a planned layout that has lost its planned architecture due to extensions to original structures (particular housing) to meet the needs of the growing population.
- There is poor physical access (especially vehicular access) throughout the community and inadequacy of space for the provision of basic infrastructure/services as a result of unauthorized structures, including housing extensions.
- A high proportion of the households living in the community are renting and most of them occupy single rooms.
- There is a high housing occupancy ratio, and most houses are compound houses (occupied by multiple households).
- The majority of residents are considered to be low-income earners who are largely engaged in jobs in the informal sector, such as petty trading, market trading, laborers, artisanal works (carpentry, masonry, etc.), metal works, vocational work, etc. When they are engaged in formal employment, they are mostly in the lowest earning bracket.

TREND's 2020 report also states that despite the understanding of LIUCs based on the characteristics shared above, there is a lack of officially defined areas, and most LIUCs are referred to as such based on "tacit consensus and shared perception among the local government authorities and other stakeholders" (TREND 2020).

3.2 POLICY AND LEGISLATIVE FRAMEWORKS FOR WATER SERVICE DELIVERY TO LOW-INCOME COMMUNITIES

GWCL is the sole national urban water service provider, responsible for supplying and delivering water to the nation's urban areas (GWCL Corporate Planning, Monitoring, and Evaluation Department 2021). It is regulated by PURC, which establishes guidelines for tariff-setting, approves tariff rates, and monitors and enforces performance standards (PURC n.d.). GWCL is also regulated by the State Interests and Governance Authority, the Water Resources Commission, and the Ghana Standards Authority (GSA) (GWCL Corporate Planning, Monitoring, and Evaluation Department 2021).

National policy making in the WASH sector falls under **MSWR.** Priority actions and commitments of the MSWR for 2022–2024 include the development of a strategy to better target low-income customers in the urban sub-sector with safe water and increasing public financing for WASH (SWA 2022).

Although there is broad consensus on the necessity to improve WASH access among the poor, there has not always been consensus around how to achieve this outcome. In the early 2000s, there were disagreements around social connection policies. The National Water Policy from 2005 called for the establishment of a Social Connection Fund (SCF) to support the connection of low-income customers to the network. However, PURC understood inadequate infrastructure as the main barrier to access, rather than connection cost, and therefore did not necessarily see a reason to subsidize connection charges. Nevertheless, PURC continues to support its own social water policy and pro-poor water programs through funds generated from a levy imposed on electricity and natural gas transmission services. The volume of funds collected by this levy is not publicly available. Furthermore,

thus far, these funds are not available to GWCL (PURC 2018). PURC's pro-poor urban water interventions are detailed in Section 3.4.1.

Despite disagreements, a cross-sectoral plan was developed around 2012, known as the **2012-2025 WSSDP.** The plan committed to several actions, including commissioning a study to map low-income urban and peri-urban communities, which were underserved with potable water supply. It also committed to developing a framework for reaching the poor, especially addressing the impacts of "compound housing" on IBTs for the poor and improving water service delivery in low-income communities (Ghana Ministry of Water Resources, Works, and Housing 2014). However, the WSSDP has not yet pursued the mapping of low-income urban and peri-urban areas and is unlikely to do so before 2025.

In 2015, GWCL created **LICSU,** which was responsible for developing and implementing policies and programs tailored to water provision for the urban poor through partnerships with donors and funding agencies (GWOPA 2021). In 2022, LICSU became a full department within GWCL, the Low-Income Customer Support Department (LICSD). This brings it greater access to financial resources and a seat at the table with utility leaders, including the Managing Director of the utility (Water and Sanitation for the Urban Poor 2022). LICSD's interventions include the extension of distribution networks to LIUCs, drilling boreholes, providing water storage, and constructing school WASH systems (GWCL Corporate Planning, Monitoring, and Evaluation Department 2021). In addition to increasing access to piped water in low-income communities and schools, LICSD has also integrated communities into service delivery. The department has mobilized community members' support by asking them to serve on water and sanitation committees that oversee WASH improvements. The ways in which committees oversee improvements is not currently documented (GWCL Corporate Planning, Monitoring, and Evaluation Department 2021; GWOPA 2021).

3.3 ACCESS TO AND COST OF PIPED (GWCL) WATER IN ACCRA

In the Accra metropolitan area, 45 percent of the population have access to a household connection (Twerefou et al. 2015), which is well below Ghana's aim for 70 percent of urban/peri-urban households to have access to piped water by 2030 (SWA 2022). In 2000, PURC conducted a study on urban water accessibility, which reported that the majority of those without services live in low-income informal settlements and in peri-urban areas (Franceys 2005). More than a decade later, baseline studies completed under the GAMA Sanitation and Water Project found that fewer than 30 percent of households in Accra's LIUCs had access to piped connections (TREND 2020). Those who lack access to piped water typically purchase water from sachet water sellers, private mobile water vendors, water tanker operators, and neighbors with piped water connections (Adams and Vásquez 2019).

Some of the main challenges with supplying water to customers in LIUCs include lack of land title required for piped connections, inadequate policy and legislative frameworks for water service delivery to low-income neighborhoods, badly or unmaintained pipe networks, and unaffordable lump sum connection fees (TREND 2020). The cost of extending water mains to areas that are not within the existing service area was also mentioned as a barrier to access for households in LIUCs (Franceys 2005). It is important to note that not all LIUCs face the same challenges due to differences in community characteristics. For example, the Ghana slum upgrading program identifies four types of slums with varying origins and purposes. These include indigenous slums, which do not face land insecurity issues, as well as migrant or transient slums, which are at higher risk of issues related to land insecurity such as eviction and lack of access to basic services. Cosmopolitan slums usually have a mix of different characteristics (Danso-Wiredu 2018).

Those with access to piped water are subject to **tariffs guided and approved by PURC.** An IBT structure is applied uniformly across the country. It consists of two consumption blocks for residential water use: zero to five cubic meters (Ghanaian Cedi [GHS] 4.0/m³), and above five cubic meters (GHS 6.8/m³),[2] in addition to a set service charge (GHS 10/month) (Bayliss, Newborne, and Tucker 2012; PURC 2022). Even though PURC has been increasing tariffs steadily, tariff levels remain below cost-recovery (Twerefou et al. 2015; GWCL 2022a). This is a "major threat" for the company in its latest Corporate Plan for 2022-2026 (GWCL Corporate Planning, Monitoring, and Evaluation Department 2021). Furthermore, consistent with global assessments, the 2012 WSSDP claims that lifeline tariffs and consumption subsidies are poorly targeted and have benefitted wealthier households over poor households (Ghana Ministry of Water Resources, Works, and Housing 2014).

For unconnected low-income households who access water through alternative sources described above, **the price of water is often significantly higher than that paid for piped water by connected consumers**. As of a 2008 study, low-income households in Accra were paying as much as 7–13 times the water utility's commercial rates per unit of water (Adams and Vásquez 2019). However, when asked about their preferences, low-income households do not always demonstrate a preference for utility connections. As Adams and Vasquez demonstrate, households' preferences are dependent on time-of-service delivery, quality of water, and trust in the service provider (Adams and Vásquez 2019).

GWCL charges a one-time fee to households to connect to the piped network. As of January 2023, these charges range from GHS 1,500 to GHS 4,000 (roughly between USD 121 and 323) depending on the distance of the property from the nearest water main (GWCL 2022b). These charges do not include the cost of the application (e.g., the fee associated with applying for a connection, which was approximately GHS 50 in December 2022) or the cost of the survey to estimate the connection price. In addition, if households are far from the water main, they have the option to pay for the extension of the water main. A 2005 study of charges for connected households in Accra and Kumasi found that over 32 percent of households had paid for water main extensions before paying GWCL connection fees. The average connection charge among the surveyed households at the time was USD 340 in 2004 dollars (equivalent to about USD 536 in 2022) (Franceys 2005).

3.4 CONNECTION SUBSIDIES AS INTERVENTIONS FOR ACCESS

3.4.1 PAST PRO-POOR URBAN WATER INTERVENTIONS

Over the last two decades, attempts have been made to improve the state of water provision in Ghana, particularly for low-income residents. For GWCL, tackling water provision challenges in low-income communities not only addressed the Government of Ghana's social inclusion commitments, but it also provided a market opportunity to increase revenues. The market opportunity relates to the realization that most of the population lives in LIUCs and can afford to pay consumption costs, allowing the utility the potential to tap into additional revenues from new customers (TREND 2020).

The first such pro-poor program was the **World Bank-funded Urban Water Project (UWP),** which took place between 2004 and 2012 to (1) significantly increase access to piped water in Ghana's urban centers, and (2) to restore financial stability and sustainability of GWCL. The government set a project goal of 50,000 new household connections, with the goal that the majority of those would

[2] These tariff rates were equivalent to USD 0.32/m³ (0-5 m³) and USD 0.55/m³ (>5 m³) as of January 30, 2023, at an exchange rate of GHS/USD 12.4. However, the exchange rate has been undergoing considerable fluctuations.

benefit low-income households. The World Bank also supported PURC to implement a set of pro-poor actions, including identified pilots in selected cities. Notably, this project took place before a pro-poor unit had been established within GWCL (Bayliss, Newborne, and Tucker 2012).

Pilot projects were targeted geographically to increase water access among three low-income communities of Accra: Teshie (Nshorna), Nima, and Glefe. There was no attempt to identify household types or incomes within the communities. The selection of these communities was based on the following factors: "the strength of community organization, availability of local water supply capacity, extent of current service shortfalls and/or existing collection rate, impact on existing secondary suppliers, and ease of construction/connection of pilot intervention" (Bayliss, Newborne, and Tucker 2012). Critiques of the selection process suggested that distribution of water resources within regions and water systems should factor into identifying areas of water poverty, referring to availability of alternate sources of safe water beyond the piped network (Bayliss, Newborne, and Tucker 2012).

Since extension of the distribution network to the three pilot communities (Nima, Teshie, and Glefe) seemed infeasible, **the pilot project focused on delivering water directly to public distribution points,** such as bulk water storage facilities and water kiosks in areas accessible to tanker service. The pilot projects built bulk water storage facilities (polytanks) and standpipes/water kiosks. It is unclear if the extension of service lines in Glefe went to households or only to communal standpipes. Water Boards and Water User Associations (WUAs) were established and trained in the pilot communities to operate and manage the facilities installed under the project. Independent evaluation of the project found that the majority of standpipes in Glefe were disconnected within a year of construction because of large debts the operators (the Water Boards and WUAs) had accrued, pointing to the need for greater consideration of pricing and payment, and agreements with beneficiary communities about such investments (Bayliss, Newborne, and Tucker 2012). The more recent studies by Adams and Vasquez suggest that household preferences for time and quality of service, as well as trust in the provider could also have played a role in the outcome (Adams and Vásquez 2019).

Regarding household connections, the evaluation found that they were difficult to secure for marginalized households due to eligibility requirements. More specifically, most poor residents were tenants and found it difficult to obtain the site plan required for connections. In addition, many poor households were situated far from the piped network and therefore unable to benefit from piped connections. More generally, the project was also criticized for needing better or more sophisticated performance targets than simply the number of new connections (Bayliss, Newborne, and Tucker 2012).

3.4.2 RECENT CONNECTION SUBSIDY PROJECTS

In 2013, the World Bank initiated **the GAMA project**. The objective of the GAMA project was to build on the experiences from previous World Bank projects, including UWP, and to increase access to both improved sanitation and water supply within the Greater Accra area, and more specifically, within LIUCs situated in the metropolitan area. The USD 150 million project spanned multiple components, including institutional strengthening, master planning, and infrastructure expansion. This included an expansion of the piped distribution network, and provision of piped water to households through standpipes (serving individual and compound houses). Specific targets included 3,500 new piped water connections and 250,000 people with access to improved water supply (Jammi n.d.). The new piped water connections were offered at a subsidized fee, and GWCL's LICSU played a significant role in coordinating and executing the new subsidized connections under the GAMA project (GWCL 2022b; WASH Stakeholders 2022).

The GAMA project exceeded its target objectives for new connections by 191 percent. By the time the project ended in 2019, the final number of new connections installed in LIUCs was over 10,200 (GWCL 2022c; Jammi n.d.). Installation of the subsidized connections was largely viewed as a success and helped to increase the credibility of both GWCL and LICSU within the sector (WASH Stakeholders 2022). Following GAMA's success, GWCL attracted more funding from donors and continued executing subsidized connections in Accra's LIUCs. Three additional donor-funded projects—WaterWorX (2019–Present), UN-Habitat (2020), and UNICEF (2021–Present)—have added subsidized connections in Accra. Under these three projects, approximately 6,000 new subsidized connections have been installed (GWCL 2022c). Details of each project are in Table 5.

Table 5. Characteristics of four recent water connection subsidy projects implemented in Accra's LIUCs

Subsidy Project	Project Years	Total Subsidized Connections Installed[3]	Length of New Water Mains Constructed (km)	Number of Kiosks/Public Standpipes Installed	Pro-poor Subsidized Connection Fee (GHS)[4]	Required Deposit Amount (GHS)	Installment Payments Allowed?
World Bank (GAMA)	2017–2019	10,297	264	43	200	None	No
WaterWorX	2019–Present	4,795	19.3	1	500–1200	100	Yes
UN-Habitat	2020	200	1	6	500–1200	100	Yes
UNICEF	2021–2022	1,200	28	Unknown	500–1200	100	Yes

[3] This table does not include estimates of the number of people that have benefitted from new subsidized connections, based on the understanding that one connection can benefit more than one person or more than one household. The number of beneficiaries will be estimated from donor reports during the research.

[4] As of November 2022, GWCL's standard connection fee (without the pro-poor subsidy) ranged from GHS 1,500 to 4,000 (GWCL 2022b).

3.4.3 CONNECTION COSTS AND PAYMENT MODALITIES

The design of connection subsidy projects has evolved, based on inputs and requirements from funders, as well as LICSU's experience implementing the GAMA project. One major change has been the cost of a subsidized connection and additional fees to connect. Under the GAMA project, the subsidized connection fee was a flat GHS 200 for all eligible customers. Under subsequent projects, the subsidized connection fee varied based on a property's distance from the water main, and the lowest possible fee was raised to GHS 500.[5] Alongside reducing the subsidy for new connections, GWCL allowed for installment payments if a customer was able to pay within the project period. Meetings with staff suggest that increasing the connection fee was meant to screen for customers who would more likely be able to pay future water bills, although this raises a question about possible exclusion of the lowest-income residents (GWCL 2022b; GWCL 2022c).

In addition to increasing the subsidized connection fee, **GWCL also added a required consumption deposit of GHS 100,** which was applied to future water bills for new customers to serve as a guarantee for the utility in case the new customers did not pay on time (GWCL 2022b; GWCL 2022c).

3.4.4 TARGETING AND SELECTION

Although GWCL has iterated on the subsidy amounts and fees**, community selection and household targeting processes have remained relatively consistent**. All of the subsidy projects have geographically targeted households in LIUCs within GWCL's three operating regions in Greater Accra (Accra West, Accra East, and Tema), and local governments have led the selection of LIUCs to receive the subsidy (GWCL 2022c). In the past, observational assessments of communities designated as LIUCs by local governments have validated the definition of LIUCs provided in Section 3.1. This has provided justification for GWCL to identify areas for pro-poor interventions based on local government consensus. In practice, this means that GWCL asks MMDAs to nominate LIUCs that should receive the subsidy interventions, although the process and reason behind each selection was not documented. For longer-term operations, TREND has recommended that a comprehensive assessment of all LIUCs should be conducted in order to create a more transparent LIUC selection process (TREND 2020). Additionally, comprehensive household-level assessments of water access and socio-economic variables within LIUCs could enable the utility to consider household-level targeting for pro-poor subsidy projects, and to **understand whether such granular targeting would be cost-beneficial to GWCL.**

GWCL undertakes community assessments to verify if identified LIUCs are low-income based on several indicators, including the type of settlement (e.g., prevalence of compound houses versus individual houses), materials used for building, sanitation situation, number of persons per household, and population density. The assessment also allows GWCL to discern the pros and cons of undertaking a project in the community and to assess technical feasibility, such as accessibility of the community and the existing water network (GWCL 2022c). These assessments collect data beyond PURC's guiding definition of poor households, defined as those who are without direct access to regulated piped supplies, who depend on secondary and tertiary suppliers, and who purchase water by the bucket (TREND 2020). It is unclear if GWCL has ever rejected a community that meets PURC criteria after a community assessment has taken place. Initial conversations with GWCL staff and

[5] For context, the World Bank reports that annual inflation in Ghana decreased during the transition period between GAMA and subsequent subsidy programs (2017–2019). Annual inflation rates were 12.4 percent (2017), 7.8 percent (2018), and 7.1 percent (2019) (World Bank n.d.).

beneficiary communities suggest that the selection process has encountered some challenges in the past, including one anecdote that a beneficiary community received fewer connections than expected because the project funding was supposedly "hijacked" by a different community within the same district (GWCL 2022b). Once a community is selected for the project, **any resident within that community was eligible to receive the subsidized connection** on a first-come, first-served basis (GWCL 2022b).

Unlike UWP, **site plans were not required under GAMA** and subsequent connection subsidy projects, but GWCL does not connect any households farther than 120 meters from the nearest distribution main. This raises a question as to whether entire (or parts of) LIUCs fall outside the 120-meter distance requirement and are therefore excluded from the benefits (GWCL 2022c). Since there is no comprehensive up-to-date map of low-income communities in Greater Accra**, there is no information on which low-income households fall within the 120-meter connection distance of the water mains** and which low-income households would require a significant extension of the piped water mains, therefore incurring higher costs. This lack of data limits our understanding of the extent to which a connection subsidy program could benefit poor urban residents given the existing distribution network.

In addition to pros and cons of geographic targeting, the first-come, first-served approach to filling GWCL's quota for subsidized connections could act as an **implicit targeting mechanism**, with a possible bias toward more well-connected and/or educated households. According to conversations with GWCL staff, they advertise the subsidized connection project within communities using multiple means, including flyers and loudspeaker announcements. In some communities, LICSD has advertised days during which community members can register for subsidized connections at mobile registration offices set up by GWCL within, or in close proximity to, the selected community (GWCL 2022b; GWCL 2022c).

3.4.5 COMMUNITY ENGAGEMENT

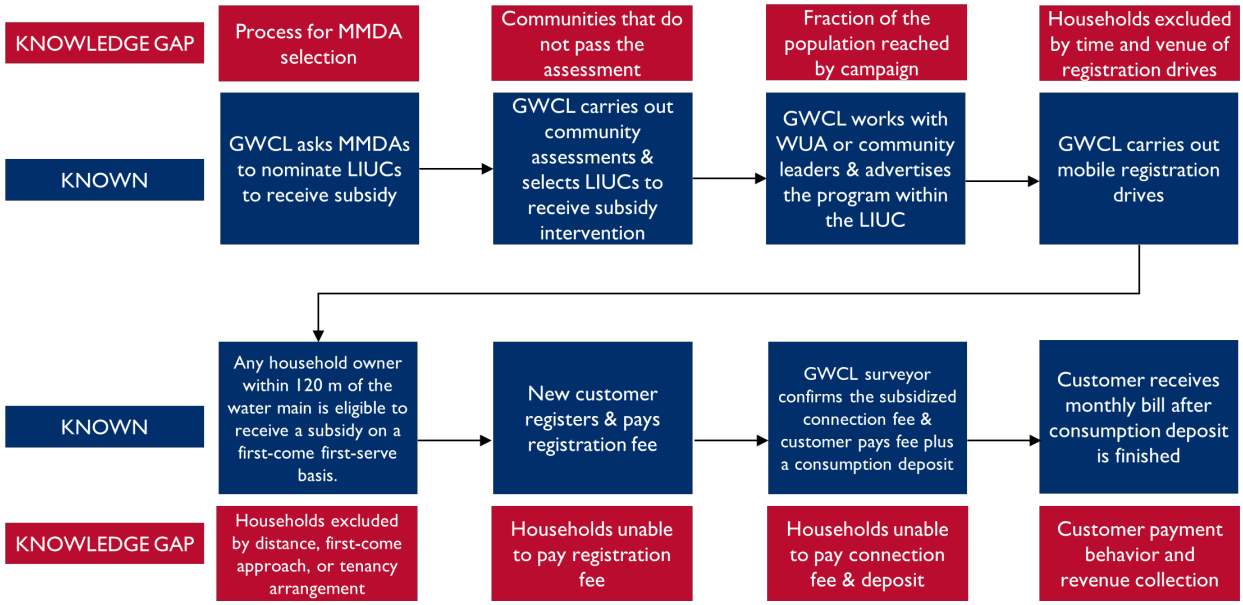
After finding beneficiary communities, LICSD staff follow a series of protocols to **engage with each community.** The community's elected assembly person first introduces GWCL to community "opinion leaders." GWCL meets with community chiefs and existing community associations (e.g., landlord associations), who facilitate meetings with the wider community. In most communities with the subsidy projects, GWCL has set up a WUA and trained its members to educate the community about bill payments, water usage, and other topics. These associations act as a conduit for any complaints or challenges that community members are facing (GWCL 2022b; Subsidy Beneficiaries 2022).

3.4.6 BILL PAYMENT AND COLLECTION

After receiving the subsidized connection, new customers must pay monthly consumption bills according to the same publicly approved tariffs as all other customers. Customers pay bills using mobile money or physical pay points. GWCL will disconnect customers for nonpayment of bills, although that is not the first mechanism that is employed by the utility. Instead, LICSD officers will go door-to-door to encourage payment from those accounts that are not current. In addition, LICSD trains WUA members to respond to household and community questions about bill payment (GWCL 2022b). Although some government and utility officials have raised concerns regarding whether customers in LIUCs can pay for their consumption, there has been no comprehensive investigation of the **payment behavior of GWCL's customers living in LIUCs** to understand if the poor are having difficulty paying their bills and how their payment behavior compares to the behavior of other non-poor segments of GWCL's residential customer base. A better understanding of LIUC customer payment behavior could provide incentives for new connections in LIUCs and/or allow the utility to conduct a cost-benefit analysis for

the expansion of the distribution network. It could also inform policy conversations regarding tariff structures and alternate funding sources for WASH service provision.

Figure 2. Summary of GWCL connection subsidy targeting and administration process and related knowledge gaps



3.4.7 FUNDING

As stated earlier, all the connection subsidy projects implemented to date by GWCL have been **donor-funded.** GWCL would prefer to move away from donor-funded schemes to a more financially sustainable operation that can adapt and expand to meet current needs. So far, the only known alternative funding mechanism is an SCF, a type of revolving fund originally envisaged under the GAMA project. The GAMA project intended for accumulated funds generated from the subsidized connection fees to be used as seed money for building a sustainable SCF. In 2020, TREND, a consulting firm providing technical assistance to GWCL, produced a concept note detailing the key concepts of an SCF strategy (TREND 2020). In addition to using subsidized connection revenues as seed money, TREND (2020) proposed many sources of funding for a SCF. Notably, **the strategy did not elaborate on expected revenues from any of the following sources:**

- The existing tariff includes a three percent surcharge on monthly consumption, of which two percent contributes to rural water supply and one percent contributes to water used for firefighting. TREND's strategy proposed an additional two percent surcharge for social connections or re-directing half of the rural water supply contribution to LIUC social connections.
- Committing a proportion of GWCL's monthly revenue.
- Applying for donor-funded output-based aid or similar results-based financing instruments is another proposed option. Under this, GWCL would first have to mobilize funding to pre-finance the service connections and the donor funding agency would pay for the cost of service after it has been delivered.
- Corporate social responsibility funding from selected private sector organizations.

- Implementing a Water Credit Scheme, under which financial institutions (e.g., banks) could provide credit for new service connections in LIUCs based on specific agreements with GWCL.

Although it is in place, the exact operational mechanisms of the SCF remain unclear, and meetings with stakeholders suggest that the scheme requires further development. Nevertheless, GWCL reports that at least 200 connections have been subsidized using these funds, and additional money has been used to procure materials for subsidized connections (GWCL 2022b; GWCL 2022c; WASH Stakeholders 2022). **Neither the TREND report nor any other study have quantified the level of funding that would be required to scale the subsidy projects for unconnected low-income households city-wide**.

3.5 INSIGHTS FROM FORMATIVE RESEARCH

Aquaya conducted formative research on the subsidy projects in September and December 2022. This research included visits to GWCL regional and district offices in Accra to speak with field staff, as well as visits to four LIUCs that had been selected for GWCL's connection subsidy projects. Within the LIUCs, the team met with WUA members, community opinion leaders, and households who had benefitted from the projects. The team also met with households who chose not to connect to the network.

Initial discussions with LIUC community members confirmed that households who chose not to connect to GWCL through the subsidy projects were limited by distance from the water main, tenancy status (renters were unable to register themselves), and inability to pay the subsidized fee. Most households the team spoke with occupied compound properties (i.e., multiple households occupying a property site). Compound properties are common across low-income communities and typically have a single, shared GWCL connection. One beneficiary household in a compound property reported that the use of the new tap water was limited to the owner's family and that on-premises renters were not allowed to use the tap due to fear of misuse and inability to collect payments from renters for water bills. Another resident shared that they did not sign up for the project because they were concerned about misuse of water by family members living on the premises, leading to high water bills (Subsidy Beneficiaries 2022).

Multiple conversations with existing recipients suggest that **some connections are shared not only by households within a property, but by neighboring households as well**. Some households with subsidized connections sold GWCL water to neighbors without connections or gave them access for free (Subsidy Beneficiaries 2022). Field visits suggested household structures could be a misleading proxy for household wealth, as a beneficiary we spoke with was a widow who lived in a concrete house built by community donations. She had no source of income and relied on community support to pay for the upfront cost of the subsidized connection, as well as ongoing water bill payments (Subsidy Beneficiaries 2022). Though this specific example may be anecdotal, it illustrates that dwelling structures or other household assets are not a perfectly accurate proxy for income, as mentioned in the literature (Trémolet, Kolsky, and Perez 2010; Dershem et al. 2013).

3.6 KNOWLEDGE GAPS SPECIFIC TO STUDY AREA

The previous sections indicated knowledge gaps related to the effectiveness and outcomes of GWCL's past subsidy projects, including impacts from targeting mechanisms, payment modalities, and administrative requirements. Table 6 summarizes these knowledge gaps and relates them back to key take-aways from global subsidy literature that were discussed in Chapter 2.

Table 6. Knowledge gaps in the study area related to findings from global subsidy literature

Topic	Key Take-Aways from Literature	Ghana Context and Knowledge Gaps
Subsidy Impacts on Livelihoods	On-premises access to improved water reduces incidences of illness and time-costs of fetching water, particularly for women and girls. This has cascading impacts on improved labor and productivity of households, improved educational opportunities for children, and reduction in healthcare costs (Moriarty and Butterworth 2003; Slaymaker et al. 2007; WHO 2022a).	Limited literature on linkages between improved on-premises water access and changes in incomes and/or occupations for LIUCs of Accra.
Subsidy Targeting	Geographic targeting is simpler to administer but risks overlooking wealth disparities within communities. Income-based means-testing and proxy means-testing offer greater accuracy but are more time consuming and costly to administer (Bayliss, Newborne, and Tucker 2012; Andres et al. 2019).	GWCL utilizes geographical targeting methods for offering connection subsidies to households in LIUCs, but it is unclear whether the most vulnerable households are successfully included through this targeting approach (GWCL 2022c). To select LIUCs for subsidy interventions, GWCL asks MMDAs for nominations and then carries out community assessments to confirm LIUC selection (GWCL 2022c), but the process for nomination and selection is undocumented and opaque,
Subsidy Fees and Payment Modalities	In addition to total transaction costs for connecting to piped water networks, a lack of diverse payment options also precludes the ability of low-income households to connect (Bakker et al. 2008; Jimenez-Redal, Parker, and Jeffrey 2014; Kayaga and Franceys 2007) Consumption deposits, in addition to connection fees, also create further cost barriers to connection (Kayaga and Franceys 2007).	GWCL has implemented two types of subsidized connection fees (flat and variable) and has also required consumption deposits in recent projects (GWCL 2022c). Installment payments were allowed in three of the four subsidy projects, although the details of how this allowance was administered are unclear (Subsidy Beneficiaries 2022). The relative performance of these different approaches is not well understood yet. Particularly in regard to compound housing arrangements, where formative research suggests that households fear sharing water within a property due to possible payment disputes (Subsidy Beneficiaries 2022). There is little understanding about ideal payment modalities among shared on-premises connections.
Administrative Barriers	Requiring proof of land ownership at time of connection excludes low-income residents with insecure or no tenure (Komives et al. 2005). Requiring permission from landowners can create barriers for low-income renters (Kayaga and Franceys 2007). A time-consuming application process can also create barriers to connection (Cook et al. 2020)	National policy in Ghana requires proof of land ownership (through site plans) for a water connection, but GWCL removed this requirement for the subsidy projects. GWCL still requires households to be within 120 meters of a water distribution line (GWCL 2022c). It is unclear how many low-income households benefitted from removal of the land ownership requirement and how many are excluded from the subsidy based on the distance requirement, GWCL conducted mobile registration drives to ease the registration process for low-income

Topic	Key Take-Aways from Literature	Ghana Context and Knowledge Gaps
		households and used a first-come, first-served approach until they reached the quota allocated to the community (GWCL 2022b). There is a knowledge gap regarding whether the mobile registration drives and/or the first-come, first-served approach acted as an implicit targeting mechanism and excluded certain households.
Billing and Payment	The literature does not document the extent to which water connection subsidies may impact utility tariff revenues or revenue collection efficiency due to bill payment behavior of subsidy recipients.	WASH stakeholders in Ghana, including some GWCL staff, are worried that customers who benefit from subsidized connections may not be able to afford ongoing bills, which would impact the utility's tariff revenues in the long run (GWCL 2022b). A detailed study of the payment behaviors of subsidy recipients has not taken place.
Funding Sources	Funding for subsidies usually comes from taxes, tariffs (cross-subsidization), or transfers (e.g., donor funding). Each source carries its own risks and advantages (Andres et al. 2019; Davis 2020; Komives et al. 2005). Cote d'Ivoire has funded connection subsidies in Abidjan through cross-subsidization, while Indian programs have been funded by government transfers/taxes. Most other connection subsidy programs in LMICs have relied on donor transfers (Cook et al. 2020).	GWCL has funded its existing subsidy projects using donor funding. A revolving fund was introduced to build an additional funding source, but its impacts remain unknown (GWCL 2022c; WASH Stakeholders 2022). Although Trend 2020 suggested additional sources of funding for a revolving fund, they did not estimate projected revenues from those sources, and they did not identify the gap between existing sources and the funding required to scale the subsidy projects city-wide.

4.0 RESEARCH OBJECTIVES AND HYPOTHESES

This research will assess the impacts of GWCL's pro-poor water connection subsidy projects in Accra's low-income communities and on the utility's revenue. The research will support GWCL to answer the following questions:

1. **Impact:**
    a. To what extent did connection subsidies increase piped water access and improve livelihoods among households in targeted LIUCs?
        - Hypothesis: The subsidy projects have increased piped water access, either directly or indirectly, for the majority of households in LIUCs that are within connecting range of the distribution network. This has resulted in income gains for connected households through water resale, a change in occupation, or savings from purchasing less water from vendors.
2. **Finances:**
    a. To what extent did the subsidy projects impact GWCL's revenue collection efficiency?
        - Hypothesis: Subsidized users demonstrate similar water consumption and payment patterns as non-subsidized users, with no substantial effects on GWCL's revenue collection efficiency.
    b. How much funding would be required to expand and sustain the program city-wide, including projected population growth, and what strategies could fill the funding gap while lowering reliance on donor funding?
        - Hypothesis: Expanding connection subsidies city-wide would require GWCL to consider multiple additional funding sources to fill the funding gap.
3. **Strategies for future programs:**
    a. What barriers do the urban poor, particularly women, renters, or marginalized groups, face in accessing connection subsidy projects? How can program implementation be adjusted to lower these barriers?
        - Hypothesis: Distance from water mains, inability to pay, information asymmetry, and administrative barriers are the primary barriers the urban poor, particularly women, renters, and other marginalized groups, face in benefiting from subsidy projects.
    b. What barriers does GWCL face in administering connection subsidy projects for low-income residents, and what strategies could address these institutional challenges?
        - Hypothesis: Staffing limitations, budgetary constraints, donor timelines, and organizational inefficiencies need to be addressed to alleviate institutional challenges to project implementation.

Within these three broad questions, this research will address several sub-topics that are of specific interest to GWCL and broadly to the water sector in Ghana (Table 7).

Table 7. Research questions and sub-research questions

Research Question	Sub-research Questions
Impact: To what extent did the subsidy projects increase water access and improve livelihoods among households in targeted LIUCs?	What were the impacts on water access among low-income women, renters, or other marginalized groups compared to the broader population? What is the demographic and socioeconomic profile of those who chose to connect to the network using the subsidy? Why did certain households choose not to connect through the subsidy program?
Finances: (a) To what extent did the subsidy projects impact GWCL's revenue collection efficiency?	What is the water consumption and water bill payment behavior among subsidy recipients and how does it compare to other GWCL (residential) customer groups? What is GWCL's revenue collection efficiency in targeted LIUCs compared to other neighborhoods. *If needed, we will explore the possibility of conducting a more in-depth financial analysis to answer the following questions:* *What was GWCL's net cash flow in discrete service areas where the subsidy program was implemented?* *Did connection subsidies increase network utilization (maximize connections along existing service lines)?*
Finances: (b) How much funding would be required to expand and sustain the program city-wide, and what strategies could fill the funding gap while lowering reliance on donor funding?	Based on the GWCL subsidy projects, what are the capital and operating costs of expanding the program to remaining unconnected residents in LIUCs within the existing networked area and outside the networked area? Could a two percent GWCL customer surcharge as suggested by TREND 2020 meet the funding requirements of expanding the program? Whom would the surcharge/tax target? If a two percent surcharge does not meet the funding requirements for expanding the program, how much is the remaining funding gap? What other sources, including government transfers, could fill the gap? *If needed, we will also explore the possibility of conducting a more in-depth financial analysis to answer the following question:* *Is there a sustainable tariff model to fund the subsidy program or remove connection fees altogether?*
Strategies for future programs: (a) What barriers do the urban poor, particularly women, renters, or marginalized groups, face in accessing connection subsidy programs? How can program implementation be adjusted to lower these barriers?	Would different targeting methods, information campaigns, or payment modalities improve the ability of households in the lowest wealth quintiles and those most vulnerable to participate in the program? How much can low-income households afford to pay for a connection? What price point and payment modality would allow for greater GWCL penetration, particularly within vulnerable households (e.g., female-headed)? Did relaxing the regulations (removing site plan requirements and only requiring national ID cards to register for new connections) help the poor? What can the regulator do to increase incentives to serve the poor?

Research Question	Sub-research Questions
	How many more unserved low-income households could be connected without extension of the water network? How many households would remain unconnected without an extension of the piped network? What additional volume of bulk water would GWCL have to produce to serve all the unserved low-income households in greater Accra?
Strategies for future programs: (b) What barriers does GWCL face in administering connection subsidy projects for low-income residents, and what strategies could address these institutional challenges?	Did GWCL face challenges with staffing and financial resources required to implement all stages of the process (community selection, engagement, registration, connection, revenue collection, operations and maintenance)? What challenges, if any, did GWCL and the MMDAs face during community prioritization and selection? Did GWCL face challenges in meeting donor requirements for subsidy administration? What challenges, if any, do donors face in changing requirements? What challenges does GWCL face with community engagement?

5.0 STUDY DESIGN

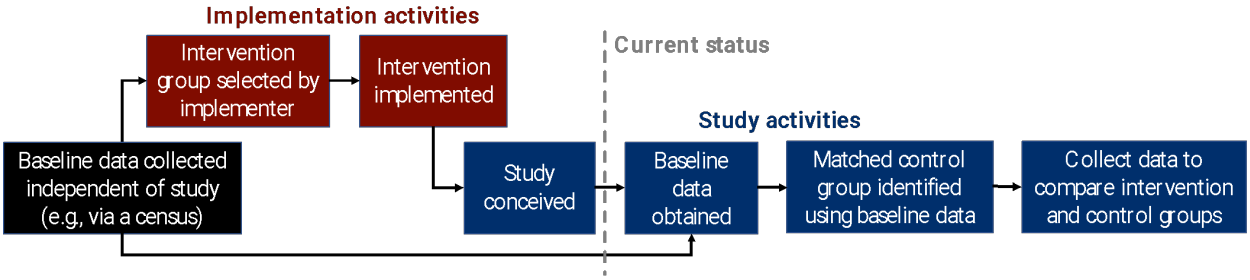
5.1 RESEARCH QUESTION 1. MATCHED COHORT DESIGN FOR PRE-EXISTING INTERVENTIONS

One of the main goals of this study is to measure how the four subsidy projects implemented by GWCL have impacted beneficiaries' water access and livelihoods, in order to derive insights to inform the design and implementation of future subsidy pilots and ongoing programs in Accra and elsewhere. Note that the study will consider both those who have benefitted directly by acquiring a piped connection on their premises, as well as those who have benefitted indirectly through proximate access and/or resale of GWCL piped water. Within the study design, the term "subsidy recipient" denotes those households that have received the subsidy, while "non-recipient" refers to households that have not. Similarly, "intervention communities" denote those LIUCs where a subsidy project was implemented, while "non-intervention communities" refer to other LIUCs where there are no projects. Key community and household-level outcome metrics in this respect will include the following:

- Percentage of households using a piped connection as their primary water source,
- Average time spent collecting water (minutes/day),
- Average monthly income (self-reported),
- Average household expenditures for water (monthly and per cubic meter), and
- Percentage of households experiencing water insecurity (defined by IWISE; Ross 2022).

We will study four prior or pre-existing subsidy interventions to examine these outcomes. We will anonymize (e.g., as "Project 1," "Project 2," and so forth) the interventions when reporting results. The four projects are similar with key differences (e.g., the GAMA project employed a lower subsidized connection fee but did not allow installment payments). Therefore, we will aim to evaluate the effects of all four subsidy projects both collectively and individually (further details in Section 5.2). This will enable our analysis to evaluate the overall effects of the subsidy on recipient households relative to non-recipients, while allowing us to consider specific features of each subsidy project. As these interventions were not implemented using a randomized experimental design for controlled assessment, we plan to use a quasi-experimental design for pre-existing interventions that involves matching (Arnold et al. 2010; Gertler et al. 2016) to create an artificial control group for comparison against those who received subsidies (Figure 3). Matching aims to pair each treatment unit (e.g., a beneficiary property that received a subsidized connection, potentially including multiple households) with a similar non-treatment unit (e.g., a non-beneficiary property), based on an observable and available set of baseline characteristics (Gertler et al. 2016). As exact matching characteristics is not feasible, we will employ propensity score matching, which is a common methodology that simplifies the characteristics into a single score, relating to the probability of receiving treatment based on the given set of baseline characteristics. Propensity scores of treatment units can then be matched with the closest non-treatment units (Arnold et al. 2010; Gertler et al. 2016).

Figure 3. Progression of a matched study design for a pre-existing intervention (adapted from Arnold et al. 2010)



As part of the initial phase of this study, we will determine the type of matched design that is feasible to implement, based on the size of eligible control populations and the availability of data for matching. We will consider four options involving different matching approaches (household-level or community-level) and potential control populations (Table 8). Note that with household-level matching, we would only aim to survey a single household per property or compound, since connections are installed at the property level. In some cases, at least part of the matching may be possible with existing baseline data (e.g., baseline surveys conducted by GWCL in intervention communities prior to subsidy implementation, 2011 census data), if these datasets are available at a sufficient scale and precision (e.g., census data for specific communities). Generally, matching based on data collected after implementation is not recommended, because the intervention may have affected the characteristics of interest (Gertler et al. 2016). We may need to consider post-intervention data if existing baseline data is unavailable or insufficient, or if we will face challenges in locating properties surveyed in existing datasets. In the case that post-intervention data is necessary for matching, we would survey more non-recipients (e.g., ~3 per subsidy recipient) to enable better matching after the survey is complete, and we would only use characteristics not likely to be affected by the subsidy for matching.

Table 8. Four options for matching, depending on existing data availability and number of artificial control group candidates. The options are numbered in order of preference

Matching Approach	Control Group	Data to Use for Matching	Advantages and Disadvantages
(1) Household matching in intervention communities without waitlists *Treatment group: beneficiary households that received subsidized connections in intervention communities*	Matched households within 120 meters of existing water mains in intervention communities	Post-intervention surveys (likely unless GWCL baseline surveys are available and feasible to use)	*Advantages* • Households randomly selected for the survey can function as a representative sample for calculating community statistics, making data collection more efficient • Allows for consideration of heterogeneous impacts within communities • Not reliant on non-intervention control communities, so not vulnerable to hidden factors determining which communities were selected for subsidy implementation • Does not involve community matching, so not reliant on finding sufficient non-intervention communities *Disadvantages* • May neglect hidden factors that determined which households received subsidies within intervention communities

Matching Approach	Control Group	Data to Use for Matching	Advantages and Disadvantages
			• Likely reliant on post-intervention data for matching • Does not enable a controlled comparison at the community level
(2) Household matching in intervention communities using waitlists *Treatment group: beneficiary households that received subsidized connections in intervention communities*	Matched households on the waitlist for subsidies within 120 meters of existing water mains within intervention communities	GWCL baseline surveys in intervention communities, if available. Otherwise, post-intervention surveys	*Advantages* • Waitlists may provide the best matches with beneficiary households • Allows for consideration of heterogeneous impacts within communities • Not reliant on non-intervention control communities, so not vulnerable to hidden factors determining which communities were selected for subsidy implementation • Does not involve community matching, so not reliant on finding sufficient non-intervention communities *Disadvantages* • May neglect hidden factors that determined which households received subsidies within intervention communities • Waitlists may be too small for matching • Baseline survey data may be unavailable or difficult to use • Does not enable a controlled comparison at the community level • Additional households needed to determine representative intervention community statistics
(3) Community matching *Treatment group: randomly selected households in intervention communities*	Randomly selected households within matched non-intervention communities	Baseline data (e.g., 2011 census), if available. Otherwise, general characteristics of communities obtainable from satellite imagery and MMDAs	*Advantages* • Enables a controlled comparison at the community level • Provides representative community-level statistics *Disadvantages* • May neglect hidden factors determining which communities were selected for subsidy implementation • The total number of non-intervention communities may be too small for matching • Does not allow for consideration of heterogeneous impacts within communities • Community-level effects may be too small to identify due to the limited number of subsidies relative to total population
(4) Household matching in non-intervention communities *Treatment group: beneficiary households that received subsidized connections in intervention communities*	Matched households in randomly selected non-intervention communities	Post-intervention surveys	*Advantages* • Does not involve community matching, so more likely to find sufficient control communities • Reduces the possibility of neglecting hidden factors that determined which households received subsidies within intervention communities • Allows for consideration of heterogeneous impacts within communities

Matching Approach	Control Group	Data to Use for Matching	Advantages and Disadvantages
			Disadvantages • May neglect hidden factors determining which communities were selected for subsidy implementation • Does not enable a controlled comparison of community-level outcomes • Reliant on post-intervention data for matching • Additional households needed to determine representative intervention community statistics

5.1.1 OPTION 1: HOUSEHOLD MATCHING IN INTERVENTION COMMUNITIES WITHOUT WAITLISTS

Our preferred option is a design in which we will aim to **match non-beneficiary households** (i.e., households not receiving a subsidized connection) that are within 120 meters of the water main, since these were eligible for the subsidized connections under each project. By selecting control households from within intervention communities, this design would eliminate any hidden community-level factors that played a role in determining which communities were selected to receive subsidies, and households within the same community are likely to be more similar than those in separate communities. Also, the household-level matching and analysis would enable us to identify heterogeneous effects among different types of households within communities, rather than relying solely on community-wide outcomes. However, selecting the control group from the same intervention communities does risk neglecting hidden household-level factors that affected which households did and did not receive subsidies within a given community.

We expect we will likely match households using post-intervention surveys, in which we would survey approximately three non-beneficiary households per beneficiary and then select the matched control group to use in the subsequent analysis. Alternatively, there may be a possibility of obtaining and using baseline data collected by GWCL in the intervention communities as the basis for matching. Our current understanding is that GWCL administered baseline surveys in each intervention community prior to project implementation in that community, meaning that each community will have a single baseline dataset. However, we expect that the use of baseline data may prove infeasible, due either to insufficient data or difficulties in locating households surveyed at baseline. Using baseline data from broader survey efforts (e.g., 2011 census data) is also unlikely to be feasible for household-level matching, as these surveys will contain de-identified data. Locating matched households in the field would likely be impossible.

Depending on the data used for matching (baseline or post-intervention), possible matching characteristics include:

- Household and/or compound size;
- Household head's gender, education level, occupation, and/or age;
- Household tenancy arrangement;
- Primary water source (only with baseline data, or possibly through recall data from post-intervention surveys);
- Time spent collecting water (only with baseline data); and

- Monthly income (only with baseline data).

This option would not involve a controlled comparison of community-level outcomes; however, summary statistics could be calculated for intervention communities (e.g., coverage of piped water connections, average income, primary occupations). If using post-intervention data for matching, surveyed non-recipients could provide a representative sample of the community, as our understanding is that the number of households who actually received subsidies were relatively small compared with overall community size. However, to account for the possibility of smaller communities where the majority of non-recipient households might be indirect beneficiaries, we propose surveying an additional group of non-recipient households in non-intervention communities, for an additional point of reference against recipient and non-recipient households in intervention communities.

5.1.2 OPTION 2: HOUSEHOLD MATCHING IN INTERVENTION COMMUNITIES USING WAITLISTS

GWCL may already have a list of potentially similar non-beneficiary households, in the form of a waitlist containing households that applied for subsidies too late to receive the limited number available. As subsidies were distributed on a first-come, first-served basis in intervention communities, it is likely that unobservable characteristics (i.e., not discernible from available data) played a role in determining which households applied quickly enough to receive support. However, we still expect households in intervention communities that applied but were waitlisted to be closer matches with beneficiary households than those in non-intervention communities. As stated previously, community characteristics likely affected where the subsidy projects were implemented. If we are able to obtain waitlists in each intervention community, and if these lists contain sufficient numbers of households for matching with beneficiary households, we may be able to match households using data from baseline surveys as described in Option 1. Possible matching characteristics using baseline or post-intervention data would be the same as those listed under Option 1.

Similar to Option 1, Option 2 would focus on household-level outcomes and would not involve a controlled comparison of community-level outcomes. Additionally, unlike Option 1, Option 2 would require surveying an additional group of households to obtain community-level representative data, particularly to include households that did not apply for the subsidy. The waitlisted households would likely not provide a random cross-section of the community, and there may be important differences between them and those that did not apply.

5.1.3 OPTION 3: COMMUNITY MATCHING

If Options 1 and 2 prove to be infeasible (due to an insufficient number of non-beneficiary households for matching in intervention communities or waitlists being unavailable), we will aim to undertake community-level matching to pair intervention communities with similar non-intervention communities. This approach would enable the collection of representative information across all included communities, as well as controlled comparisons of community-level outcomes from the subsidy interventions.

If enough communities do exist, and if we are able to obtain sufficient baseline data for matching (e.g., community-level averages from the 2011 census and/or supplementary information obtained satellite imagery, conversations with MMDAs, and transect walks), we would identify matched control communities using the following set of possible characteristics:

- Population density, primary land cover, and/or urban vs. peri-urban typology;

- Predominant ethnicity, religion, occupation, and/or political affiliation;
- Availability of improved water sources;
- Average time spent collecting water (only with baseline data);
- Average monthly income (only with baseline data); and
- Distance to economic centers.

Household selection in both intervention and non-intervention communities would occur via random sampling, to provide a representative community cross-section. Because this option is primarily focused on community-level outcomes, our treatment households (in intervention communities) would also be randomly selected regardless of whether they actually received subsidies, in contrast to other options where only beneficiary households act as the treatment group. Accordingly, this option would enable us to assess the impacts of subsidy implementation on community-level rates of piped access, including the potential of sharing connections with households outside of the compound. However, given our understanding of the subsidy program's scale, it seems likely that community-level effects may be small and/or statistically insignificant. Additionally, this approach may not be able to account for factors that affected which communities were selected for subsidy interventions, and it would provide less information on household-level heterogeneity within the community.

5.1.4 OPTION 4: HOUSEHOLD MATCHING IN NON-INTERVENTION COMMUNITIES

Our final option, which would come into play if community matching were not feasible, would involve matching non-beneficiary households from randomly selected non-intervention, low-income communities. This option returns to a focus on household-level matching and outcomes, but non-recipient households are now further removed from beneficiaries, as they come from different communities. This separation reduces the possibility of neglecting hidden factors that determine who received subsidies within intervention communities, but it introduces hidden community-level factors affecting where the interventions occurred. In this case, we must rely on post-intervention data for matching, and an additional set of households from intervention communities would need to be included to provide representative community-level statistics. Accordingly, this is our least-preferred option.

We are in the process of evaluating the appropriateness and feasibility of these four options, based on conditions described in previous literature (Table 9). In summary, we hope to move forward with Option 1, household-level matching within intervention communities, as we expect it to be feasible, provide a control group of households that is highly similar to the beneficiary group, and enable a detailed examination of heterogeneous effects across different households.

Table 9. Conditions for matched cohort studies of pre-existing community interventions (adapted from Arnold et al. 2010)

Condition	Status
A partnership with the implementing organization	Confirmed. We have established a partnership with GWCL.
Sufficient intervention scale (at least 8–10 communities per group)	Confirmed for the World Bank and WaterWorX projects. We propose combining the UN Habitat and UNICEF projects, resulting in a total of nine communities, as these interventions had similar characteristics.
Uniformity of the intervention across communities	Confirmed. GWCL implemented water connection subsidies using consistent requirements across LIUCs.

Condition	Status
Availability of control communities, if needed (in Matching Option 3, at least two potential control communities for each treatment community needed to enable matching)	To be determined. We have confirmed that there are at least seven LIUCs in Accra West that did not receive the subsidy intervention, while 30 LIUCs did. We are in the process of confirming the number of LIUCs in Accra East and Tema that did not receive the subsidy intervention.
Community/household independence	To be determined. We will aim to prioritize communities with minimal risk of intervention influence, based on geographic proximity with beneficiary communities. We can also conduct a rapid assessment after matching but prior to data collection to verify that control communities have not benefitted from interventions in the treatment communities (e.g., by confirming water sources used by households.)
Availability of baseline (pre-intervention) data	To be determined. Ghana's 2011 Census may provide the best existing dataset for community-level matching. We are confirming the availability of this data. Census data could also be supplemented by satellite imagery (e.g., population density, primary land cover, flood-prone areas), information from MMDAs (e.g., predominant ethnicity, religion, political affiliation), or direct observation via transect walks (e.g., availability of alternative water sources, distance to economic centers).

5.2 HOUSEHOLD SURVEY SAMPLE SIZE FOR RESEARCH QUESTION 1

The matching option we select will play a role in determining the number of communities and households to include in the survey. We will aim to evaluate the effects of all four subsidy projects collectively and individually, to the extent possible. Among the four interventions, the World Bank and WaterWorX funded subsidy projects were implemented at a scale sufficient to evaluate each individually (Arnold et al. 2010), but the UN Habitat and UNICEF projects were only implemented in two and seven communities, respectively. Due to the similar characteristics of the latter two projects (e.g., the same subsidized connection fees and the possibility of paying in installments), we propose evaluating these two projects together as a single intervention, resulting in a total of three interventions to investigate.

As the combined UN Habitat and UNICEF projects cover a total of nine intervention communities, we propose to include fewer than nine intervention communities from each of the three projects. To balance statistical power and practical survey logistics, we suggest selecting seven intervention communities for each project for an overall total of 21 intervention communities across the entire study (Table 10). If we identify groups of intervention communities with distinct characteristics (e.g., urban vs. peri-urban, distance to economic centers, access to alternative water sources), we will employ stratified random sampling to select communities from within each group proportionate to the total number in that group. We also propose surveying 175 households from each of the three projects in the treatment group, compared against an equivalent number of households in the control group. This sample size corresponds to minimum detectable differences in outcomes (e.g., percent of households using piped water as their primary source) of 19–20 percentage points for each individual project and 11–12 percentage points collectively across all projects.[6]

[6] Assumptions for calculating minimum detectable difference: 80 percent power, 5 percent significance, intra-cluster coefficient of 0.02 (Yelland et al. 2011), outcome values average to 50 percent across treatment and control groups (conservative).

In matching Options 1 and 2, control and treatment households would come from intervention communities. If employing post-intervention survey data for matching subsidy recipients with control households, we will include approximately three non-recipient households per subsidy recipient in the survey and only a subset of matched non-recipients will form the final control group (Table 10 conservatively assumes the use of post-intervention data). In Option 2, we will also include a supplemental random selection of 100 households per project (300 total, sufficient to provide a 6 percent margin of error at a 5 percent significance level collectively across all projects) to provide representative cross-sectional data for intervention communities and offer insight into why some households did not apply for the subsidies (another objective of the study). In Option 1, the non-beneficiaries surveyed for potential matching will fulfill the same functions. In both options, we will survey an additional 100 households per project (300 total) to provide a representative sample of households from non-intervention communities (all non-recipients). Under these assumptions, the household survey would include a total of 2,400 households under Option 1 and 2,700 households under Option 2.

In contrast, Option 3 would employ community-level matching to identify non-intervention communities to act as the control group. As this option is focused primarily on community-level outcomes, households from intervention and non-intervention communities are sampled randomly to provide a representative picture of community conditions. While this option would require fewer households in the survey (1,800), a large number of non-intervention communities would be needed initially to enable community matching (54), potentially making this option infeasible.

The sample associated with Option 4 would be similar to Option 2 (a total of 2,700 households surveyed), with the exception that the non-recipient households included as matching candidates for the control group would originate from randomly selected non-intervention communities, rather than from intervention communities.

Table 10. Sample size and selection processes associated with each matching approach, assuming that post-intervention survey data is used to identify control households

Matching Option	(1) Household Matching in Intervention Communities without Waitlists	(2) Household Matching in Intervention Communities Using Waitlists	(3) Community Matching	(4) Household Matching in Non-Intervention Communities
Intervention communities per project (total)	7 (21) selected randomly	7 (21) selected randomly	7 (21) selected randomly	7 (21) selected randomly
Subsidy-recipient households per project (total)	175 (525) selected randomly	175 (525) selected randomly	300 (900) selected randomly for representative cross-section, including subsidy-recipients and non-recipients	175 (525) selected randomly
Non-recipient households per project (total)	525 (1,575) selected randomly for matching and representative cross-section, of which 175 (525) will be retained	525 (1,575) selected randomly from waitlists for matching controls, of which 175 (525) will be retained for	300 (900) selected randomly for representative cross-section, including subsidy-	100 (300) selected randomly for representative cross-section

Matching Option	(1) Household Matching in Intervention Communities without Waitlists	(2) Household Matching in Intervention Communities Using Waitlists	(3) Community Matching	(4) Household Matching in Non-Intervention Communities
	for controlled comparison.	controlled comparison + 100 (300) selected randomly for representative cross-section	recipients and non-recipients	
Non-intervention communities per project (total)	3 (9) selected randomly for representative cross-section	3 (9) selected randomly for representative cross-section	16 (48) selected randomly for matching, of which 8 (24) will be retained for controlled comparison	7 (21) selected randomly
Non-recipient households per project (total)	100 (300) selected randomly	100 (300) selected randomly	300 (900) selected randomly for representative cross-section	525 (1,575) selected randomly for matching and representative cross-section, of which 175 (525) will be retained for controlled comparison
Total communities needed per project (total)	10 (30)	10 (30)	24 (72)	14 (42)
Total households to survey per project (total)	700 (2,400)	900 (2,700)	600 (1,800)	900 (2,700)

We plan to employ random selection among the different groups of households to include in the survey (e.g., recipients, non-recipients). The specific procedures used to identify households in these groups will vary depending on the matching approach we employ (Appendix A). The following bullets summarize selection procedures for the household survey associated with different matching approaches. Note that "field-based procedures" for household selection may include beginning from a randomly generated Global Positioning System (GPS) point, walking in a specified direction, and identifying a household after walking a certain distance or passing a certain number of households.

1. **Identifying subsidy-recipient households under household matching:** Subsidy-recipient households will be identified using random selection from GWCL information of existing customers who received subsidized connections. GWCL information may include records of registered accounts and/or GPS coordinates of subsidized connections. These households will be located in the field with assistance from WUAs.
2. **Identifying non-recipient households under household matching**: Non-recipient households will be identified using random selection via GPS coordinates and/or field-based

procedures. In Option 1, this random selection will take place in intervention communities to identify control households. In Option 2, control households will be selected from GWCL subsidy waitlists while households that provide a representative cross-section will be randomly selected from intervention communities. For both Options 1 and 2, additional random selection will take place in non-intervention communities to provide a representative cross-section of non-recipients in those communities. In Option 4, control households will be randomly selected from non-intervention communities while households that provide a representative cross-section will be randomly selected from intervention communities.

3. **Identifying subsidy recipient households under community matching**: Subsidy recipient households will be identified using random selection via GPS coordinates and/or field-based procedures in intervention communities. Random selection will ensure a representative cross-section of households.

4. **Identifying non-recipient households under community matching**: Non-recipient households will be identified using random selection via GPS coordinates and/or field-based procedures in non-intervention communities.

5.3 RESEARCH QUESTION 2. HOUSEHOLD SURVEYS AND ANALYSIS OF SECONDARY DATA

To explore part A of the second research question regarding how the subsidy projects have impacted GWCL's tariff revenues, we plan to employ secondary data obtained from GWCL to assess bill payment behaviors. We will use payment data to determine the extent to which customers in LIUCs who received subsidized connections have made on-time tariff payments, accrued debt, or been disconnected, and if possible, we will compare these trends with those for GWCL's other customers. For the comparison, we will also attempt to segment the non-subsidized customers into wealth groups by estimating summary income statistics for households outside of LIUCs using Ghana Living Standards Survey data. Finally, we will also supplement GWCL billing data with LIUC household survey responses related to difficulty in paying bills, and the number of times that households have been disconnected for nonpayment.

To explore part B of the second research question regarding the funding required to expand and sustain the program city-wide, and what strategies could fill the funding gap while lowering reliance on donor funding, we plan to employ secondary data from GWCL to assess past subsidy project expenses. We will use data on subsidy project costs, including capital expenses, operation and maintenance costs, and implementation expenses associated with tasks such as baseline surveys, community engagement, and registration, to estimate the full costs of providing connection subsidies and the funding needed to expand the program throughout GWCL's existing network within Accra. Additional data, including network maps, LIUC locations, and projected population growth rates, will also contribute to estimating the funding required for a one-time city-wide expansion of the subsidy program in addition to recurring capital costs to expand the program annually as the city grows. Once we have identified the funding requirement, we will evaluate the effectiveness of a surcharge as a non-donor reliant mechanism of funding. This is based on the understanding that existing GWCL tariff revenue does not cover operating costs and therefore cannot serve as an effective subsidy funding mechanism (Twerefou et al. 2015; GWCL 2022a). We will calculate the projected revenues from a two percent surcharge based on GWCL billing and collection data from financial reports over the past five years. We will then compare this amount to the estimated funding requirement to determine if a surcharge is a viable funding mechanism and what funding gap remains, if any, after the surcharge. We will also look at annual

government transfers to GWCL to determine what a nominal percentage increase in transfers could contribute to the overall funding gap. Additional details on plans for collecting secondary data are provided in Section 6 (Data Collection Procedures).

5.4 RESEARCH QUESTION 3. HOUSEHOLD SURVEYS, INTERVIEWS, AND FOCUS GROUPS

To answer part A of the third question concerning how to improve future program implementation to address existing challenges and barriers faced by the urban poor, particularly women, renters, and other marginalized groups, household survey questions that focus on experiences with the subsidy program will be supplemented with qualitative interviews and focus group discussions (FGDs). We will interview members of two community WUAs and hold 5–10 FGDs in communities where subsidies were provided to understand successes and challenges from the community perspective (e.g., payment difficulties and flexible payment options), and to identify specific barriers for certain groups, such as women-headed households, renters, and other vulnerable groups. Additional details on interview and focus group topics and participant selection are provided in Section 6 (Data Collection Procedures).

In addition to qualitative data, household survey responses will provide insights into the potential for alternate targeting mechanisms and different administrative requirements to remove barriers for LIUC households. Regarding the amount of the subsidized GWCL connection fee, the household survey will include questions to determine willingness to pay (WTP). This module of survey questions will be administered to all non-recipient households and the responses will produce a demand curve (i.e., the proportion of households willing to pay as a function of the fee amount). To capture the impact of installment payments on WTP for connections, the survey will include a set of questions that require respondents to share what monthly payments they would be willing to make over 12 months. For non-recipient households that are renters rather than owners, the WTP questions will ask respondents if they are willing to pay a higher rent in order to obtain a household connection on premises. All WTP questions will utilize the double-bound dichotomous choice method, employing six price points of increasing value. A final open-ended question will ask for the maximum one-time fee and monthly installment amount that the respondent is willing to pay for a GWCL connection on their property, or in the case of a renter, what increase in rent they are willing to pay. Additional details on price points are provided in Section 6 (Data Collection Procedures).

To answer part B of the third question concerning strategies to address institutional challenges faced by GWCL in administering the subsidy projects, we will conduct approximately 10 interviews with a variety of stakeholders, including GWCL management and LICSD staff, MMDAs, and subsidy project donors. These interviews will focus on understanding processes and challenges related to topics such as community prioritization and selection, community engagement, subsidy administration, operations and maintenance in LIUCs, and revenue collection. Additional details on interview and focus group topics and participant selection are provided in Section 6 (Data Collection Procedures).

6.0 DATA COLLECTION PROCEDURES

6.1 OVERVIEW OF DATA COLLECTION PROCEDURES

As stated in Section 5, **household surveys** will serve as the primary data collection mechanism to study the impacts of the subsidy interventions. In addition to the surveys, which are described in detail below, the team will also utilize a number of other data collection procedures to supplement the household survey data, including **(1) Mapping and characterizing LIUCs, (2) secondary data collection, and (3) interviews and FGDs. Mapping and characterizing LIUCs** will allow URBAN WASH to confirm availability of control communities and households for the study design. Additionally, this activity will contribute to understanding the number of low-income communities and/or households that lie outside the GWCL networked area within Greater Accra. This will help us to approximate the maximum extent to which a connection subsidy intervention could increase piped access without requiring further capital investment to expand the main distribution network. This exercise will also rely on secondary data sources, such as network maps to be requested from GWCL. Other **secondary data collection** will include requests for financial information from GWCL, including billing records, which will help confirm bill payment behavior and revenue collection efficiency among subsidized users; actual expense records from the subsidy projects, which will help model costs for future programs; and financial statements to estimate the projected value of a possible surcharge on customer billing, as well an increase in government transfers. Finally, **interviews and FGDs** will allow the team to ask open-ended questions and collect qualitative data about the implementation of the subsidy project to understand existing barriers to accessing the subsidy. Interviews will take place prior to and/or in parallel to household surveys, while FGDs will take place after some community surveys have been completed.

6.2 MAPPING AND CHARACTERIZING LIUCS

Since there are no comprehensive maps or surveys of LIUCs in Accra, the project team will collect data to create comprehensive maps of the total number of LIUCs within the Greater Accra area. This effort will build on existing data sources such as:

- GWCL's existing map of LIUCs within Accra West, one of GWCL's three operating areas within Accra; and
- Existing maps or lists of LIUCs available from MMDA offices.

Additional data collection will take place to delineate LIUCs through the following two methods:

- Utilizing satellite imagery to determine boundaries of existing LIUCs within Greater Accra. Additionally, we will consider using an AI-based technique of point-to-region co-learning which relies on publicly and freely available data and has been employed in Kenya (Li et al. 2023). This method would allow us to predict boundaries of LIUCs based on satellite data.
- Manually collecting GPS data on LIUC boundaries through transect walks.

Once the spatial boundaries of the LIUCs have been determined, we can utilize population density maps to estimate the total population per LIUC.

6.3 HOUSEHOLD SURVEYS

As mentioned in the previous section, the study will employ household surveys to collect relevant data on numerous metrics related to the research questions. The survey questions will fall into the following categories:

- Demographic characteristics and housing arrangements:
  - Ethnicity/religion, gender of head of household, age, marital status, education level, main occupation;
  - Tenancy arrangement, type of housing, sanitation facilities; and
  - Access to site plan and national ID.
- Socioeconomic Assessment:
  - Questions derived from reputed poverty assessment tools, including the DHS Wealth Index, the PPI, and the Equity Tool (see Table 11 for a summary of assessments). We will also record whether surveyed households are enrolled in the Government of Ghana's LEAP (cash transfer) program.
  - Indicators of vulnerability, such as household-head who is elderly or with disability or chronic illness, etc.
- Water access, livelihoods, and health:
  - Primary and secondary water source(s) for drinking and other uses,
  - Household water storage and treatment practices,
  - Time spent collecting water,
  - Occupation before and after on-premises connection,
  - Water resale activities,
  - Incidence of water-related illness in the past year, and
  - Incidence of diarrhea in the past week.
- Experience with GWCL subsidy program:
  - How recipients and non-recipients in intervention communities learned about the projects and the process of registering,
  - Payment modality used and preferred payment modalities for connections, and
  - Why non-beneficiary households did not connect to GWCL through the subsidy projects.
- Bill payment and ability to pay water tariffs:
  - How often and when households pay water bills (from households and GWCL),
  - How multiple households sharing a piped connection split the bill,

  - Difficulties faced in paying bills,
  - Preferred payment modalities for tariffs, and
  - Whether the household has ever been disconnected for non-payment of bills (from household and GWCL).
- Affordability:
  - Monthly and/or daily water expenses;
  - Change in rent due to new piped connection (for renters);
  - Yearly, six-monthly, and/or monthly income (may consider daily or weekly income during survey pilot in case necessary);
  - Ranking of water expenses relative to other household expenditures (housing, food, etc.); and
  - Access to or use of formal or informal credit (e.g., micro-loans).
- WTP for connection fee:
  - Double-bound dichotomous choice method to determine WTP for a one-time connection fee, for monthly installment payments, and for an increase in rent. For a one-time connection fee, WTP questions will employ price points of GHS 100, 200, 300, 500, 1000, and 2000. For monthly instalment payments and an increase in rent, WTP questions will employ price points of GHS 50, 75, 100, 125, 150, and 200. A final open-ended question will ask for the maximum amount that the respondent is willing to pay for each type of payment to receive a GWCL connection on their property.

The household survey tool is available in Appendix A. Enumerators will enter survey responses in the CommCare mobile application (Dimagi).

Table 11. Summary of all household poverty assessment questions to be included in household survey

Assessment	Summary
DHS Wealth Index	A set of country-specific indicators that include household assets, dwelling characteristics, and utility services that can be used to calculate household scores and construct wealth quintiles (DHS 2017).
EquityTool	A short (11-question) country-specific questionnaire consisting of a subset of the DHS questions, which can be used to construct household scores and wealth quintiles (Chakraborty et al. 2016; Equity Tool n.d.).
PPI	A short (10-question) country-specific survey that calculates scores for households and then determines the probability that a household is living under the national poverty line or under thresholds (Salas, Kshirsagar, and Ramanathan 2019).
LEAP Program	The Government of Ghana's LEAP Program is a social cash transfer program administered since 2008. The program targets households meeting two criteria: (1) they should be extremely poor according to a national proxy-means test, and (2)

Assessment	Summary
	they have a vulnerable member (older than 65, person with disability, orphan or "vulnerable"[7] child) (Ministry of Employment and Social Welfare 2012)

6.4 INTERVIEWS AND FOCUS GROUP DISCUSSIONS

We will conduct around 12 interviews and between 5–10 FGDs to collect qualitative data and ensure that we capture diverse perspectives. The interviews and FGDs have been categorized as follows:

- MMDAs: Conduct interviews with two to three Municipal/District Assembly officials who represent low-income communities within Greater Accra to understand how communities were prioritized for the past subsidy interventions, any difficulties experienced during the community selection process, and MMDA priorities for future programs. We will prioritize MMDAs with higher concentrations of low-income communities and/or MMDA representatives present at the time of subsidy implementation for interviews. If needed, we will add one to two interviews with additional officials to capture diversity of opinions and tenure in office.

- GWCL LICSD Staff: Conduct one FGD with GWCL LICSD staff, including LICSD representatives from each GWCL region serving Greater Accra, to understand successes and challenges with administering the projects, including community engagement, registration, ongoing maintenance, and revenue collection. In particular, determine any lessons learned and ideas for improvements in administering future programs. If LICSD staff have left or retired since projects were implemented, we will consider adding them to the FGD.

- GWCL Strategic Management: Conduct two to three interviews with directors of GWCL's Commercial Department and Public Relations Department to understand challenges and motivations related to administering the subsidy projects from other departments' perspectives.

- Donors: Conduct one interview with a donor representative of each project (four total interviews) who was actively involved in administering past subsidy projects to understand challenges and motivations related to administering the subsidy projects from a donor perspective. We will also consider adding an additional interview with a representative from the Kwame Nkrumah University of Science and Technology (KNUST) team that is evaluating the UNICEF project, depending on the progress of the evaluation.

- WUAs: Conduct two interviews with members of community WUAs where the subsidy intervention has taken place to gather a deeper understanding of community successes and challenges around the projects.

- Community FGDs: Conduct 5–10 total community FGDs in communities where the subsidy intervention was implemented to discuss community perspectives on successes or challenges related to the subsidy projects, particularly payment difficulties and alternative flexible payment options that might enable low-income households to pay the connection fees and ongoing tariffs. Possibly conduct separate focus groups with women, landlords, renters, and other vulnerable or marginalized groups to prompt a discussion around improving access to the connection subsidy among different groups. Furthermore, if feasible, we will separate FGDs with people who benefitted from the subsidy and those who did not. Selection of participants for the community

[7] A vulnerable child is defined as disabled, or chronically ill, or with a missing parent, or member of a household with a head who is under 18 years old or chronically ill.

focus groups will take place with support of GWCL LICSD staff and community leaders/WUA members. To reduce bias in participant selection, we will identify individuals within target groups of interest (e.g., renters, women) during the household survey and document contact numbers to randomly select participants from these groups after the survey is complete.

6.5 SECONDARY DATA COLLECTION

In addition to collecting primary data through household surveys, interviews, and FGDs, we will also collect relevant and available secondary data sources, including the following:

- GWCL network maps to spatially analyze where LIUCs are situated in relation to where the network exists.
- GWCL billing and collection records to assess payment compliance among subsidized customers and (if possible) non-subsidized residential customers, and to determine if any connection subsidy beneficiary accounts have accrued debt or been disconnected since installation of the connection. Additionally, summary-level statistics for income levels of customers located outside LIUCs to compare payment behavior to income level.
- Details of costs associated with implementing the subsidy projects, including capital costs (costs to extend connections and extend mains) and ongoing operation and maintenance costs. Costs for implementation should include time, materials, and transportation expenses starting from baseline and site surveys, through registration processes (including community engagement), and final installation. Costs for ongoing operations and maintenance should include costs of maintaining service pipes and meters, and if possible, the nearest water main serving the LIUC. GWCL financial statements from the last three years to understand annual government and transfers and estimate the value of a two percent customer surcharge based on existing billing and collection revenue.
- Projected rate of population growth for Accra, and the proportion of that growth within LIUCs, to determine annual expansion of subsidized connections.
- If possible, existing bulk water production volumes and associated costs within Accra to determine bulk water supply needs and costs for expanding services to LIUCs.

6.6 FIELDWORK PROCEDURES

URBAN WASH will recruit 12 enumerators, split into teams of four, each led by one supervisor. Estimating a maximum of 60 minutes per survey, each enumerator should be able to complete four to five surveys per day, which translates to around a total of 40 surveys per day for the whole team. This will result in a data collection period of approximately two and a half months to complete up to 4,200 surveys.

URBAN WASH will train data collection teams for at least six days: three days in the classroom and three days in the field to pilot household selection procedures and the survey tool. When data collection begins, enumerators will collect data on Android phones using the CommCare survey application. Supervisors will oversee team logistics, lead community entry, conduct quality control procedures (described below), and collect consent forms.

URBAN WASH staff will conduct the interviews and FGDs ahead of or in parallel to survey data collection. URBAN WASH will audio-record all interviews and transcribe them into English.

6.7 RISKS AND MITIGATION STRATEGIES

Table 12 summarizes various risks and mitigation strategies associated with the study. Overall, the study is highly dependent on GWCL's support, including willingness to share data for analysis and respond to clarifying questions, availability for interviews and focus groups. The MoU signed with GWCL ensures that they are aware of their responsibilities to support the study and commit to doing so.

Table 12. Summary of risks and associated mitigation strategies for the study

Risks	Mitigation Strategies
Delays in identifying comprehensive lists of low-income communities in Accra, leading to delays in selection of intervention and control communities (if needed).	Begin mapping LIUCs while still requesting information from MMDAs, to counter potential delays in requests for information on LIUCs
Delays in receiving responses for data requests from GWCL	Field staff in Accra will follow up with GWCL regularly and be available to visit offices in person to speed up responses to data requests and provide clarifications as needed.
There are not enough control communities that match the scores of intervention communities	Match households instead of communities and collect surveys from a representative cross-section of households within communities to develop summary statistics for each community.
Selection of beneficiary households in intervention communities could include bias of community leaders/WUA members providing guidance	Rely on GPS coordinates of subsidy recipients where possible to randomize selection of recipient households to survey
Gender or age of survey respondents could be skewed toward more powerful groups (men, older, homeowners)	Utilize community focus groups to supplement survey data and ensure participation of women, youth, differently abled, and renters. Request GWCL and community leaders to ensure participation from these groups.
One survey response per compound property could overlook difficulties faced by other households living on the same compound	Ensure survey questionnaire includes questions regarding access to the GWCL connection for other households on the same property, and whether compound property households shared connection costs and ongoing monthly water bills. Use FGDs to elicit responses regarding barriers faced by residents of compound properties.

7.0 DATA ANALYSIS PLAN

7.1 IMPACTS OF CONNECTION SUBSIDIES ON CUSTOMERS

As described in Section 5, we will employ a matched cohort study design to assess the extent to which previous connection subsidy projects increased water access and improved livelihoods among LIUCs in Accra. Matching will employ propensity scores derived from logistic regression with nearest-neighbor matching (Arnold et al. 2010; Gertler et al. 2016). For households, the logistic regression outcome is whether the household received a connection subsidy. For communities, the logistic regression outcome is whether the subsidy project was implemented in the community. In either case, a set of covariates (see Section 5) would determine the propensity score.

Once matching is complete, we will compare post-intervention outcomes (Section 5) among beneficiary households relative to those among matched non-beneficiary households (i.e., the main explanatory variable is whether a household received the subsidy) using logistic and linear regression models with adjusted standard errors to account for community-level and project-level clustering. We will employ separate regression models for each subsidy project (with the UN Habitat and UNICEF projects combined), as well as one combined model across all projects. We will also assess post-intervention differences between subsidy recipients and non-recipients using chi-square tests (for binary outcomes) and t-tests (for continuous outcomes). Additionally, if baseline data are available, we will explore using the difference-in-differences method to calculate changes in outcomes before and after the projects for subsidy recipients relative to non-recipients (Gertler et al. 2016). This would represent an additional measure to reduce the potential biases associated with matching and to go beyond post-intervention comparisons of treatment and non-treatment groups (Gertler et al. 2016). Finally, we will disaggregate results to examine outcomes specifically for vulnerable and marginalized groups such as women-headed households, households with members having disabilities or chronic illnesses, and renters.

7.1.1 SOCIOECONOMIC ANALYSES

The household survey will collect socioeconomic information, such as household head gender and age, tenancy status, and whether households contain members with specific vulnerabilities, which we will use to construct socioeconomic profiles and disaggregate results. Further, we will employ the various poverty assessment methods included in the household survey (DHS Wealth Index, Equity Tool, PPI, LEAP program enrollment, and specific vulnerability checks based on the Government of Ghana's guidelines) to identify vulnerable households according to each method. The DHS Wealth Index uses Principal Component Analysis to derive index values for each household based on a weighted combination of standardized indicators included in the DHS questionnaire. A distribution of the sampled household population is created by giving each member of a household that household's index score. We will construct wealth quintiles within our sampled population (Rutstein and Johnson 2004), and we will also compare index scores to quintiles constructed at the national and regional levels from the Ghana MHS 2017 survey (DHS 2017), to understand how the survey population compares with national and regional populations. The Equity Tool employs a smaller subset of parameters used in the DHS Wealth Index to derive index scores representing wealth or poverty levels. The PPI uses a similar method with a set of 10 questions to produce poverty probability values relative to the national poverty line and other poverty thresholds.

The results of these various poverty assessment tools will provide insight into the potential value of using proxy means tests or other methods for targeting households eligible to receive subsidized support.

During household surveys, we will also ask non-recipients in intervention communities why they did not opt into the project, providing possible responses such as inability to pay the connection fee and/or expected future water bills, tenancy status, and registration difficulties. Community FGDs will allow for qualitative responses to the same question. Key outcome metrics will include the following:

- Percentage of sampled households below the poverty line (as estimated by the PPI),
- Percentage of sampled households that fall into the bottom two quintiles of the national DHS Wealth Index (for urban areas),
- Percentage of vulnerable households that benefitted from the subsidy,
- Percentage of sampled households that did not opt into the project because of inability to pay for the connection fees and/or inability to pay water bills, and
- Percentage of sampled households that did not opt into the project because of tenancy status.

7.2 IMPACTS OF CONNECTION SUBSIDIES ON GWCL FINANCES

7.2.1 PAYMENT BEHAVIOR OF SUBSIDIZED CUSTOMERS

Based on the billing records for subsidized connections obtained from GWCL and the survey responses collected from beneficiary households, we will estimate water consumption and bill payment behavior among subsidy recipients. Outcome metrics will include the following among subsidy recipients:

- Average monthly water consumption and monthly water bill,
- Percentage of accounts whose monthly consumption falls within the first tariff block (i.e., the social/lifeline tariff),
- Percentage of accounts that have made all monthly payments since receiving a connection (excluding those that are still utilizing the initial consumption deposit paid at the time of connection), and
- Average debt (arrears in payment) among subsidy beneficiary accounts.

Percentage of beneficiary households that have been disconnected due to non-payment of bills. If we are able to obtain additional data from GWCL concerning water consumption and bill payments among other residential customers (i.e., those with unsubsidized connections), we will generate the same outcome metrics for comparison with subsidy recipients.

We will employ techniques such as regression models to examine whether specific characteristics of subsidy interventions have affected these outcome metrics (e.g., whether the connection fee paid by subsidy recipients correlated with water bill payment compliance).

7.2.2 COST OF EXPANDING CONNECTION SUBSIDIES

Based on the secondary cost data shared by GWCL, we will estimate the following metrics:

- Capital cost per new connection within GWCL's serviced LIUCs (i.e., within 120 meters from the nearest water main),
- Capital cost per km of water main extension (under the past subsidy projects),

- Annual operations and maintenance costs per connection, and
- One-time and annual subsidy program costs (e.g., administration, implementation) per subsidized connection.

From these metrics, we will compare the actual costs associated with subsidized connections to the revenues generated through connection fees and consumption tariffs (Section 7.2.1). This comparison will provide insight into the level of funding needed from other sources to continue the program and connect additional low-income households.

Depending on GWCL's ability to share data on water production costs, we will include those costs as an additional variable to consider when funding future connection subsidy projects.

7.2.3 GAP ANALYSIS AND STRATEGIES FOR FUNDING FUTURE CONNECTION SUBSIDIES

Once we have estimated the total number of unconnected households in LIUCs (Section 7.3.4), we will be able to use the estimated costs per connection from Section 7.2.2 to determine a total capital cost for a one-time expansion of the connection subsidy program, a recurring capital cost based on projected population growth, and a recurring operational cost for maintaining the connections once they are installed. We will compare these costs to annual transfers from the central government/donors and GWCL's total annual budget. The resulting difference will determine the magnitude of additional funding that is required for expanding the connection subsidies program to cover all low-income households in the greater Accra area, initially through a one-time project and then followed by a recurring annual expansion to account for population growth.

We will then explore the potential for surcharges to fill this gap. Based on GWCL billing and consumption data, we will apply a two percent and five percent surcharge to the average monthly bill of a non-subsidized customer to quantify the resulting revenue and determine if the resulting additional revenue could finance capital costs for low-income households within the networked area and/or outside the networked area. We will also quantify a five percent increase in government transfers and repeat the above steps to determine how much of the funding gap external transfers can address.

The analysis will lead to the following key outcome metrics:

- Capital cost of expanding connections to unconnected households within GWCL networked area (within 120 meters of existing GWCL lines),
- Capital cost of expanding connections outside the GWCL networked area (areas requiring water main extension),
- Annual recurring cost of maintaining all subsidized connections,
- Gap between existing central government/donor transfers and funds needed to expand the program,
- Possible additional revenue from a two percent surcharge and five percent surcharge on monthly bills for non-subsidized customers, and
- Possible additional revenue from a five percent increase in government transfers to GWCL.

7.3 STRATEGIES FOR FUTURE IMPROVEMENTS TO SUBSIDY PROGRAMS

7.3.1 AFFORDABILITY, WILLINGNESS TO PAY, AND PAYMENT MODALITIES

We will use a variety of techniques and indicators to estimate affordability of and WTP for piped connections and ongoing consumption tariffs. In the household surveys, we will ask subsidy recipients directly if they have faced difficulties in making payments associated with connection fees and/or monthly water bills. Additionally, we will evaluate the fraction of monthly income that beneficiary and non-beneficiary households are spending on water), based on reported income levels and water payments (as well as billing records from GWCL, if possible), and compare this fraction to an affordability threshold for households at the poverty line (Andres et al. 2020). We will also compare estimates to relevant past studies (Adams and Vásquez 2019; Amoah and Moffatt 2017; Vásquez and Adams 2019). Finally, we will construct a demand curve showing reported WTP for connection fees at various price points, and we will assess preferences for different payment modalities (e.g., installment plans linked with monthly water bills) among subsidy recipients and non-recipients. Key outcome metrics related to these affordability topics will include the following:

- Percentage of households that have faced difficulty in water bill payments due to compound housing arrangements, inconsistent income, competing basic needs, or emergency situations;
- Percentage of households whose expenditure falls above the affordability threshold at existing and hypothetical connection price points;
- Price point for a one-time connection fee that 80 percent of household owners can afford and/or are willing to pay;
- Price point for a monthly installment fee that household owners can afford are/or willing to pay for a connection on-premises;
- Incremental rent increase that renters can afford and/or are willing to pay for a connection on-premises; and
- Reasons for difficulty in paying water bills, ideas for improving payments, and ideas of flexible payment options that would have enabled low-income customers to pay for the subsidized connection fee (qualitative).

7.3.2 ADMINISTRATIVE BARRIERS

A section of the household survey will focus on reasons why non-recipients in intervention communities either did not apply for or did not receive connection subsidies. From this information, along with complementary qualitative information from FGDs and interviews with GWCL staff, we will identify common difficulties faced by households in registering for the subsidy projects in time. Key outcome metrics will include the following:

- Percentage of households that could not benefit from the subsidy because the quota of connections had already been filled;
- Percentage of sampled households that did not opt into the project due to living arrangements (compound property and/or renters);
- Percentage of sampled households that did not opt into the project due to lack of information about the subsidy or mobile registration drives; and

- Difficulties or barriers faced by residents in registering for a subsidized GWCL connection, particularly women, youth, and other vulnerable populations, and/or reasons they did not wish to apply (qualitative).

We will disaggregate results among marginalized and vulnerable groups, such as women-headed households, households with members who have disabilities or chronic illness, and renters, to determine if certain groups faced greater barriers or specific difficulties in benefitting from connection subsidies.

Additionally, the FGD with GWCL staff will also provide insight into any challenges faced by GWCL in administering the subsidy projects, as well as the effects of relaxing requirements for low-income residents applying for new connections (e.g., only requiring a national ID card to register) on households' ability and incentive to register. We will make recommendations for future programs based on the study.

7.3.3 REGULATORY BARRIERS

The household survey will ask respondents if they have access to site plans for the property that they reside on. This is a regulatory requirement for new water connections that GWCL relaxed during the subsidy projects. Responses to this question will provide insight into how many subsidy recipients were able to benefit from the program due to the waiving of this requirement:

- Percentage of recipients who do not have access to property site plans, and
- Percentage of households who have national IDs.

7.3.4 IDENTIFYING THOSE THAT ARE UNCONNECTED

By combining the maps of LIUCs that we develop with GWCL's existing network maps, we will estimate the extent to which unconnected households in LIUCs fall within GWCL's current service area (defined as being within 120 meters of a water main). First, we will identify the number of households within a service area using either satellite imagery or observed household density during enumeration. By identifying all households located within the service area and removing those already connected through the subsidy interventions, we will estimate the number and percentage of unconnected households that are within 120 meters of the existing network. This number will provide a conservative estimate for the number of connections needed to serve all low-income households within the current service area with either a private single household connection or as a private compound house connection serving several households. Combined with consumption data from billing documents, the number of connections will also be used to determine the volume of additional bulk water required to serve unconnected LIUC households. Key findings will include the following:

- Percentage of low-income households within connection distance of GWCL's water mains,
- Percentage of low-income households outside the connection distance of GWCL's water mains,
- Number of connections needed to connect all unserved households in LIUCs within GWCL's service area, and
- Volume of bulk water needed to serve all unserved households in LIUCs within GWCL's service area.

This information, combined with previous findings on the costs associated with connections, will provide a high-level estimate of the funding needed to extend service to unserved low-income households already residing within GWCL's service area, with no main network extension required (Section 7.2.3).

8.0 DATA MANAGEMENT

8.1 HUMAN SUBJECTS PROTECTION AND FIELD PREPARATION

URBAN WASH will obtain ethical research approval from the Council for Scientific and Industrial Research (CSIR), an Institutional Review Board (IRB) in Ghana. While waiting for approval, the team will verify the availability and quality of existing baseline data to refine the data collection tool and prepare training materials for the enumerators. This will include purchasing field materials and preparing relevant guides and itineraries. We will translate the data collection tool into local languages (Twi, Dagbani) with additional input from enumerators during the training process to ensure consistent wording in the field.

8.2 DATA QUALITY ASSURANCE

URBAN WASH will take the following steps to ensure the quality of household survey and qualitative data:

- Embed data consistency checks and non-falsifiable questions (e.g., GPS) within the household survey data collection platform (CommCare),
- Review incoming data daily and follow up with data collection teams on inconsistencies,
- Have supervisors conduct back-checks or spot checks on 20 percent of surveys,
- Require qualitative data collectors to finalize notes on the day of an interview and transcribe audio-recordings within three days to avoid loss of information due to recall errors, and
- Review qualitative transcripts as soon as they are ready and follow up with qualitative data collectors for clarifications when needed.

8.3 DATA MANAGEMENT PLAN FOR HUMAN SUBJECTS PROTECTION

In addition to submitting data collection protocols to the CSIR, URBAN WASH will also collect written informed consent from all study participants. Enumerators will upload all quantitative and qualitative data daily onto password-protected computers, backed up on a password-protected Dropbox account. URBAN WASH will not communicate any personally identifiable information to local stakeholders and will only present summary statistics and statements. The team will remove all personal identifiers (names and GPS coordinates) before uploading data on USAID's Development Data Library.

9.0 ENGAGEMENT AND DISSEMINATION

URBAN WASH will maintain regular engagement with local partners to ensure that the research is relevant and actionable to the WASH sector. The project will establish a technical working group (TWG) comprised of local stakeholders who have interest in the topic and are likely influencers and users of the research findings. URBAN WASH will hire an in-country engagement manager to facilitate this engagement with local stakeholders to ensure uptake of evidence produced through research activities. The engagement manager will serve as the key liaison between URBAN WASH researchers and local stakeholders, including government officials at the national and sub-national levels, service providers, development partners, implementers, and community members. They will work closely with the research team and local stakeholders to maximize exposure and opportunity for uptake of research findings in-country, leveraging in-country networks with WASH policymakers, practitioners, academics, consultants, and NGOs to achieve this.

Additionally, URBAN WASH proposes the following engagement events and will attempt to combine these with existing sector-wide events and existing active national-level platforms (or groups) whenever possible.

9.1 TECHNICAL WORKING GROUP

The TWG of key stakeholders at national and/or city-level has been created and will meet quarterly throughout the project. Table 13 lists the members of this group. This working group will review the research process and the subsequent selection of pilot interventions, ensuring that URBAN WASH's activities address relevant local and national issues. The working group will also advise and assist in identifying effective ways to share and disseminate the findings. They will also participate in dissemination workshops.

We selected TWG members based on a stakeholder engagement process conducted between September and November 2022 which included the following steps:

1. **Stakeholder Identification**

   Searched for existing sector working groups, relevant government ministries/agencies, academic institutions, DFIs, and NGOs in the sector. GWCL provided feedback on the initial list and suggested contacts for listed stakeholders.

2. **Stakeholder Engagement and Analysis**

   Conducted one-on-one meetings with identified stakeholders to present an overview of the program, the research partnership, and the concept of the TWG. Analyzed stakeholders based on (1) influence on the topic/sector, and (2) experience with implementing, researching, or advocating pro-poor subsidies. Based on those two dimensions, stakeholders were sorted into three categories: Manage Closely, Keep Satisfied, and Monitor. See Appendix I for a detailed summary of this analysis.

3. **TWG Formation**

   Stakeholders sorted into the "manage closely" category (~10) were selected for the TWG and were requested to share a confirmation of their interest and commitment in joining the TWG.

4. Inaugural Meeting and Co-design Workshop

The TWG met for an initial workshop on December 14, 2022, at the African Regent Hotel Conference Center in Accra. The group agreed upon terms of reference, with the key activities and deliverables anticipated as, but not limited to:

- Identifying additional key stakeholders necessary to catalyze uptake of URBAN WASH learnings;
- Developing/refining the research and learning agendas in partnership with the study team to generate research that is strategic, timely, and relevant to the intended users;
- Advising on engagement opportunities and communication channels to ensure that all stakeholders are engaged in the study, aware of the findings, and open to implementing recommendations; and
- Communicating the recommendations and promote their implementation.

During the workshop, the TWG group also agreed to conduct three meetings during the proposed research timeline. One research meeting will take place at the beginning of data collection, another toward the end of data collection and analysis, and a final validation workshop to share and verify draft research outputs closer to the end of the research timeline. These meetings are summarized in the engagement activities table (Table 14).

Table 13. Technical working group members

TWG Member	Affiliation
Patience Ampomah	National Development Planning Commission
Suzzy Abiadoo	MSWR
Daniel Allan (or alternative)	PURC
Benedict Tuffuor	TREND
Dr. Kwabena Nyarko	KNUST
Veronica Ayi-Bonte	Resource Center Network (IRC) Ghana
Samuel Amoako Mensah (or alternative)	UNICEF
John Nedjoh	USAID Ghana
Krijn Driessen	Vitens Evides International
Faustina Boachie (and/or others as necessary)	GWCL

9.2 CONFERENCES AND WORKSHOPS

In addition to the TWG activities described above, the research team will investigate and pursue additional dissemination activities, such as webinars and conference presentations within Ghana and internationally. Potential dissemination activities within Ghana include the annual Mole Conference, which is organized by the Coalition of NGOs in Water and Sanitation (CONIWAS) and is one of the longest running multi-stakeholder platforms in the WASH sectors in Ghana (Resource Centre Network Ghana n.d.). Another potential venue for dissemination is IRC's annual All Systems Go Africa Conference, which attracts WASH experts from across Sub-Saharan Africa with the aim of strengthening systemic change to achieve targets set by national governments across the continent (IRC 2022). In 2022, IRC's conference was held in Ghana.

International venues for dissemination include the Water and Health conference at the University of North Carolina and Stockholm World Water Week.

In addition to disseminating findings among WASH sector actors, we also plan to conduct up to three district or community-level workshops where we share relevant information and findings with leaders and representatives of the LIUCs within which we conduct the research. These community workshops can allow community leaders and MMDA representatives to gain a better idea of service provision within their communities and existing barriers to accessing water services. These learnings will help representatives advocate for policy change where needed. Each engagement activity will require its own communication product, and we will integrate feedback from engagement workshops into final activity communication products, such as policy briefs and papers/conference presentations. Table 14 summarizes the proposed engagement activities as well as the related communicated products.

Table 14. Summary of engagement and dissemination activities

Engagement Activity	Output	Communication Product
TWG Co-Design Workshop	Consensus on research questions	Project Updates
TWG Data Collection Workshop	Finalize survey tools and methods	Project Updates
TWG Data Analysis Workshop	Finalize research outputs	Project Updates
TWG Validation Workshop	Validate findings from data analysis and finalize report	Project Updates, Policy Brief
Community Workshops (up to three)	Share learnings with LIUC local leaders and MMDA reps	Community Presentation
CONIWAS Conference	Share learning and recommendations with Ghana WASH sector actors	Conference Presentation, Policy Brief
IRC/University of North Carolina/Stockholm World Water Week.	Share learning and recommendations with international audiences	Conference Presentation/Paper, Academic Paper

10.0 ACTIVITY MANAGEMENT PLAN

Tetra Tech/URBAN WASH will have overall management, financial, and quality assurance/quality control (QA/QC) responsibilities for the URBAN WASH core activity. Deputy Chief of Party Dr. Miriam Otoo will provide technical oversight of the research activities and provide QA/QC of all deliverables. Aquaya will report to Dr. Otoo and be responsible for the technical research activities, with support from the wider URBAN WASH team and inputs from stakeholder groups, such as USAID.

Additional details on roles and responsibilities are included in Table 15.

Table 15. Summary of team roles and responsibilities

Team Member	Role	Responsibilities
Dr. Miriam Otoo	Deputy Chief of Party	Miriam will oversee the management of the URBAN WASH activity, coordinate with relevant external stakeholders, and support the review and quality control process for deliverables.
Haleemah Qureshi	Research Lead	Haleemah will lead implementation of research activities, including coordination with key stakeholders, data collection activities, data analysis, and development of deliverables.
Dr. Caroline Delaire	Research Advisor	Caroline will provide advice and guidance for the activity design and implementation. She will support co-creation activities and provide guidance on overall program design, preparation, troubleshooting, data analysis, and outputs. Caroline will support the review and quality control process for all deliverables.
Miles Osprey Schelling	Research & Planning Officer	Based in Ghana, Miles will support project initiation activities, provide support to the implementation of the research activities, including field research, coordination with key stakeholders, data collection activities, and preparation of deliverables.

11.0 MONITORING AND EVALUATION

The URBAN WASH team will monitor and evaluate the activity as required by the URBAN WASH contract and Activity Monitoring, Learning, and Evaluation Plan. Quarterly and annual reports will describe the activity's progress and report on the agreed-upon custom indicators (Table 16) to measure the results of the first phase and dissemination.

Table 16. URBAN WASH performance indicators

N°	Performance Indicator [and Type]	Disaggregation
C.1	Number of partners and stakeholders applying URBAN WASH-generated learning [Custom, Outcome]	Type of partners/stakeholders; learning topic area; geographic area
C.2	Number of institutional tools (reports, policies, laws, agreements, action plans, regulations, strategies, or investment agreements) influenced by URBAN WASH [Custom, Outcome]	Type of guidance; topic area; type of institution; stage (proposed/draft, adopted/final); influence level (strong, medium, weak); geographic area
C.3	Number of technical publications/communications materials developed to share information and learning [Custom, Output]	Type of products; topic area; type of institution; geographic area
C.4	Number of individuals exposed to WASH and water resources management approaches/tools through attendance at URBAN WASH presentations/events, communication materials, and knowledge products (Custom; Output)	Sex (male/female/undisclosed); age (15–29, 30+); type of exposure (events, knowledge, and communication products); topic area; affiliated institution; geographic area
2.1	Number of country- or local-level workshops/events for research co-design and presentation of findings [Custom; Output])	Level of project role (organized, co-organized, presented); topic area; geographic area
2.2	Number of local partners actively participating in design and implementation of URBAN WASH research activities [Custom, Output]	Level of project role (organized, co-organized, presented); topic area; geographic area

Based on the evidence and insights generated through the research activities described in this inception report, URBAN WASH will work with GWCL and other key stakeholders to develop potential pilot interventions for additional connection subsidies in Accra. Future workshops with the TWG will include a discussion of the most suitable indicators to measure the results of the success and achievement of the pilot interventions. At that time, URBAN WASH will review the standard USAID WASH indicators and consider if additional custom indicators are necessary and will select the indicators that are most appropriate for measuring the outcomes of the selected interventions.

12.0 TIMELINE AND DELIVERABLES

We expect the research activities described in this inception report to begin in April 2023 and extend for approximately 12 months, concluding by April 2024. Within this time, key milestones and deliverables will include:

- IRB submission (May 2023);
- Determine appropriate matching option based on available data and control populations (May 2023);
- Complete household survey pilot with enumerators (July 2023);
- TWG data collection workshop (June 2023);
- Complete data collection (September 2023);
- TWG data analysis workshop (November 2023);
- TWG validation workshop, including discussion of possible pilot interventions (February 2024);
- Final report with recommendations for piloting new subsidy interventions (April 2024); and
- Community workshops (April–May 2024).

Table 17. Proposed timeline of research activities and deliverables

Activity	2022	2023												2024			
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Study Design and Refinement																	
Draft study design and inception report – submit to USAID				X													
Revise inception report from USAID comments																	
Prepare and submit IRB package (2–3 weeks for approval)						X											
Verify availability of baseline data and number of control communities																	
Review/revise data collection tools																	
Field Work																	
Mapping LIUCs																	
Hire enumerators and prepare training materials																	
Train enumerators																	
Pilot surveys and refine tools																	
Data collection (household surveys, interviews, focus groups)																	
Data Analysis																	
Select control communities/households																	
Data cleaning (after data collection)																	
Analyze survey data and generate summary statistics																	
Analyze qualitative data																	
Reporting Outcomes																	
Draft evaluation report and research brief																	
Submit to USAID																	X
Engagement and Dissemination																	
TWG Co-Design Workshop	X																
TWG Data Collection Workshop							X										

Activity	2022	2023												2024			
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
TWG Data Analysis Workshop												X					
TWG Validation Workshop															X		
Community Workshops																	X

13.0 COVID-19 CONTINGENCY PLAN

The URBAN WASH team will take the necessary steps to adhere to the national COVID-19 guidance in Ghana and ensure to adopt all recommended or required COVID-19 mitigation measures. For the field activities, the team will also use WHO's Mass Gathering Risk Assessment Tool that Tetra Tech recommends as complementary guidance when planning events and activities requiring physical participation (WHO 2022b).

URBAN WASH will take all necessary precautions when collecting primary data through in-person surveys and interviews to protect the health of the evaluation team and those with whom they interact. These measures may include wearing masks, offering masks to interview and survey participants, conducting interviews or surveys outdoors and/or at a safe distance, and testing the team regularly for COVID-19. The team will explain risks to interview and survey subjects, offer options for mitigating risks, and proceed with the interview or survey only if the participant agrees.

In the event that COVID-19 restrictions prevent travel or in-person data collection, or URBAN WASH believes in-person data collection poses an unacceptable risk to our team or those with whom they interact, URBAN WASH will pivot to remote methods, e.g., methods that rely on information and communication technologies such as telephone, email, or internet, as needed.

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APPENDIX A: SURVEY HOUSEHOLD SELECTION PROCEDURES

Table 188. Selection procedures for the household survey associated with four matching approaches

Matching Option	(1) Household Matching in Intervention Communities without Waitlists	(2) Household Matching in Intervention Communities Using Waitlists	(3) Community Matching	(4) Household Matching in Non-Intervention Communities
Subsidy recipient households (treatment group)	Random selection from Ghana Water Company Limited (GWCL) information,[1] located in the field with assistance from Water User Associations (WUAs)	Random selection from Ghana Water Company Limited (GWCL) information,[1] located in the field with assistance from Water User Associations (WUAs)	Random selection (representative cross-section) via Global Positioning System (GPS) coordinates and/or field-based procedures[2] (e.g., based on distance walked and/or number of households passed from a starting point) in intervention communities	Random selection from GWCL information,[1] located in the field with assistance from WUAs
Non-recipient households (control group)	Random selection via GPS coordinates and/or field-based procedures[2] in intervention communities	Random selection from GWCL waitlists in intervention communities, located in the field with assistance from WUAs	Random selection via GPS coordinates and/or field-based procedures[2] in non-intervention communities	Random selection via GPS coordinates and/or field-based procedures[2] in non-intervention communities
Non-recipient households (representative cross-section)	Random selection via GPS coordinates and/or field-based procedures[2] in non-intervention communities	Random selection via GPS coordinates and/or field-based procedures[2] in intervention and non-intervention communities	Random selection via GPS coordinates and/or field-based procedures[2] in non-intervention communities	Random selection via GPS coordinates and/or field-based procedures[2] in intervention communities

[1] GWCL information related to identifying subsidy recipients may include records of registered accounts and/or GPS coordinates of subsidized connections.

[2] Field-based procedures for household selection may include beginning from randomly generated GPS point, walking in a specified direction, and identifying a household after walking a certain distance or passing a certain number of households.

APPENDIX B: HOUSEHOLD SURVEY

A. Introduction and Informed Consent

Hello, my name is _____. I am a staff member at the Aquaya Institute based in Accra. I would like to invite you to participate in our research study. The purpose of our research is to understand the water connection subsidy programs implemented by GWCL. The study will be conducted over 9–12 months. You are being asked to participate in this study because you live in one of the areas where a subsidy program was implemented or a similar community.

The discussion will involve questions about the connection subsidy programs implemented by GWCL, water supplied by GWCL, and other water sources. The discussion should last no longer than one hour or until you feel you have told me everything you want me to know. If you agree to participate in this research, I will conduct a survey with you now.

There are no right or wrong answers, so please be honest and tell us what is true for you. Information from this study may help increase understanding and awareness of what it is like to live in Accra, and how you (and your community members) get your household water. There are no personal risks or benefits to your participation. Everything that you say will be confidential, and we will not use your real name or any identifying information in any of our reports or papers. Our team may sometimes look at your record for research purposes. The results will be used to inform GWCL and other institutions in improving future GWCL programs and providing water service connections.

Your participation in this research is completely voluntary. You can decline to answer any questions, and if you do not wish to continue, you can let me know so we can stop the interview. You will not receive any monetary payment for your participation. An alternative is not to participate in this study.

If you have any questions or concerns about the research, please feel free to contact me. I can be reached at +_____ or _____@aquaya.org or [hand over the business card].

If you agree to participate, please say so.

[ALL QUESTIONNAIRES WILL BE SAVED BY THE INTERVIEWER REGARDLESS OF THE RESPONDENT'S DECISION TO PARTICIPATE OR NOT TO PARTICIPATE.]

No.	SECTION A: Consent and Identifiers	Answer Choices	Code	Logic
Z0	Enumerator:	Enumerator 1 Enumerator 2 Enumerator 3 Enumerator 4 Enumerator 5 Supervisor	1 2 3 4 5 6	
Z1	Community name	DROP-DOWN MENU		
Z2	What number is this COMPOUND of those you have visited today?	1st compound 2nd compound 3rd compound 4th compound 5th compound	1 2 3 4 5	
Z3	What number is this household of those who have visited today?	1st household 2nd household 3rd household 4th household 5th household 6th household 7th household 8th household 9th household 10th household	1 2 3 4 5 6 7 8 9 10	
Z4	*CommCare to generate unique household ID.*			
A1	Does this household have at least one member above 18 years old?	Yes No	1 0	>>Note 2
A2	Is an adult (above 18 years old) involved in financial decisions home and available to be interviewed?	Yes No	1 0	>>A3
A3a	READ CONSENT FORM Are you willing to participate in the study?	Yes, available now Yes, though at a later time No	1 2 0	>>A6 >>A3 >>Note2
A3b	Write household ID on consent form			
A4	How many times have you visited this household?	This is the first time This is the second time This is the third time	1 2 3	>>A4 >>A4 >>Note2
A5	May a household member who is 18 years old or above be available at a later time?	Yes, later today Yes, on another day No	1 2 0	>>Note1 >>Note2 >>Note2
Note1	Save this form as incomplete and return later today.			
A6	Why was the household ineligible? (automated calculation)	Not available today Not willing to participate. No household member > 18 years old.		>> End >> End >> End
Note2	This household is ineligible because [A5].			

No.	SECTION A: Consent and Identifiers	Answer Choices	Code	Logic
A7	Respondent family name/last name:	_____		
A8	Respondent first name:	_____		
A9	Popular name: *Optional*	_____		
A10	Respondent gender:	Female Male	2 1	

No.	SECTION B: Demographics	Answer Choices	Code	Logic
Note3	Now I would like to ask you questions about the composition of your household.			
B1	Are you the head of household? *We are asking about head of HOUSEHOLD, not head of FAMILY*	Yes No	1 0	
B2	Did you participate in the GWCL connection subsidy program?	Yes No	1 0	
B2	What is your age? *(Ask birth year if doesn't know)*	_____ Years		>>End if <18
B3	What is your marital status?	Married Living together Separated Divorced Never married/single Widowed Other: ____	1 2 3 4 5 6 96	
B4	What is the highest level of school you <u>completed</u>?	None Primary school JHS/JHS SSS/SHS Diploma/HND Bachelors Masters Don't know	0 1 2 3 4 5 6 99	
B5	What is your main occupation? *In the last 12 months*	Agriculture, fishing, forestry Selling produce or goods (market or kiosk) Cooperatives Private sector: self-employed Private sector: employed Government sector Nongovernmental organizations (NGOs) (local and international)	1 2 3 4 5 6 7	

No.	SECTION B: Demographics	Answer Choices	Code	Logic
		Student No occupation, stay home Other: ___ Don't know	8 0 96 99	
B6	Do you have a National ID?	Yes No Don't know	1 0 99	
B7	First name of head of household			
B8	What is your relationship to the head of household?	Father Mother Husband Wife Son Daughter Brother Sister Other: _____	1 2 3 4 5 6 7 96	
B8	What is the gender of the head of household?	Female Male	2 1	
B9	What is the age of the head of household? *(Ask birth year if doesn't know)*	_____ Years		
B10	Does the head of household have a chronic illness?	Yes No Don't know	1 0 99	
B11	What is the highest level of school the head of household <u>completed</u>?	None Primary school JHS/JHS SSS/SHS Diploma/HND Bachelors Masters Other: _____ Refuse to answer Don't know	0 1 2 3 4 5 6 96 98 99	
B12	What is the marital status of the head of household?	Married Living together Separated Divorced Never married/single Widowed Other:	1 2 3 4 5 6 96	
B13	What is the main occupation of the head of household? *In the last 12 months*	Agriculture, fishing, forestry Selling produce or goods (market or kiosk) Cooperatives Private sector: self-employed Private sector: employed	1 2 3 4 5	

No.	SECTION B: Demographics	Answer Choices	Code	Logic
		Government sector NGOs (local and international) No occupation, stay home Student Other: ____ Refuse to answer Don't know	6 7 0 8 96 98 99	
B14	Does the head of household have a National ID?	Yes No Don't know	1 0 99	
B15	How many children are in your household?	_____		
B16	How many people are in your household, including yourself? *People who eat and sleep here more than 50% of the time or 6 months in the year.* *(Probe for children and elders. 99 if doesn't know)*	_____		
B17	How many rooms in this household are used for sleeping?	_____		
B18	How many people occupy a typical sleeping room?	_____		
B19	What is the present holding/tenancy arrangement of this property (residence / dwelling)?	Family house / rent-free Government / Private Owned (staff accommodation) Own house / owner occupied Rented house Caretaker Perching / Squatting Other: ____	1 2 3 4 5 6 96	>>B21 >>B21 >>B21 >>B21 >>B21
B20	If in rented house, how much (in Ghana Cedis) do you pay every month?	< 50 50 – 100 101 – 200 201 – 300 301 – 500 Above 500		
B21	Do you have access to a site plan for this property?	Yes No Don't know	1 0 99	
B22	Are there more households in the same compound?	Yes No Don't know	1 0 99	 >>C1 >>C1

No.	SECTION B: Demographics	Answer Choices	Code	Logic
B23	How many additional households are in the same compound?	_____		
B24	How many additional people live in the same compound?	_____		

No.	SECTION C: Household Characteristics (all)	Answer Choices	Code	Logic
C1	What is the main construction material used for the dwelling's outer walls? *Observe.*	No walls Cane/palm/trunks Mud/landcrete Bamboo with mud Stone with mud Uncovered adobe/mud bricks Plywood Cardboard Reused wood Cement Stone with lime/cement Kiln-fired bricks Cement blocks Covered adobe/mud bricks (plastered) Wood planks/shingles Other: _____ Don't know	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 96 99	
C2	What is the main construction material used for the dwelling's roof? *Observe*	No roof Thatch/palm leaf Mud/sod Rustic mat Palm/bamboo Wood planks (rudimentary roofing) Cardboard Zinc/Aluminum Wood (finished roofing) Ceramic/brick tiles Cement Roofing shingles Asbestos/slate roofing sheets Other: _____ Don't know	0 1 2 3 4 5 6 7 8 9 10 11 12 96 99	
C43	What is the main construction material used for the dwelling's floor? *Observe*	Earth/sand Dung Wood planks Palm/bamboo Parquet or polished wood Vinyl or asphalt strips Tiles (ceramic, marble, porcelain, terrazzo) Cement Carpet (woolen or synthetic)	1 2 3 4 5 6 7 8 9	

No.	SECTION C: Household Characteristics (all)	Answer Choices	Code	Logic
		Linoleum/rubber carpet Other: _____ Don't know	10 96 99	
C4	What type of fuel does your household mainly use for cooking?	Electricity LPG Natural gas Biogas Kerosene Cooking gel Charcoal Wood Straw, shrubs, grass Agricultural crop residue Animal dung Other: _____ None, no cooking Don't know	1 2 3 4 5 6 7 8 9 10 11 96 0 99	 >>C7
C5	What type of cookstove is mainly used for cooking?	Electric stove Solar cooker Liquefied petroleum gas (LPG)/cooking gas stove Piped natural gas stove Biogas stove Liquid fuel stove Manufactured solid fuel stove Traditional solid fuel stove Three stone stove/open fire Other: No food cooked in household Don't know	1 2 3 4 5 6 7 8 9 96 0 99	>>C7 >>C7 >>C9
C6	Does the stove have a chimney?	Yes No Don't know	1 0 99	
C7	Is the cooking usually done in the house, in a separate building, or outdoors?	In the house In a separate building Outdoors Other: _____	1 2 3 96	 >>C9
C7	Do you have a separate room which is used as a kitchen?	Yes No	1 0	
C9	In the past month, have you purchased any chicken eggs (fresh or single)?	Yes No	1 0	
C10	In the past month, have you purchased any beef?	Yes No	1 0	
C11	At night, what does your household mainly use to light the home?	Electricity Solar lantern Rechargeable flashlight, torch, or lantern	1 2 3	

No.	SECTION C: Household Characteristics (all)	Answer Choices	Code	Logic
		Battery-powered flashlight, torch, or lantern Biogas lamp Gasoline lamp Kerosene or paraffin lamp Charcoal Wood Straw/shrub/grass Agricultural crop Animal dung/waste Oil lamp Candle No lighting in household Other: _____	4 5 6 7 8 9 10 11 12 13 14 15 16 96	
C12	Does your household have any of the following items? *Choose for each.* *Check yes if the household owns the item, even if it is broken or non-functional.*	Electricity Radio Television Non-mobile telephone Computer/tablet Refrigerator Freezer Electric generator/invertor Washing machine Photo camera (not on phone) Video deck/DVD/VCD Sewing machine Bed Table Chair *(Stools don't count as chairs.)* Cabinet/cupboard	Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk	
C13	Does any member of your immediate family living in your household own any of the following items? *Choose for each.* *Check yes if the household owns the item, even if it is broken or non-functional.*	Wristwatch Mobile phone Bicycle Motorcycle Animal-drawn cart Car or truck Boat with motor Boat without motor	Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk Y/N/dk	
C14	Does any member of your immediate family living in your household own any agricultural land? *(Including land outside this area)*	Yes No Refuse to answer Don't know	1 0 98 99	 >>C16 >>C16 >>C16
C15	How many acres of agricultural land do members of this household own?	_____		

No.	SECTION C: Household Characteristics (all)	Answer Choices	Code	Logic
C16	Does this household own any livestock, herds, other farm animals or poultry?	Yes No Don't know	1 0 99	 >>C18 >>C18
C17	How many of the following animals does this household own?	Milk cows or bulls: _____ Other cattle: _____ Horses, donkeys, mules: _____ Goats: _____ Sheep: _____ Chickens or other poultry: _____ Pigs: _____ Rabbits: _____ Grasscutter: _____		
C18	Does any member of this household have a bank account? *This does not include a mobile money account.*	Yes No Don't know	1 0 99	
C19	Does any member of this household use a mobile phone to make financial transactions such as sending or receiving money, paying bills, purchasing goods or services, or receiving wages?	Yes No Don't know	1 0 99	
C20	Is your household able to feed itself all year round without help from neighbors or relatives?	Yes No Don't know	1 0 99	
C21	Is your household enrolled in Livelihood Empowerment Against Poverty?	Yes No Don't know	1 0 99	
C22	Does any member of your household have a disability or chronic illness?	Yes No Don't know	1 0 99	
C23	Is any member of your household older than 65 years in age?	Yes No Don't know	1 0 99	
C24	Do you own this house either alone or jointly with someone else?	Own alone Own jointly Do not own	1 2 0	>>C26 >>C26
C25	How much do you pay per month in rent?	_____		
C26	Do you own any other dwellings for which you collect rent?	Yes No	1 0	

No.	SECTION C: Household Characteristics (all)	Answer Choices	Code	Logic
C27	Are there compounds for which you rent all of the households within the compound?	Yes No	1 0	
C28	For how many compounds which you collect rent, is there piped water inside dwelling or to yard/plot?	_____		
C29	For each COMPOUND C29-C33), please indicate the number of rooms used for sleeping and the rent charged per month.	____		
C30	How many rooms are used for sleeping?	___		
C31	How much rent do you charge per month?	____		
C32	Did you increase the rent as a result of the provision of on-premises piped water infrastructure?	Yes No	1 0	
C33	How much did the rent increase?	____		
C34	For how many properties which you collect rent, is there piped water inside dwelling or to yard/plot?	_____		
C35	For each PROPERTY (C35-C39), please indicate the number of rooms used for sleeping and the rent charged per month.	____		
C36	How many rooms are used for sleeping?	___		
C37	How much rent do you charge per month?	____		
C38	Did you increase the rent as a result of the provision of on-premises piped water infrastructure?	Yes No	1 0	>>Next section
C39	How much did the rent increase?	____		

No.	SECTION D: Health	Answer Choices	Code	Logic
D1	Have any persons in your household suffered water relates illnesses in the past year?	Yes No Don't know	1 0 99	 >>D6 >>D6
D2	How many people in the household have been sick with water related illness in the past year?	_____		
D3	Were people in your house sick all throughout the year or only at specific times?	Throughout the year Specific time Don't know	1 2 99	
D4	What months are people in the household most sick (all that apply)?	January-February March-April May-June July-August September-October November-December	1 2 3 4 5 6	
D5	Which of these symptoms did these people suffer from this year?	Headache Runny nose, cough, breathing difficulty Vomiting Skin infection/rash Fever Diarrhea	1 2 3 4 5 6	
D6	Did people in this household have diarrheal symptoms in the past week (three or more loose stools per day)?	Yes No Don't know	0 1 99	

No.	SECTION E: Sanitation	Answer Choices	Code	Logic
E1	What kind of sanitation facility does your household usually use?	Flush to piped sewer system Flush to manhole/septic tank Flush to pit latrine Flush to somewhere else Flush, don't know where Ventilated improved pit latrine Pit latrine with slab Pit latrine without slab/open pit Composting toilet Bucket toilet No facility/bush/field Flush to piped sewer system - shared Flush to manhole/septic tank - shared Flush to pit latrine - shared Flush to somewhere else - shared	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14	>>E3 >>E3 >>E3 >>E3 >>E3 >>E3 >>E3 >>E3

No.	SECTION E: Sanitation	Answer Choices	Code	Logic
		Flush, don't know where - shared Ventilated improved pit latrine - shared Pit latrine with slab - shared Pit latrine without slab/open pit - shared Composting toilet - shared Bucket toilet - shared Hanging toilet/hanging latrine - shared Other - shared	15 16 17 18 19 20 21 22 96	
E2	If flush or pour flush toilet: Where does it flush to?	Piped sewer system Septic tank Pit latrine Somewhere else Biodigester Don't know	1 2 3 4 5 99	
E3	Is the main sanitation facility available to household members shared with other households?	Yes No Don't know	0 1 99	 >>E5 >>E5
E4	If sanitation facility is shared – Including your own household, how many households share this sanitation facility?			
E5	Where is this sanitation facility located?	In own dwelling In own yard/plot Other	1 2 96	

No.	SECTION F: Water Connection and Use	Answer Choices	Code	Logic
Note 4	Now I will ask you questions about your water connection and use			
F1	Who makes decisions about water in the household?	Household head Spouse Major income earner Everybody Landlord / landlady Other: ____	1 2 3 4 5 96	
F2	What source of drinking water do you use? (Mark all that are relevant)	Piped into dwelling Piped to yard/plot Piped to neighbor Public tap/standpipe Tube well or borehole Protected well Unprotected well Protected spring Unprotected spring	1 2 3 4 5 6 7 8 9	

No.	SECTION F: Water Connection and Use	Answer Choices	Code	Logic
		Rainwater Tanker truck Cart with small tank Surface water (river/dam/lake/pond/stream/canal/irrigation channel) Bottled water Sachet water Other: _____	10 11 12 13 14 96	
F3	FOR EACH SOURCE: Where is that water source located?	In own dwelling In own yard/plot Somewhere else	1 2 3	
F4	If the household uses piped water or a public tap/standpipe: Is this GWCL piped water?	Yes No Don't know	1 0 99	
F5	FOR EACH SOURCE: What is the main reason you choose to use this water source?	Price Convenience Water quality Reliability Other: ___	1 2 3 4 96	
F6	What is the main source of water used by our household for other domestic purposes such as cooking and washing?	Piped into dwelling Piped to yard/plot Piped to neighbour Public tap/standpipe Tube well or borehole Protected well Unprotected well Protected spring Unprotected spring Rainwater Tanker truck Cart with small tank Surface water (river/dam/lake/pond/stream/canal/irrigation channel) Bottled water Sachet water Other: _____	1 2 3 4 5 6 7 8 9 10 11 12 13 14 96	
F7	Do you treat your water before drinking?	Yes No Don't know	1 0 99	 >>F9 >>F9
F8	If yes, what type of water treatment do you carry out before drinking?	Boiling Point-of-use filter (biosand, ceramic, other filters) Point-of-use chlorination Straining through a cloth	1 2 3 4 5	

No.	SECTION F: Water Connection and Use	Answer Choices	Code	Logic
		Alum or coagulant Solar disinfection Settling Other: _____ Don't know	6 7 8 96 99	
F9	How satisfied are you with your water access?	Very dissatisfied Dissatisfied Neutral Satisfied Very satisfied	1 2 3 4 5	
F10	Do you face any challenges with getting water	Yes No Don't know	1 0 99	 >>F12 >>F12
F11	If yes, what are the challenges (select all that apply)	Long distance Waiting time High price Unavailability from source Odor in water / smells Salty water Dirty water Other: _____	1 2 3 4 5 6 7 96	
F12	Do you have sufficient quantities of water to meet your daily needs?	Yes No Don't know	1 0 99	
F13	Does your household use the same water source for drinking and other uses such as cooking cleaning water etc.?	Yes No Don't know	1 0 99	

No.	SECTION G: Water Collection	Answer Choices	Code	Logic
	These questions will be asked separately for each water source used by the respondent's household in the last seven days and respondents will be asked to provide similar information about any other household members who had fetched water during the same period. If household members who fetch water are present during the survey, they should respond to the questions themselves.			
G1	What is the approximate time it takes for you or a member of your household to walk to your water source, queue for the source, fill your container(s), and walk back from the source?	Not applicable as water is delivered to the house 00-05 minutes 06-10 minutes 11-15 minutes 16-20 minutes 20+ minutes Don't know	1 2 3 4 5 6 99	>>Next section

No.	SECTION G: Water Collection	Answer Choices	Code	Logic
G2	How many times have you fetched water from the source on this day?	_____		
G3	How many times in the previous seven days have you fetched water from the same source?	_____		
G4	How many containers do you carry for each fetching trip?	_____		
G5	What is the volume of each container used for fetching water?	_____		

No.	SECTION H: Water Storage	Answer Choices	Code	Logic
H1	What methods of storage does your household use for general water purposes? (Select all that apply)	Roof Tank Underground Level Tank outside the house Ground level tank outside the house Water tank in house Small container, Drum, Barrel and Jerry cans Bucket/Pan No Storage Others: ____	1 2 3 4 5 6 0 96	
H2	What is the approximate price you paid for your storage container?	Amount Refuse to answer Don't know	1 98 99	
H3	If the household uses small containers/jerry cans: How long do you typically store water before using it?	Less than one day One day More than one day (specify) Don't know	1 2 3 99	
H4	May I see your drinking water storage container?	Yes No Does not have a storage container	1 2 0	 >>Next section >>Next section
H5	If the household has a storage container – [Observation] – What is the approximate volume of the container in litres?	_____		
H6	If the household has a storage container – [Observation] – Does the water storage container have a lid covering it?	Yes No	1 2	
H7	If the household has a storage container – [Observation] – Does the water storage	Yes No	1 2	

No.	SECTION H: Water Storage	Answer Choices	Code	Logic
	container have an opening big enough to put a cup in?			
H8	If the household has a storage container – [Observation] – Does the water storage container have a tap to dispense water?	Yes No	1 2	
H9	If the household has a storage container – When is the last time someone in your household cleaned this container?	Today Yesterday 2-6 days ago 1-4 weeks ago More than 1 month ago Never Don't know	1 2 3 4 5 0 99	
H10	If the household has a storage container that has ever been cleaned – How was the container cleaned the most recent time?	With soap With chlorine or bleach Water and a cloth sponge By shaking sand or rocks inside Water and grass or leaves Don't know Other:	1 2 3 4 5 99 96	

No.	SECTION I: Customer Service Satisfaction & Level of Service (All)	Answer Choices	Code	Logic
Note5	I am now going to ask you questions about your experience with your water.			
I1	Please rate your level of satisfaction with your main water source *Use Likert scale on flashcard.*	Very satisfied Somewhat satisfied Somewhat not satisfied Very not satisfied Don't know	1 2 3 4 99	
I2	What do you dislike about the GWCL water? *Select all that apply*	Bad taste, smell Bad color Unsafe for health Too far from my house Long waiting time, queuing Too expensive Unreliable water supply Other: _____ Don't know	1 2 3 4 5 6 7 96 99	
I3	If using water from GWCL: Is the GWCL water treated by GWCL before reaching your collection point?	Yes No Don't Know	1 0 99	 >>I6 >>I6
I4	What type of treatment are you aware of is performed by	Periodic tank cleanings Occasional chlorination	1 2	

No.	SECTION I: Customer Service Satisfaction & Level of Service (All)	Answer Choices	Code	Logic
	GWCL before you receive the water? *Select all that apply.*	Ongoing chlorination Treated at the water treatment plant Other treatment: _____ Don't know	3 4 96 99	
I5	How did you know the water is treated? *Select all that apply*	Told by the GWCL Told by a friend Told by community leader Changes in the taste or smell of water More precipitates (black or orange particles) in the water Community center or radio Other: _____ Don't know	1 2 3 4 5 6 96 99	
I6	Do you feel safe for you and your household to consume water from your GWCL connection? Do you trust that the water is safe to drink?	Yes No Don't Know	1 0 99	
I7	Do you conduct any level of treatment before consuming water supplied by the GWCL?	Yes No Don't Know	1 0 99	 >>I9 >>I9
I8	What water treatment method do you use before consuming water supplied by GWCL?	Boiling Point-of-use filter (biosand, ceramic, other filters) Point-of-use chlorination Straining through a cloth Alum or coagulant Solar disinfection Settling Other (please specify) Don't know	0 1 2 3 4 5 6 96 99	
I9	Is the GWCL water tested?	Yes No Don't Know	1 0 99	 >>I12 >>I12
I10	Are you aware of the test results?	No Yes: water is safe Yes: water is unsafe	0 1 2	
I11	How did you know the water is tested? *Select all that apply*	Told by the GWCL Told by a friend Told by community leader Told by GWCL staff Community center or radio Saw the operator sample water Other: _____ Don't know	0 1 2 3 4 5 96 99	

No.	SECTION I: Customer Service Satisfaction & Level of Service (All)	Answer Choices	Code	Logic
112	Did your household receive any information from the GWCL about water safety? *Select all that apply*	No Yes: about tank cleanings Yes: about chlorination/treatment Yes: about water testing Yes: about safe storage practices Yes: other: _____ Don't know	0 1 2 3 4 5 99	
113	Did your household listen to any radio or community center program about water safety?	Yes No Don't know	1 0 99	
114	*[Private connection user]* On how many hours each day is water usually available at your private tap? *[Standpipe user]* On how many hours each day is water usually available at your standpipe?	1-4 hours per day 4-8 hours per day 8-12 hours per day More than 12 hours per day 24 hours per day Don't know	1 2 3 4 5 99	
115	How many days per week do you have water available from your main GWCL connection?	1 – 3 days per week 4 – 6 days per week 7 days per week Don't know	1 2 3 99	
116	In the past two weeks, has there been a FULL DAY when water was not available?	Yes No Don't know	1 0 99	
117	In the past two weeks, has there been a day when water was not available WHEN YOU NEEDED IT?	Yes No Don't know	1 0 99	
118	In the past 12 months, were there periods when service interruptions were more frequent? *Select all that apply*	January – March April – May May- August September – October October - December Don't know	1 2 3 4 5 99	
119	Do you agree or disagree with the following statement: We trust that GWCL could provide the water that we need.	Strongly Disagree Disagree Neutral Agree Strongly Agree Don't know	1 2 3 4 5 6	

No.	Section J: Non-Beneficiary of Subsidy in Intervention Community *(Non-beneficiaries and non-piped water users only)*	Answer Choices	Code	Logic
J1	How many Cedis is your household spending daily on water?	_____		
J2	Would you be interested in getting a GWCL water connection?	Yes No	1 2	 >>J5
J3	If yes, what type of GWCL water connection do you prefer?	Household Yard tap Compound Standpipe	1 2 3 4	
J4	If yes, how much are you willing to pay for a connection?	Below 500 500 501 – 1,000 1,001 – 1,500 Above 1,500	1 2 3 4 5	>>J7 >>J7 >>J7 >>J7 >>J7
J5	If no, why are you not interested in a GWCL connection?	Already have a connection Can't afford a connection Satisfied with existing water supply Please specify -----	1 2 3	
J6	If no, would you be interested in a household connection if a different organization (other than GWCL) was providing it?	Yes, if it was the Metropolitan, Municipal, and District Assembly (MMDA) Yes, if it was CWSA Yes, if it was a community representative Yes, if it was a private company Yes, if it was an NGO Yes, other (specify) No, it would not make a difference	1 2 3 4 5 6 7	
J7	Why did you choose not to register for a GWCL connection with the program? (Select all that apply)	Did not know about the program in time Cost of the connection was too high Cost of future water bills may be too high Registration process was too long Registration process required documents which you did not possess. Registration process required literacy skills your household members did not possess Registration process required you to visit in-person to places which you did not wish or did not feel comfortable visiting House is too far from the GWCL pipes No more connections were available You are a renter and your landlord did not sign up for a connection Landlord did not allow	1 2 3 4 5 6 7 8 9 10 11 12 13	

No.	Section J: Non-Beneficiary of Subsidy in Intervention Community *(Non-beneficiaries and non-piped water users only)*	Answer Choices	Code	Logic
		Living in a compound house made payment of bills difficult because all occupants would have to be split this bill. Do not trust the quality of water supplied by GWCL (not safe to drink) Current water access is likely more reliable than the one GWCL would provide Other: Please specify	14 15 96	
J8	Would you have registered for the program if you had the option to pay in instalments?	Yes No Don't know	1 2 3	 >>J10 >>J10
J9	If you were able to pay in instalments, how much would you be willing to pay for a connection?	Below 500 500 501 – 1,000 1,001 – 1,500 Above 1,500	1 2 3 4 5	
J10	What would be your preferred payment approach to pay the one-time connection fee?	One-time upfront payment Monthly payment installments over 6 months Monthly payment installments over 12 months Pay down the total with flexibility so long as half the total is paid up in 6 months.	1 2 3 4	
J11	Rank your monthly expenses for the following items from least expensive to most expensive	Water Sanitation Housing Transportation Food Electricity Education Health/medical	1 2 3 4 5 6 7	
J12	In the last 12 months, what was your household's total income?	<2,400 Ghanaian Cedi (GHS) 2,401-6,000 GHS 6,001-12,000 GHS 12,001-24,000 GHS 24,001-36,000 GHS >36,000 GHS Refuse to answer Don't know	1 2 3 4 5 6 0 99	
J13	In the last 12 months, what was your household's total income (to the best of your knowledge)?	Amount Refuse to answer Don't know	1 2 99	

No.	Section J: Non-Beneficiary of Subsidy in Intervention Community *(Non-beneficiaries and non-piped water users only)*	Answer Choices	Code	Logic
J14	In the last 6 months, what was your household's total income?	Amount Refuse to answer Don't know	1 2 99	
J15	In the last 1 month, what was your household's total income?	Amount Refuse to answer Don't know	1 2 99	

No.	Section K: Beneficiary of Subsidy in Intervention Community (Beneficiaries only)	Answer Choices	Code	Logic
K1	(for renters) Did you live in this house when the piped connection was added?	Yes No, moved in after the piped connection was added	1 0	
K2	(for renters) Did your rent increase after the piped connection was added	Yes No Moved in after the piped connection was added Don't know	1 0 2 99	 >>K4 >>K4 >>K4
K3	(for renters, if yes above) How much did your rent increase?	_____		
K4	How did you learn about GWCL's subsidy program?	I was not aware of the program Community announcement Other media Friend/Family member Water User Association Opinion Leader Other:	1 2 3 4 5 6 96	
K5	How did you register for GWCL's subsidy program?	GWCL mobile registration drive in community GWCL office Don't know (owner registered) Other: ___	1 2 3 96	
K6	Are other members living on the compound premises allowed to use the private GWCL connection?	Yes No Don't know	1 0 99	
K7	Are people living outside the compound premises allowed to use the private GWCL connection?	Yes, with payment Yes, without payment No No, but they still use it without permission Don't know Other (specify)	1 2 3 4 99 96	

No.	Section K: Beneficiary of Subsidy in Intervention Community (Beneficiaries only)	Answer Choices	Code	Logic
K8	Does your household ever use the GWCL piped water as a source of (drinking) water?	Yes No Don't know	1 0 99	
K9	If primary source of drinking water is not GWCL piped water - For what reason(s) does your household not use the GWCL piped water as the primary source of drinking water?	Don't like the smell and/or taste Don't like the color of water The water is not safe to drink Too far from my house Too expensive Other: _____ Don't know	1 2 3 4 5 96 99	
K10	What was your main source of (drinking) water before you received a piped connection on premises?	Piped water inside dwelling Piped water to yard/plot Piped water to neighbor Piped water to public tap/standpipe Tube-well or borehole Protected dug well Unprotected dug well Protected spring Unprotected spring Rainwater Tanker truck Cart with small tank Surface water (river, dam, lake, pond, stream, canal) Bottled water Sachet water Other: _____ Refuse to answer Don't know	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 96 98 99	
K11	Has your occupation changed since you received a GWCL connection on premises?	Yes No Don't know	1 0 99	 >>K13 >>K13
K12	If yes, what was your main occupation before?	Agriculture, fishing, forestry Selling produce or goods Cooperatives Private Sector Informal Private Sector Formal Government sector NGOs (local and international) No occupation, stay home Other: _____ Refuse to answer Don't know	1 2 3 4 5 6 7 8 96 98 99	
K13	Has the head of household's occupation changed since you	Yes No	1 0	

No.	Section K: Beneficiary of Subsidy in Intervention Community (Beneficiaries only)	Answer Choices	Code	Logic
	received a GWCL connection on premises?	Don't know	99	>>Next section >>Next section
K14	If yes, what was their main occupation before?	Agriculture, fishing, forestry Selling produce or goods Cooperatives Private Sector Informal Private Sector Formal Government sector NGOs (local and international) No occupation, stay home Other: _____ Refuse to answer Don't know	1 2 3 4 5 6 7 8 96 98 99	
K15	If yes, what was their main occupation after?	Agriculture, fishing, forestry Selling produce or goods Cooperatives Private Sector Informal Private Sector Formal Government sector NGOs (local and international) No occupation, stay home Other: _____ Refuse to answer Don't know	1 2 3 4 5 6 7 8 96 98 99	

No.	Section L: AFFORDABILITY AND PAYMENT OF TARIFF *Beneficiaries and other piped users*	Answer Choices	Code	Logic
Note XX	I will now ask you questions about payment and your finances			
L1	When was the piped water supply installed?	Date		
L2	How much did you pay to GWCL for the piped GWCL connection (including registration and all fees)?	____		
L3	Were there additional costs beyond those paid to GWCL required for your connection such as changes to your property?	Yes No Don't know	1 0 99	 >>L3 >>L3

No.	Section L: AFFORDABILITY AND PAYMENT OF TARIFF *Beneficiaries and other piped users*	Answer Choices	Code	Logic
L4	If yes, how much did you pay for these additional costs?	_____		
L5	From what source did you pay for the connection?	Income Savings Borrowed money Other: _____ Don't know	1 2 3 96 99	>>L6 >>L6 >>L6 >>L6
L6	If paid from borrowed money, how much total debt did you have after payment?	_____		
L7	How did paying for the connection fee affect your ability to meet other basic household needs?	There was no affect It was more difficult to meet basic household needs Don't know	1 2 99	
L8	Did you pay for the piped GWCL connection in installments?	Yes No Don't know	1 0 99	 >>L10 >>L10
L9	How many installments did you pay?	_____		
L10	How much did you pay per installment?	_____		
L11	Did other members living on the compound premises contribute to the total cost of the connection?	Yes No Don't know	1 0 99	
L12	Does your household ever pay user fees or a tariff for water you get from your household or shared pipe?	Yes No Don't know	1 0 99	 >>L13 >>L13
L13	If tariff/fee is paid, when was the last time you paid a tariff? *(How long was it since your previous payment?)*	_____ (months)		
L14	How much did your household pay last time in GHS? *Type -99 if don't know*	_____		
L15	If tariff/fee is paid, what time period did this cover? In Days	_____		
L16	In a typical month, how much does your household pay in GHS for the water coming out of your connection?	_____		
L17	Do other members living on the compound premises contribute to water bills	Yes No Don't know	1 0 99	 >>L22 >>L22

No.	Section L: AFFORDABILITY AND PAYMENT OF TARIFF *Beneficiaries and other piped users*	Answer Choices	Code	Logic
		Other members are not allowed to use the piped water connection	2	>>L22
L18	How much did other members living on the compound premises pay toward your water bill?	_____		
L19	Do they pay the same amount each month?	Yes No Don't know	1 0 99	
L20	Do they pay you at the same time each month?	Yes No Don't know	1 0 99	
L21	Who collects the payment from them?	Landlord/owner Head of household Other: _____	1 0 96	
L22	Who pays GWCL the collected amount?	Landlord/owner Head of household Other: _____	1 0 96	
L23	How many times has your GWCL connection been disconnected?	Never Once Other: ___	0 1 96	
L24	Have GWCL officers visited your household to request bill payment?	Never Once Other: ___	0 1 96	
L25	If the household never pays a tariff: Why does your household never pay for GWCL water? *Select all that apply.*	Water from this source is free for all My household is exempt from paying Too expensive Caretaker doesn't collect money Other: _____ Don't know	1 2 3 4 96 99	
L26	If tariff/fee is paid – What is the payment method that your household uses most often to pay for water?	Cash Mobile money Bank transfer Bank card Mobile application Other: _____	1 2 3 4 5 96	
L27	If tariff/fee is paid – What is the preferred payment method that your household uses most often to pay for water?	Cash Mobile money Bank transfer Bank card Mobile application Other: _____	1 2 3 4 5 96	

No.	Section L: AFFORDABILITY AND PAYMENT OF TARIFF *Beneficiaries and other piped users*	Answer Choices	Code	Logic
L28	What would be your preferred payment approach to pay the one-time connection fee?	One-time upfront payment Monthly payment installments over 6 months Monthly payment installments over 12 months Other: ___	1 2 3 96	
L29	RANK your expenses for the following items from least expensive to most expensive.	Water Sanitation Housing Transportation Food Electricity Education Health/medical	1 2 3 4 5 6 7	
L30	In the last 4 weeks, what was your household's total income?	*Appropriate ranges will be included here* Refuse to answer Don't know	1 2 98 99	
L31	In the last 12 months, what was your household's total income?	<2,400 GHS 2,401-6,000 GHS 6,001-12,000 GHS 12,001-24,000 GHS 24,001-36,000 GHS >36,000 GHS Refuse to answer Don't know	1 2 3 4 5 6 98 99	
L32	In the last month, how much did your household spend on housing?	*Appropriate ranges will be included here* Refuse to answer Don't know	1 2 98 99	
L33	Does your household housing spending amount include other charges (water, electricity)?	Yes – water Yes- electricity Yes – water & electricity No Other Don't know	1 2 3 0 96 99	
L34	In the last month, how much did your household spend on transportation? *Fuel, trotros, taxis, bus, car maintenance*	*Appropriate ranges will be included here* Don't know Other	1 2 3 4 96 99	
L35	In the last month, how much did your household spend on education?	*Appropriate ranges will be included here*	1 2 3	

No.	Section L: AFFORDABILITY AND PAYMENT OF TARIFF *Beneficiaries and other piped users*	Answer Choices	Code	Logic
			4	
		Don't know	96	
		Other	99	
L36	In the last month, how much did your household spend on health/medical expenses?	*Appropriate ranges will be included here*	1	
			2	
			3	
			4	
		Don't know	96	
		Other	99	

No.	SECTION M: Willingness to Pay: Double-Bounded Dichotomous Choice for non-GWCL Customers	Answer Choices	Code	Logic
Note XX.	Your household currently pays X-GHS per bucket, which is equivalent to X GHS per m^3 on average.			
M1	Would your household be willing to pay a Y-GHS one-time fee to connect to GWCL system and have a private water connection?	Yes No Don't know	1 0 99	
M1	Would your household be willing to pay a Z-GHS one-time fee to connect to GWCL system and have a private water connection?	Yes No Don't know	1 0 99	
M1	What is the maximum amount that your household would be willing to pay to connect to the GWCL system and have a private water connection?	_____		
M1	If renters, what is the maximum amount of increase in rent that your household would be willing to pay to connect to the GWCL system and have a private water connection?	_____		

APPENDIX C: WATER USER ASSOCIATION MEMBER INTERVIEWS

A. Introduction and Informed Consent

Hello, my name is _____. I am a staff member at the Aquaya Institute based in Accra. I would like to invite you to participate in our research study. The purpose of our research is to understand the connection subsidy programs implemented by GWCL. The study will be conducted over 9–12 months. You are being asked to participate in this study because you live in one of the areas where a subsidy program was implemented or a similar community.

The discussion will involve questions about the connection subsidy programs implemented by GWCL, water supplied by GWCL, and other water sources. The discussion should last no longer than one hour or until you feel you have told me everything you want me to know. If you agree to participate in this research, I will conduct an interview with you now.

There are no right or wrong answers, so please be honest and tell us what is true for you. Information from this study may help increase understanding and awareness of what it is like to live in Accra especially with regard to access of drinking water. There are no personal risks or benefits to your participation. Everything that you say will be confidential, and we will not use your real name or any identifying information in any of our reports or papers. Our team may sometimes look at your record for research purposes. The results will be used to inform GWCL and other institutions in improving future subsidy programs and providing water service connections.

With your permission, I will record our conversation and my colleague will take notes during the interview. The recording is to accurately capture the information you provide and will be used for transcription purposes only. You have the right to review, edit, or erase any information from the interview that you do not want documented or written down. Excerpts from the recordings/transcripts may be used to illustrate the research findings. This will always be done in a way to protect your identity (e.g., your name will not be used). Any other material or information generated by you, such as ideas written down on paper, will be subject to the same strict controls.

Your participation in this research is completely voluntary. You can decline to answer any questions, and if you do not wish to continue for any reason, you can let me know so we can stop the interview. You will not receive any monetary payment for your participation. An alternative is not to participate in this study.

If you have any questions or concerns about the research, please feel free to contact me. I can be reached at +_____ or _____@aquaya.org or [hand over the business card].

If you agree to participate, please say so.

[ALL QUESTIONNAIRES WILL BE SAVED BY THE INTERVIEWER REGARDLESS OF THE RESPONDENT'S DECISION TO PARTICIPATE OR NOT TO PARTICIPATE.]

B. Interview Details:

Name of interviewer:
Name of respondent(s):
Community or region:
Date:

ASK FOR PERMISSION TO RECORD AND START RECORDING

C. Respondent and the Community Details

Please tell me about yourself.

- How long have you lived at your current residence?
- Do you own your own home or pay rent?
- What is your role within the Water User Association (WUA)?
- How long have you been a member of the WUA and how did you become involved with the association?
- Please tell me about your community. To the best of your knowledge:
  - Do you know what most people in your community do for a living? Does their income vary seasonally? What impacts their income? How do households cover costs during months when seasonal income is low?
  - Do you know how long your neighbors or other community members have lived in this area?
  - Do you have community members or neighbors who have moved away from your community? Did they return to their village? Did they move to another part of the city?

D. Current Water Sources

Tell me about where people in your community get their water.

- How do most community members access GWCL water supply (private GWCL water connection, property compound yard tap, communal public standpipe managed by GWCL, resale of GWCL water from those who have private connections)?
- What are other sources of water that community members use often?
- Where do people get their water for drinking, cooking, bathing, cleaning?
- Do people typically use different water sources for drinking, cooking, cleaning, etc.?
- How much do different types/sources of water cost?
- Do you know what source of water is most expensive and which is cheapest?
- Do you know people without access to piped water in their compounds?

E. Water Bill Payment Schemes and Barriers

- What are the main reasons some community members are unable to get a GWCL connection in their compound?
  - Probe: is it due to costs? Or not having the required documentation? Or not knowing what the procedure is? Or because the landlord doesn't want to?

- What payment methods would make it easiest for households to connect to the network? (Payments in installments for connection fees, micro-credit loans for connection fees, shorter payment intervals for tariffs, seasonal payment intervals, pre-paid schemes, etc.)
- Do you know if some community members struggle to pay GWCL's monthly bill? What would make it easier for them to pay?
- What are people's main concerns or complaints regarding GWCL's services?
  - Probe: reliability, water quality, etc.
- Do some people in your community have more difficulties paying water tariffs and connection fees than others (women-headed households, renters, elderly, etc.)?
- Do you know how these people get their water?
- Do GWCL customers ever allow other more vulnerable non-customers to collect water from their tap for free?
- Does the community ever help more vulnerable households pay for their water connection by contributing funds?
- How do people share connection fees and water bills when multiple households share a single tap in a compound?
- Have you ever observed conflict between people sharing a piped connection within a compound property? How have these conflicts been resolved?

F. Past/Existing Subsidy Projects

- Was the connection subsidy project successful in encouraging connections?
- Do you know people—neighbors or friends in your community—who used the GWCL subsidy to get a new connection to water
- How did households learn about the connection subsidy project?
- What were the main challenges with the connection subsidy project?
- Did community members contribute funds to help more vulnerable households participate in the project?
- What changes would you suggest to improve the previous connection subsidy project? (Or what do you think should be done better or differently to encourage more people to use the subsidy and get a water connection?)

Would you like to tell me anything else about your community, about sanitation, or any other topic?

Thanks so much. Do you have any questions for me?

APPENDIX D: GWCL LICSD STAFF INTERVIEWS

A. Introduction and Informed Consent

Hello, my name is _____. I am a staff member at the Aquaya Institute based in Accra. I would like to invite you to participate in our research study. The purpose of our research is to understand the connection subsidy programs implemented by GWCL. The study will be conducted over 9–12 months. You are being asked to participate in this study because you part of the GWCL Low-Income Customer Support Department (LICSD) team.

The discussion will involve questions about the subsidy programs implemented by GWCL, water supplied by GWCL, and other water sources. The discussion should last no longer than one hour or until you feel you have told me everything you want me to know. If you agree to participate in this research, I will conduct an interview with you now.

There are no right or wrong answers, so please be honest and tell us what is true for you. Information from this study may help increase understanding and awareness of what it is like to live in Accra especially with regard to access of drinking water. There are no personal risks or benefits to your participation. Everything that you say will be confidential, and we will not use your real name or any identifying information in any of our reports or papers. Our team may sometimes look at your record for research purposes. The results will be used to inform GWCL and other institutions in improving future subsidy programs and providing water service connections.

With your permission, I will record our conversation and my colleague will take notes during the interview. The recording is to accurately capture the information you provide and will be used for transcription purposes only. You have the right to review, edit, or erase any information from the interview that you do not want documented or written down. Excerpts from the recordings/transcripts may be used to illustrate the research findings. This will always be done in a way to protect your identity (e.g., your name will not be used). Any other material or information generated by you, such as ideas written down on paper, will be subject to the same strict controls.

Your participation in this research is completely voluntary. You can decline to answer any questions, and if you do not wish to continue for any reason, you can let me know so we can stop the interview. You will not receive any monetary payment for your participation. An alternative is not to participate in this study.

If you have any questions or concerns about the research, please feel free to contact me. I can be reached at +_____ or _____@aquaya.org or [hand over the business card].

If you agree to participate, please say so.

[ALL QUESTIONNAIRES WILL BE SAVED BY THE INTERVIEWER REGARDLESS OF THE RESPONDENT'S DECISION TO PARTICIPATE OR NOT TO PARTICIPATE.]

B. Interview Details:

Name of interviewer:
Name of respondent(s):
Region or office of primary work:
Position/Title:
Date:

ASK FOR PERMISSION TO RECORD AND START RECORDING

C. Introductions

- [For all participants] Tell me about your current position. How long have you been in this position? What role did you play in the subsidy projects?

D. Subsidy Projects: Selection

- How were communities selected for the subsidy projects?
- How did GWCL decide where to expand the distribution network under the subsidy projects?

E. Subsidy Projects: Advertising and Engagement

- How did you disseminate information about the subsidy projects to households and communities?
- Are there dissemination methods that accommodate low-literacy households such as using radio or community meetings? If community meetings are held, who usually attends these?
- What are some of the reasons households within low-income urban communities (LIUCs) may not have heard of the subsidy projects? Is there a way to overcome these barriers?

F. Subsidy Projects: Administration

- What challenges did you encounter in administering the subsidy program(s)?
  - Possible probes: Human resources – GWCL; enough community support; uninterested WUA; sufficient financial resources; transport and communication costs to reach communities; certain communities are less likely, on average, to participate.

G. Subsidy Projects: Participation and Outcomes

- What are some of the reasons why households within LIUCs may have chosen not to get a connection even after they learned about the program?
- What would be considered a "successful" outcome of a subsidy project?
- How do you monitor the performance of the subsidy projects? (number of active connections, bill payments, etc.)
- How do you currently handle LIUC household accounts that are not able to pay monthly water tariffs?
- In your experience, what type of households are unable to pay monthly tariffs?
- What concerns did you hear internally about the projects?
- What improvements would you recommend for future implementation?
  - Possible probe: subsidy amount, how it is administered, to whom it should be offered, how it should be offered, etc.

APPENDIX E: DONOR REPRESENTATIVE INTERVIEWS

A. Introduction and Informed Consent

Hello, my name is _____. I am a staff member at the Aquaya Institute based in Accra. I would like to invite you to participate in our research study. The purpose of our research is to understand the connection subsidy programs implemented by GWCL. The study will be conducted over 9–12 months. You are being asked to participate in this study because you are a donor representative.

The discussion will involve questions about the subsidy programs implemented by GWCL, water supplied by GWCL, and other water sources. The discussion should last no longer than one hour or until you feel you have told me everything you want me to know. If you agree to participate in this research, I will conduct an interview with you now.

There are no right or wrong answers, so please be honest and tell us what is true for you. Information from this study may help increase understanding and awareness of what it is like to live in Accra especially with regard to access of drinking water. There are no personal risks or benefits to your participation. Everything that you say will be confidential, and we will not use your real name or any identifying information in any of our reports or papers. Our team may sometimes look at your record for research purposes. The results will be used to inform GWCL and other institutions in improving future subsidy programs and providing water service connections.

With your permission, I will record our conversation and my colleague will take notes during the interview. The recording is to accurately capture the information you provide and will be used for transcription purposes only. You have the right to review, edit, or erase any information from the interview that you do not want documented or written down. Excerpts from the recordings/transcripts may be used to illustrate the research findings. This will always be done in a way to protect your identity (e.g., your name will not be used). Any other material or information generated by you, such as ideas written down on paper, will be subject to the same strict controls.

Your participation in this research is completely voluntary. You can decline to answer any questions, and if you do not wish to continue for any reason, you can let me know so we can stop the interview. You will not receive any monetary payment for your participation. An alternative is not to participate in this study.

If you have any questions or concerns about the research, please feel free to contact me. I can be reached at +_____ or _____@aquaya.org or [hand over the business card].

If you agree to participate, please say so.

[ALL QUESTIONNAIRES WILL BE SAVED BY THE INTERVIEWER REGARDLESS OF THE RESPONDENT'S DECISION TO PARTICIPATE OR NOT TO PARTICIPATE.]

B. Interview Details:

Name of interviewer:
Name of respondent(s):
Donor Affiliation:
Position/Title
Date:

ASK FOR PERMISSION TO RECORD AND START RECORDING

C. Introductions

- Tell me about your current position. How long have you been in this position?
- What are the top priorities for your organization with water, sanitation, and hygiene (WASH)?
- What role did you play in the subsidy projects?

D. Subsidy Projects

- How was the funding for this project conceived? What justification was used for funding this project?
- What successes or challenges did you encounter when funding this project?
- What kinds of expenses were covered by the funding? Were any expenses excluded?
- What kinds of requirements did GWCL have to meet in order to receive or maintain the funding?
- What changes would you like to see in the design of the project or its implementation?
- As a donor, did your organization feel they received sufficient information about the performance of the project? What type of information did you get? What else would have been helpful?
- Is your institution planning to fund another project similar to this one in Accra?
- What changes would you like to see in the funding for similar projects in the future?
- Does your institution contribute to the Social Connection Fund? Why or why not?

APPENDIX F: METROPOLITAN, MUNICIPAL, AND DISTRICT ASSEMBLY STAFF INTERVIEWS

A. Introduction and Informed Consent

Hello, my name is _____. I am a staff member at the Aquaya Institute based in Accra. I would like to invite you to participate in our research study. The purpose of our research is to understand the connection subsidy programs implemented by the Ghana Water Company Limited (GWCL). The study will be conducted over 9–12 months. You are being asked to participate in this study because you are a Municipal/District Assembly official in an area where a subsidy program was implemented.

The discussion will involve questions about the subsidy programs implemented by GWCL, water supplied by GWCL, and other water sources. The discussion should last no longer than one hour or until you feel you have told me everything you want me to know. If you agree to participate in this research, I will conduct an interview with you now.

There are no right or wrong answers, so please be honest and tell us what is true for you. Information from this study may help increase understanding and awareness of what it is like to live in Accra especially with regard to access of drinking water. There are no personal risks or benefits to your participation. Everything that you say will be confidential, and we will not use your real name or any identifying information in any of our reports or papers. Our team may sometimes look at your record for research purposes. The results will be used to inform GWCL and other institutions in improving future subsidy programs and providing water service connections.

With your permission, I will record our conversation and my colleague will take notes during the interview. The recording is to accurately capture the information you provide and will be used for transcription purposes only. You have the right to review, edit, or erase any information from the interview that you do not want documented or written down. Excerpts from the recordings/transcripts may be used to illustrate the research findings. This will always be done in a way to protect your identity (e.g., your name will not be used). Any other material or information generated by you, such as ideas written down on paper, will be subject to the same strict controls.

Your participation in this research is completely voluntary. You can decline to answer any questions, and if you do not wish to continue for any reason, you can let me know so we can stop the interview. You will not receive any monetary payment for your participation. An alternative is not to participate in this study.

If you have any questions or concerns about the research, please feel free to contact me. I can be reached at +_____ or _____@aquaya.org or [hand over the business card].

If you agree to participate, please say so.

[ALL QUESTIONNAIRES WILL BE SAVED BY THE INTERVIEWER REGARDLESS OF THE RESPONDENT'S DECISION TO PARTICIPATE OR NOT TO PARTICIPATE.]

B. Interview Details:

Name of interviewer:
Name of respondent(s):

MMDA name:
Position/title:
Date:

ASK FOR PERMISSION TO RECORD AND START RECORDING

C. Introductions

- Tell me about your current position. How long have you been in this position?
- What are the top three to five priorities for the communities in your jurisdiction?
- How often do you work with GWCL?
- What role did you play in the subsidy projects?

D. Subsidy Projects

- Do you know/remember how your office selected the LIUCs for the subsidy projects?
  - What criteria were considered?
  - What role did GWCL play? What role did donors play?
  - List two to three LIUCs that were not selected and ask why those were not selected.
- What role did you personally play in the selection of the LIUCs for the subsidy projects?
- Do you think this project was successful in meeting its goals?
- What changes would you recommend for future projects?
  - Probe: what type of complaints did you hear from community members?
  - Probe: any changes with respect to community selection or targeting
- Do you think that additional households would connect to GWCL if the project was extended/expanded?

APPENDIX G: GWCL MANAGEMENT INTERVIEWS

A. Introduction and Informed Consent

Hello, my name is _____. I am a staff member at the Aquaya Institute based in Accra. I would like to invite you to participate in our research study. The purpose of our research is to understand the connection subsidy programs implemented by the Ghana Water Company Limited (GWCL). The study will be conducted over 9–12 months. You are being asked to participate in this study because you part of the GWCL management.

The discussion will involve questions about the subsidy programs implemented by GWCL, water supplied by GWCL, and other water sources. The discussion should last no longer than one hour or until you feel you have told me everything you want me to know. If you agree to participate in this research, I will conduct an interview with you now.

There are no right or wrong answers, so please be honest and tell us what is true for you. Information from this study may help increase understanding and awareness of what it is like to live in Accra especially with regard to access of drinking water. There are no personal risks or benefits to your participation. Everything that you say will be confidential, and we will not use your real name or any identifying information in any of our reports or papers. Our team may sometimes look at your record for research purposes. The results will be used to inform GWCL and other institutions in improving future subsidy programs and providing water service connections.

With your permission, I will record our conversation and my colleague will take notes during the interview. The recording is to accurately capture the information you provide and will be used for transcription purposes only. You have the right to review, edit, or erase any information from the interview that you do not want documented or written down. Excerpts from the recordings/transcripts may be used to illustrate the research findings. This will always be done in a way to protect your identity (e.g., your name will not be used). Any other material or information generated by you, such as ideas written down on paper, will be subject to the same strict controls.

Your participation in this research is completely voluntary. You can decline to answer any questions, and if you do not wish to continue for any reason, you can let me know so we can stop the interview. You will not receive any monetary payment for your participation. An alternative is not to participate in this study.

If you have any questions or concerns about the research, please feel free to contact me. I can be reached at +_____ or _____@aquaya.org or [hand over the business card].

If you agree to participate, please say so.

[ALL QUESTIONNAIRES WILL BE SAVED BY THE INTERVIEWER REGARDLESS OF THE RESPONDENT'S DECISION TO PARTICIPATE OR NOT TO PARTICIPATE.]

B. Interview Details:

Name of interviewer:
Name of respondent(s):
Position/title at GWCL:
Date:

ASK FOR PERMISSION TO RECORD AND START RECORDING

C. Introductions

- Tell me about your current position. How long have you been in this position?
- What are the top three to five priorities for your department?
- What role did you play in the subsidy projects?

D. Subsidy Projects

- Why were the subsidy projects implemented?
- Do you think the subsidy projects were needed? Why or why not?
- What are your concerns regarding these projects?
- What challenges do you think the subsidy programs faced? (e.g., human resources capacity, technical capacity, financial ability)
- What improvements would you recommend for future subsidy programs?
- If GWCL were to extend similar projects to all non-connected LIUCs in Accra, where could the funding come from?
- Would it be possible to implement a cross subsidy by requiring wealthier households to pay a little more on their water bills?
- Do you believe that the Public Utilities Resources Commission (PURC) would agree to the surcharge? Who would collect it?

APPENDIX H: FOCUS GROUP DISCUSSION GUIDE

VERBAL CONSENT SCRIPT TO PARTICIPATE IN RESEARCH (FOCUS GROUP)

My name is _____. I am a staff member at The Aquaya Institute based in Accra. I would like to invite you as the head of household or a knowledgeable family member to participate in our research study. The purpose of our research is to understand the subsidy programs implemented in Accra by the Ghana Water Company Limited (GWCL).

If you agree to participate in this research, I will conduct a group interview with you now. The interview will involve questions about the kind of household you live in, access to and satisfaction with water and sanitation services. The discussion should last no longer than two hours or until you feel that you have told me everything you want me to know.

There is no direct benefit to you from taking part in this study. It is hoped that the research will provide you with an opportunity for you to talk about some of your experiences and concerns with water services. Information from this study may help increase understanding and awareness of what it is like to live in [name of city].

With your permission, I will audiotape and take notes during the interview. The recording is to accurately record the information you provide and will be used for transcription purposes only. You have the right to review, edit, or erase any information from the interview that you do not want recorded or written down. We will not use your real name or any identifying information in any of our reports or papers. Excerpts from the recordings/transcripts may be used to illustrate the research findings. This will always be done in a way to protect your identity (e.g., comments will not be attributed). Any other material or information generated by you, such as ideas written down on paper, will be subject to the same strict controls.

Your participation in this research is completely voluntary. You can decline to answer any questions and if you do not wish to continue, you can withdraw from the interview discussion at any time for any reason.

Because focus groups include discussion of personal opinions, it is important to keep information discussed in the focus group confidential. By agreeing to participate, you agree to keep everything discussed in the room confidential.

You will not receive any monetary payment for this group discussion.

I can be reached using the contact information on the sheet that I am about to give to you [Distribute business card or flyer with Aquaya contact information]. If you agree to participate, please say so.

TOPICS FOR FOCUS GROUPS DISCUSSIONS

A. Subsidy Projects

- How effective were the subsidy projects in assuring water supply to low-income households? Why or why not? Which types of households or community members have difficulty accessing the connection subsidy?
  - Probe: women-headed households, multiple households sharing one compound, etc.

- How easy was it for community members to apply for and receive a subsidized connection? What could have been done differently?
- What barriers stop households from applying for a GWCL connection in their compound? What alternate strategies could help to allow these households to connect to the network?
- What was the registration process like? How could the registration process be improved?
- Would there be a more preferable method of paying for a GWCL connection?

B. Bill Payment

- What is the bill payment process like? How could it be improved?

C. Alternate Vendors

- What are the pros/cons of using alternate sources of water to GWCL (price, quality, convenience, reliability)?
- Under what circumstances would you purchase water from an alternate vendor?

D. Satisfaction

- How satisfied are you with the current services provided by GWCL?
- What issues do you face with your current water supply?
- What are the benefits of having a GWCL pipe connection? What do you like/dislike about having a connection?

E. Service Reliability

- How promptly and consistently does GWCL respond to issues or complaints? How could GWCL responses be improved?
- How often do you experience shortages of water that last more than 12 hours?
- How do you prepare for these shortages or intermittency?
- Do you know the reason for rationing or intermittency of supply?

F. Transparency

- What information have you received from GWCL about water quality and supply?
- What additional information you would like to receive from GWCL?

APPENDIX I: STAKEHOLDER ENGAGEMENT AND ANALYSIS

Stakeholder Category	Stakeholder	Interest	Influence	Stakeholder Outcome	Objective of Engagement	Engagement Activities	Communication Activities
Manage Closely	National Development Planning Commission (NDPC)	NDPC produces an annual report on the state of access to water and noted that the sector's improvements have been stagnating in recent years due to difficulties in reaching "the last 15%." Improving targeting and implementation of subsidies can help move the needle.	Designs policy/programming at the national level to achieve sustainable development goals, including WASH.	Inclusion of recommendations into national policy/programs.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	Technical working group (TWG) workshops	Project Updates, Briefs
Manage Closely	Ministry of Sanitation and Water Resources (MSWR)	The National Water Policy is currently undergoing review and updates and MSWR wants to ensure that research findings link up with that process. They are also coordinating other donor-funded research programs like Rural Evidence and Learning for Water (REAL Water).	Drafts National Water Policy and ensures policy uptake by sector actors. Service providers and other sector agencies report to the Ministry.	Inclusion of recommendations into national policy.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	TWG workshops	Project Updates, Briefs
Manage Closely	Public Utilities Regulatory Commission (PURC)	PURC has previously produced research that supported the development and growth of a low-income customer support unit (LICSU) within GWCL. They have also piloted pro-poor water programs through donor funding. Some of their leadership is currently more interested in rural programs.	As the regulator of the sector, they have a high level of influence over tariff-setting in particular. They also have the power to approve a social connections policy, which currently does not exist.	Prioritization of urban pro-poor programs (in addition to rural programs), and incorporation of findings into new policy and guidelines for service providers.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	TWG workshops	Project Updates, Briefs

Stakeholder Category	Stakeholder	Interest	Influence	Stakeholder Outcome	Objective of Engagement	Engagement Activities	Communication Activities
Keep Satisfied	Ministry of Local Governments and Rural Development	Cross-sectoral ministry interested in any policy matters that impacts the local governments they serve.	Focus on oversight of decentralization to local governments but do not exert policy influence in the water sector.	Support for research recommendations that are related to local government actors.	Inform of research findings and recommendations.	Coalition of Nongovernmental Organizations in Water and Sanitation (CONIWAS) Conference	Conference Presentations
Keep Satisfied	Local Government Services	Cross-sectoral agency which provides technical assistance to MMDAs to ensure that local governments effectively perform their functions. Low level of interest or knowledge with subsidies.	Local government services can facilitate engagement with MMDAs as needed for the research.	Support for research recommendations that are related to local government actors.	Inform of research findings and recommendations.	CONIWAS Conference	Conference Presentations
Monitor	Ministry of Gender, Children, and Social Protection	Focus on gender policy and programming in rural areas.	Minimal influence in the urban water sector.	Prioritize urban poor programs and develop interest in WASH	Inform of research findings and recommendations.	CONIWAS Conference	Conference Presentations
Manage Closely	United States Agency for International Development Ghana	Highly supportive of the research proposal to evaluate GWCL's progress with pro-poor water subsidies.	Fund and execute country programming across sectors, including WASH.	Support for research.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	TWG workshops	Project Updates, Briefs
Manage Closely	Resource Center Network (IRC) Ghana	Programs focus more on rural areas, but they have expertise on challenges related to water access in low-income urban areas and additional interest in the research due to its relevance to changing rural contexts.	Country Director for IRC Ghana serves on GWCL's Board of Directors (one of two women on the Board).	Advocate for research recommendations and create stronger communication channel between nongovernmental organizations (NGOs) and GWCL.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	TWG workshops	Project Updates, Briefs

Stakeholder Category	Stakeholder	Interest	Influence	Stakeholder Outcome	Objective of Engagement	Engagement Activities	Communication Activities
Manage Closely	Training, Research, and Networking for Development (TREND)	Provide technical services to clients in the WASH and Agriculture sectors. They have worked closely with GWCL's LICSU over the last six years, including close collaboration during the World Bank-funded Greater Accra Metropolitan Area project when GWCL first piloted connection subsidies.	Develop technical assistance products for GWCL and other sector actors.	Give them a platform to amplify past learnings with political actors and build on those through current research.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	TWG workshops	Project Updates, Briefs, Academic Paper
Keep Satisfied	CONIWAS	Majority of the member NGOs within the coalition are focusing on rural WASH interventions. Urban water experience is limited to interventions like kiosks and boreholes.	Host a large annual conference for actors in the sector, as well as a national learning platform (NLLAP).	Provide an avenue for dissemination activities/events once research recommendations are finalized.	Inform of research progress, findings, and recommendations.	CONIWAS Conference	Conference Presentations
Manage Closely	United Nations Children's Fund (UNICEF)	UNICEF funded GWCL's most recent water connection subsidy project and are very interested in ensuring successful outcomes of such programs through research. Would like GWCL to institutionalize subsidies.	Fund programs and advocate policy within the urban water sector.	Integrate research findings into future program design and funding.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	TWG workshops	Project Updates, Briefs
Monitor	WaterAid Ghana	Focused on kiosk delivery of water to the poor, and mostly operate in rural areas.	Minimal influence in the urban water sector.	Prioritize urban poor programs and create linkages with GWCL.	Inform of research findings and recommendations.	CONWAS Conference	Conference Presentations, Briefs
Manage Closely	Vitens Evides International	Funded one of GWCL's water connection subsidy projects, with the goal of "filling in the gaps" of the existing distribution network. Interested in	Ongoing partnership with GWCL to provide funding and technical assistance to the Low-Income	Support possibility of changes to subsidy targeting approach based	Consult and integrate feedback into research design, analysis, and recommendations.	TWG Workshops	Project Updates, Briefs

Stakeholder Category	Stakeholder	Interest	Influence	Stakeholder Outcome	Objective of Engagement	Engagement Activities	Communication Activities
		advocating importance of subsidies among policymakers but suspicious of independent evaluations that threaten expansion of programs.	Customer Support Department (LICSD). Only active funder of LICSD at the moment.	on the research findings.	Collaborate on additional dissemination activities.		
Manage Closely	Kwame Nkrumah University of Science and Technology	Currently documenting the UNICEF subsidy project approach and interested in building on past research enumerating barriers to water access due to connection fees.	Provide research and technical assistance to GWCL.	Promote research and collaboration on similar topics among local academia.	Consult and integrate feedback into research design, analysis, and recommendations. Collaborate on additional dissemination activities.	TWG Workshops	Project Updates, Briefs, Academic Paper

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