RESEARCH ARTICLE

Access and Sustainability of Water Point Sources in Sekyere Kumawu District

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Abstract
The "3K Project" has increased the number of water point sources and the quantity of water available to Sekyere Kumawu District, however, community settlers still struggle to get potable water. The study, therefore, sought to examine the accessibility and sustainability of water point sources in the Sekyere Kumawu District. The descriptive survey was employed. Mixed approach; both quantitative and qualitative research designs were used in the study. Primary data were sourced using structured questionnaires, interview guide and field observations. Multiple stage sampling techniques was employed to select 390 households while 9 key stakeholders were purposively selected. The Statistical Product and Service Solutions was used to process and analyse the data. Both descriptive and inferential statistics such as frequencies, percentages, crosstabs, Pearson Chi-square and paired sample t-test were used in the data analysis to arrive at key findings. Also, interviews were manually transcribed, coded, grouped into themes and used appropriately to either confirm or reject the quantitative analyses whereas observations in the form of pictures from the field were also presented in plates to support the findings from questionnaires and interviews. It was found out that among the various water point sources in the district, pipe borne water was preferred for drinking due to its hygienic nature and quality. It is therefore, recommended that the District Assembly should liaise with water and sanitation NGOs and GWCL to finance water projects expansion within the communities, especially areas where there were spatially deficiency in the water point sources or under-coverage and to newly developed areas in a bid to improve accessibility, especially to access safely managed drinking water services.

Keywords: Water; Access; Sustainability; Water Point Sources; Sekyere Kumawu District

Introduction

Water is essential for maintaining human health and dignity, supporting ecological systems, and serving as a crucial input for production systems that sustain livelihoods (United Nations Development Programme, 2006). Globally, an estimated 663 million people still lack access to improved drinking water sources (WHO, 2015). By 2050, global water demand is expected to rise by 55%, primarily due to increasing urbanization in developing countries (OECD, 2012). Consequently, cities will need to either extend their reach or dig deeper to access water or rely on innovative solutions and advanced technologies to meet their water needs. Between 1990 and 2012, the number of urban residents without access to improved drinking water sources increased from 111 million to 149 million (WHO/UNICEF, 2014). In sub-Saharan Africa, where urbanization is most rapid, the percentage of people with piped water on their premises dropped from 42% to 34% (WHO/UNICEF, 2014). The World Bank report states that more than one-sixth of the worlds' population does not has access to safe drinking water.

Among those who do not have access to water, 80 percent leaves in rural areas, and this makes access to water difficult to be guaranteed globally.

The developing world including countries in West Africa, continue to lag behind developed nations in their progress towards meeting the water-related Sustainable Development Goals (SDGs) (WHO/UNICEF, 2016). Based on WHO/UNICEF report (2008), one of the most important measures to spur economic growth, reduce poverty as well as improve public health is universal access to and use of clean potable water.

Prüss-Üstün et al. (2008) highlighted that nearly 10% of the global burden of disease was attributable to unsafe water, lack of sanitation, and poor hygiene, claiming 3.6 million lives annually. Recent data from the World Health Organization (WHO) indicates that unsafe water, sanitation, and hygiene (WASH) continue to pose significant health risks. In 2022, contaminated water sources caused approximately 505,000 diarrhoeal deaths annually, with microbial contamination being the primary concern. Despite progress towards Sustainable Development Goal 6, which aims for universal access to safely managed water and sanitation by 2030, around 2.2 billion people still lacked access to safely managed drinking water in 2022. This lack of access exacerbates health risks and hinders economic and social development (WHO, 2023). Addressing the global water crisis requires concerted efforts to improve water access and sustainability, particularly as the global population grows. Enhancing WASH infrastructure and management is essential to reduce preventable diseases and support overall community well-being (WHO, 2023).

The concept of Sustainable Development has gained increasing attention and relevance in the last decades. The term sustainable development is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987, p. 43). In practice, sustainable development is a societal concept that is grounded in three basic principles; environmental integrity, economic prosperity, and social equity which is commonly referred to as the three pillars of sustainability (Elliott, 2005). Therefore, access to potable water should be sustainable based on these three principles. According to Annor (2011), if care is not taken, the next world war would occur as a result of water crisis. Though there is an increase in population, the world through the Sustainable Development Goal (SDG) 6 has committed itself to attaining universal water coverage by 2030 by improving upon the 75% universal coverage of water proposed in the Millennium Development Goal 7 which just ended in 2015. The Sustainable Development Goal (SDG) 6 seeks to ensure availability and sustainable management of water and sanitation for all. It focuses on achieving universal and equitable access to safe and affordable drinking water. About 71 percent of the global population (5.2 billion people) used a safely managed drinking water service; that is, an improved drinking water source located on premises, available when needed and free from contamination while over 844 million people still lacked even a basic drinking water service (drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip) (Global Health Observatory (GHO), 2015).

In Ghana, though there seem to be increasing water coverage nationwide, the situation on ground lives much to be desired since majority of the people living in both urban and rural areas have limited access to water. More than 40 percent (10 million) of Ghana's 25 million people do not have access to safe water (Safeghana, 2018). Report by the Parliamentary Select Committee on Works and Housing in Ghana (2017) revealed that 24% of urban dwellers have no access to potable water. Similarly, a critical analysis of data collected in 2014 by the Sekyere Kumawu Assembly on water and sanitation facilities in the district vis- avis the population revealed that access to potable water is woefully inadequate (DPCU-SKDA, 2014). These people are therefore left with no other choice than to find their own means of getting water. However, due to poor management and sustainable practices, most of the water point sources are not reliable and potable.

Historically, households in Sekyere Kumawu District have experienced water crises since the broke down of treatment plant installed at River Onwam in 1995 due to lack of maintenance (GWCL, 2013). The affected population have been relying on other water point sources such as streams, springs, rainwater, tankers, water supplied vendors, ponds, rivers, boreholes, wells as well as sachet water (Ghana Statistical Service and Population and Housing Census, 2010). Recently, Sekyere Kumawu District was provided with reservoirs of pipe borne water as part of the benefits of the Konongo, Kumawu and Kwahu Water Expansion Project ("3K project) of the Ghana Water Company Limited.

Under this project, public tap/ standpipes were provided to serve as a service point (service centre) and access point sources to the pipe-borne water from the reservouir. These access point sources served as places where pipe

taps are mounted for households to fetch water to their various homes. However, the number of public standpipes provided under the "3K project" is not enough to meet the needs of the affected communities in the SKD. Also, some of these public tap/ standpipes are located at the foot of some highlands (hills) and others are at a far distance from the places of residence of the households which makes it difficult to access this water. Additionally, the prices as which water is sold to the people also makes affordability a problem. The inability of the people, especially, those in the rural communities, to afford the cost make the water supply inaccessible though it is available. On the other hand, there are a lot of incidence of burst pipes almost every day, dalliance in connection of pipe to various homes, as well as inconsistent in water flow of taps.

Despite the fact that the Konongo, Kumawu and Kwahu water expansion (3K) project has made potable water available to the Sekyere Kumawu District, there are threats to its equity distribution, sustainability, accessibility, and affordability. Nevertheless, there is paucity of empirical evidence on difficulties that household face in accessing potable water and how these water point sources are managed and sustained among others. This study, therefore, sought to examine the access to and sustainability of potable water sources in the Sekyere Kumawu District.

Literature Review

Potable Water

Grandjean (2004) define potable water as water that is considered safe for drinking and can be used for other domestic purposes. It is either treated, cleaned or filtered and meets the locally established drinking water standards (free of harmful bacteria and contaminants). Examples of potable water would be tap water from treated municipal water systems, or that has been Ultraviolet filtered, water distilled, or purified by reverse osmosis.

Water Point Sources

There are a lot of repositories of water which many households draw their potable water from for both domestic and industrial purposes. These sources are not limited to, but include; springs, wells, boreholes, pipe stands, water tankers/vendor supplies among others. Groundwater is less susceptible to pollution due to its location within the earth crust (water table/aquifer) and for that matter, it is often recommended for use as drinking water (Kortarsi, 1994). Groundwater can be tapped to the earth surface through either by wells or boreholes, spring and infiltration galleries (Kpordze, 2010). Wells and springs are rampantly used by developing countries as a source of drinking water. Springs occur naturally whereas wells are dug, drilled or bored.

A well is an issue of water from the earth: a pool fed by a spring (Marriam Webster, 2015). It is also known to be a pit or hole sunk into the earth to reach a supply of water. Tilton (n.d.) also defines a well as a hole or shaft drilled down through the earth to water-bearing stratum of sand, gravel, or a crack in the rock. There are different types of a well according to their mode of construction. For instance, hand dug wells are the most common method of abstracting groundwater in developing countries. Hand dug wells have relatively large diameters (often ranges from 1–2m) to allow sufficient digging space. On the other hand, depths may range from shallow wells (3-5m) to deep wells 10 to over 20 m to ensure that water table can still be reached in dry seasons (Kpordze, 2010). A traditional hand dug well is often drawn using rope and bucket and this makes it prone to contamination since they are often not covered and the rope or bucket could be contaminated before placing it into the well (Powell Black & Hickman, 1992).

Another mode of construction could be in the form of drilling to deeper depths using drilling rig or augurs. Boreholes are deeper (depth 20-100m and over) than tube wells. The boreholes are also drawn using hand pumps or mechanical pumps. Research has shown that though the initial costs of Boreholes are expensive, they are less susceptible to contaminations since their diameters are relatively smaller and they are also sealed with the hand pumps or mechanical pumps (WaterAid, n.d.). Water tankers are the vehicular reservoir used to fetch water from rivers or pipe stands and then distribute to the requested households at a fee or cost. Moreover, water supplied vendors include individuals who used to fetch water from other water point sources such as springs, rivers, streams, wells and or pipe stands and sell it to households for money. These people normally put the water in plastic

containers, "gallon" and small poly tanks as well as buckets. Furthermore, stand pipes are places where pipe taps are mounted for households to fetch water to their various homes. This type of water is treated by the Ghana Water Company Limited at a fee or cost.

Functionality of Water Point Sources

The functioning and non-functioning of water point sources are termed as functionality. Studies conducted on the functionality of water point sources by CARE (2012) and Habtamu (2012) place functionality under the type of technology (a type of hand pumps) employed, the availability of spare parts in the local market and availability of skilled personnel for operation, repairs and maintenance. Factors that contribute to long-term functionality of technologies included; governance, diversity and inclusivity of committee members such as, female involvement and training for maintenance and repairs. CARE (2012) further indicates that the involvement of women in committees contributed tremendously to water point functionality in Northern Mozambique. On the other hand, insufficient training for operation and maintenance and lack of spare parts in the local market were the factors dwindling the functionality as well as sustainability of water point sources. Most of the spare parts are imported and are not locally manufactured and hence the reason for is unavailability in the market. Habtamu (2012) again, indicates that the community participation in the choice of technology was another contributing factor enhancing long-term functionality since the people felt a sense of ownership and protection of the propriety. Also, the community involvement in the construction of the technology coupled with the training received, equip them with some skill on repair and maintenance (Hayson, 2006).

Mapping of Water Points

According to Welle (2007), mapping is the act of bringing what is hidden in the dark to light. Mapping can be in any form based on what information is required. In order to envisage information of a particular jurisdiction, a map is created at the end of any mapping exercise. Mapping according to Welle (2007), serves as an advocacy tool since it provides citizens as well as a local government with information and arguments to demand improved services. Mapping of water point sources helps in revealing information such as coverage (number of water point sources in the system), access levels (number of population which has access to water), functionality (number of water point functioning and non-functioning), water quality and equity (fair distribution of water points) of service delivery (WaterAid, n.d.). Information gathered from mapping is very useful for improving planning and monitoring of water service delivery nationally and locally by local government and water service providers (Welle, 2007). Welle (2007) further argues that mapping in itself is a tool that is used by water service providers and Agencies such as WaterAid (water and sanitation body) to track its projects.

In as much as mapping can be advantageous, it can be misleading since changes cannot be provided on maps generated as and when they occur (Welle, 2007). For instance, after mapping a particular place, any activities like demolition that goes on cannot be factored again into the map. Again, mapping is done based on the information the mapper is looking for and so several maps are generated for various purposes. Welle (2007) argue that data gathered had to be entered into a compatible mapping tool that may require training, skill and experience.

Access to Water Point Sources

Access to safe drinking water is a fundamental precondition for the enjoyment of several human rights, including the right to education, housing, health, life, work and protection against cruel, inhuman or degrading treatment or punishment. It is to eradicate discrimination among sex, income status and social class (UN-Water, 2009). Access to water can be defined based on parameters such as population, distance, time and quantity (Moriarty, Batchelor, Fonseca, Klutse, Naafs, Nyarko, Pezon, Potter, Reddy & Snehalatha, 2011). With regard to population access to safe drinking water is defined or estimated by the percentage of the population using improved drinking water sources such as protected hand dug wells, boreholes, protected springs, public standpipes and rainwater harvesting (Joint Monitoring Program, 2011). A household is considered to have access to an improved water source if it gets drinking water primarily from a pipe-borne water supply system, a public standpipe, borehole and dug well

with pump, a protected spring, a well-developed rainwater harvesting system, a reliable water vendor or water tank truck. Sources such as direct from surface waters, thus, rivers, lakes, ponds, etc. and unprotected wells and springs are regarded as unimproved water sources (United Nations International Children Education Fund (UNICEF), 2008; World Health Organization (WHO), 2008).

According to WHO (2011) and Community Water and Sanitation Agency (CWSA) (2007), a water point source such as borehole must serve 200 to 300 persons. Studies conducted in Ghana shows that most often than not a water point source (borehole) serves less than 300 people at a time (Moriarty *et al.,* 2011). Access to a water point source in terms distance must be between 200m to 500m (Moriarty *et al*., 2011). According to Joint Monitoring Programme of WHO (2000), reasonable access to a water point source in terms of quantity must be available to a person at least 20 litres (five gallons) per day from a source within one kilometre of the user's dwelling. However, in Ghana, CWSA defines access to safe drinking water in rural areas to include supplies from boreholes delivering a minimum of 20 litres per person/day, serving at least 300 persons each within 500 meters of households being served (CWSA, 2007). With regards to time, it is recommended by UN to be 30mins per a normal trip (from house to water and back to the house).

As the amount of water accessed every day is largely determined by the distance to the water source and the collection time, a reasonable distance is one that allows everyone to collect sufficient water to cover personal domestic uses. According to WHO, in order to have a basic access to 20 liters per day, the water source has to be within 1,000 metres of the home and collection time should not exceed 30 minutes. When water is piped into the home, access is optimal and at least 100 litres per person per day is likely to be ensured. In this respect, United Nations Development Programme (UNDP) confirms in its human development report 2006 that having a regular supply of clean water piped to the household is the optimal type of provision for human development. Access to a regular supply of water within the home also eliminates the need for women and children to spend time and physically exert themselves to collect water from distant sources. Howard and Bartram (2003) defined access to potable water using four levels based on four board service levels which are distinguished on three categories namely; distance the consumer travels or the time spent collecting water, the quantity of water collected and the health concerns of water consumers. To them, basic access to water offers minimum health protection, and users of this service level will have access to less than 20 litres of water per day which includes 7.5 litres required for consumption. On the other hand, optimal access to water offers a minimum of 100 litres per day which is normally seen in houses with multiple pipe stands. Here, the level of health concern is very low and quality is readily assured. Access to water in urban areas in Ghana has increased over the years since people in urban areas depend mainly on piped-borne water supplied by GWCL. The Ghana Statistical Service (GSS) (2014) indicates that about 95 percent of urban households have access to potable water (pipe, borehole and bottled water). Though access to water has increased, people usually have to travel outside their homes to collect water. This may be due to the landscape of the area, planning or settlement pattern and one's income status.

Sustainability of Water Point Sources

The term 'sustainability' is derived from the Latin *sustenere* meaning to maintain and its use in relation to the resources of the planet has a long pedigree dating from the late 18th Century. The contemporary term *sustainable development* was popularised in 1987 in the Brundtland Report which defined sustainable development as "…*development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs"* (World Commission on Environment and Development (WCED), 1987:43). Subsequent work on sustainability stems from action under the 1992 United Nations (UN) Conference on Environment and Development, specifically Agenda 21. 'Sustainability and sustainable development' have been defined in several ways by different institutions and researchers (Awoke, 2012). DFID (2000) suggests that sustainability has been achieved when prevailing structures and processes have the capacity to continue their functions over the long term. Bjornlund (2004) defines sustainability as the satisfactory functioning and effective use of services, and equity as when everyone (men and women, rich and poor) … have equal access to benefits from projects. For the purpose of this study, sustainability is defined as the continuous provision of acceptable services in an equitable manner to beneficiaries for a targeted lifetime without any form of discrimination.

Sustainability can be defined as the functionality of water point sources over a long period of time (Habtamu, 2012). Since the world committed itself to provide water to halve the world population without access to safe drinking water by the year 2015, the focus has been provisioning rather than sustainability. Every year, large sums of money are used in the implementation of water supply projects but only a few are seen functioning at the end of the year or two (Gebrehivot, 2006). Thus, these huge sums of money invested often go to waste. It is estimated that 35% of all rural water supplies in sub-Saharan Africa are not functioning and despite the frequency with which it appears in development discourse, the reality of sustainability remains elusive (Habtamu, 2012).

Moreover, research has also shown that rural water supplies (often water point sources) in sub-Saharan Africa, particularly those relying on hand pumps, often demonstrate low levels of sustainability. The key causes for this include inappropriate policy or legislation; insufficient institutional support; unsustainable financing mechanisms; ineffective management systems; and lack of technical backstopping. The problem will only be solved by adopting a holistic approach to planning and implementation rather than focusing on one issue (Habtamu, 2012). No wonder sustainability lately has become a prerequisite for inclusion in a project proposal document and in the objective of every water supply and sanitation projects (Parry-Jones, Reed & Skinner, 2001).

Methodology

Study Area

The Sekyere Kumawu District is located between Latitudes 0° 20' and 1° 20' North and Longitudes 0° 45' and 1° 15' West. It covers an estimated land area of 576.58 square kilometres, which forms 6.2 percent of the total land size of the Ashanti Region (SKDA, 2014). Figure 1 depicts that the District shares common boundaries with the Sekyere Central District to the west, Sekyere East and Asante Akim North districts to the South and the Sekyere Afram Plains District to the east. Kumawu, the capital of SKDA is about 54 kilometres north-east of Kumasi, the regional capital. The population size of the district is 65,402 with females recording 34,421 (53.4%) and males 30,981 (46.6%) (GSS, 2010). The district is predominantly rural with a rural population of 34,530 (52.8%) as compared with the urban population of 30,872 (47.2%). It has a growth rate of 3.5 percent (GSS, 2010). There are 14,185 households in the district. The sources of drinking water for households are rivers/streams (30.2%), followed by bore-hole/pump/tube well (29.3%) (GSS, 2010). One out of every five households obtain drinking water through tanker supply/vendor provided, which account for 15.7 percent of all drinking water available to the district. Pipe-borne water (public tap/standpipe, outside and inside dwelling) is the source of drinking water for 11.3 percent and 7.6 percent of rural and urban households, respectively (GSS, 2014).
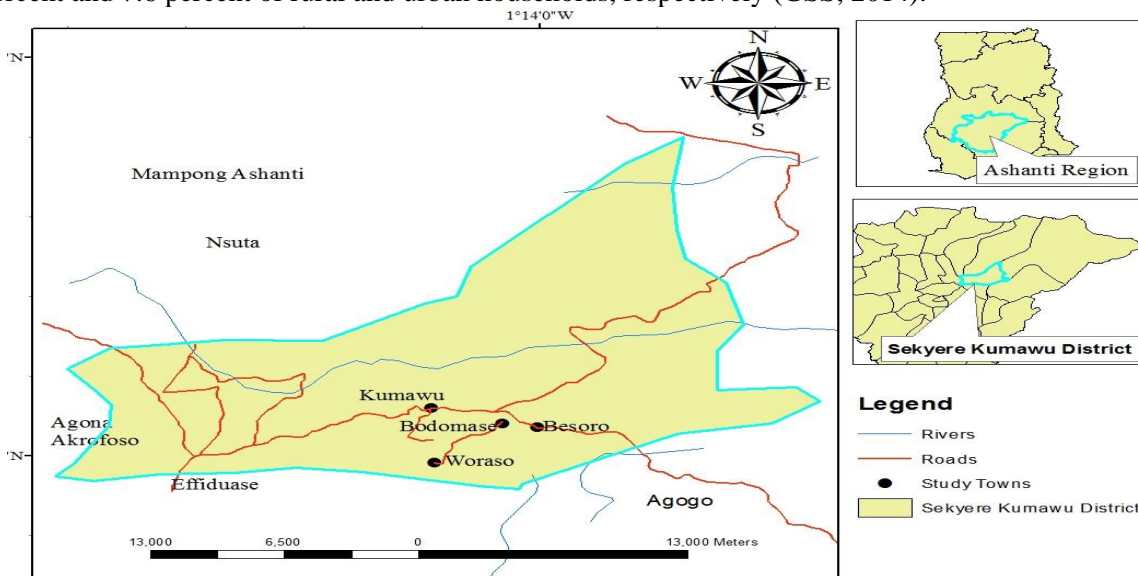

Figure 1: A study area of Sekyere Kumawu District

The study adopted a mixed approach (a combination of qualitative and quantitative methods). According to Johnson and Onwuegbuzie (2004) and Creswell (2012), merging the quantitative and qualitative techniques of data analysis concurrently helps to balance the strengths and weaknesses of the two, while it aids in achieving a greater degree of validity and reliability. The study used a multi-stage sampling to select 390 respondents within the Sekyere Kumawu District based on the household population (16,292) with the aid of Yamane (1967) formula for determining sample size. The residential areas involved in the survey were stratified into four- Kumawu, Bodomase, Besoro and Woraso and households. The stratification was based on the communities who were without potable water and now being served with pipestand as well as the income status of the area. A purposive sampling technique was employed in gathering data from 9 key stakeholders. These key stakeholders included; an assembly member, the chief, 3 water vendors, and the manager of Ghana Water Company.

Primary data were sourced using structured questionnaires, interview guide, GPS and field observational checklist. The study adhered to highly ethical issues such as informed and free consent, anonymity, and confidentiality of the respondents. The Statistical Product and Service Solutions (SPSS version 25) was used to process and analyse the data. Also, interviews were manually transcribed, coded, grouped into themes and discussed whereas pictures taken during observations were presented to support the findings of the study.

Results and Discussions

Demographic Characteristics

The study was predominantly female (59.5%) with about 44 percent of respondents aged 58 and above, primarily subsistence farmers, with 24.9% of the respondents being well-informed about water accessibility and management. Most respondents were Christians (85.4%), followed by Muslims (11.5%), mirroring the district's religious demographics. Educationally, a notable number of respondents lacked formal education, necessitating interviews for data collection. Marital status showed a majority (77.2%) were married, aligning with the demographic trends of the district. Household sizes varied, with 46.2% having between 1 to 5 members, slightly higher than the district average. The majority of respondents had lived in their communities for over 20 years, indicating deep familiarity with local water issues. Occupation-wise, 40.5% were farmers, and a significant portion were traders. Income levels were generally low, with 35.4% earning below GH₵ 100 monthly, potentially impacting their economic access to potable water.

Water point sources in the district

Water point sources found in the district included pipe borne water, standpipe, sachet/bottled water, river/stream, rainwater, water vendor and borehole while the most preferred one was the pipe-borne water due to its potability. Among the communities, it was found out that majority of the respondents in Bodomase (90.2%) significantly preferred pipe borne water than respondents from Kumawu, Besoro and Woraso. Figure 2 depicts the various water point sources in the district.

Mapping of water points sources in the Sekyere Kumawu District

Cost Distance Analysis of the Geographic Information System was employed to map the spatial distribution of water point sources in the district. It was found that majority of the standpipes were concentrated in the Kumawu community, followed by Bodomase. Just a few were found in the Besoro and Woraso communities (refer to Fig 2). This distribution pattern might have been influenced by the population distribution within these. It was also observed that majority of the stand pipes were found along main roads. This was to increase accessibility of water point sources in terms of transporting them to various homes and nearby communities. There were few water point sources (pipe stands) that were disconnected due to frequent pipe burst and or failure to pay water bills. Moreover, a larger number of water point sources (pipe stands) were inconsistent with the flow of water while the streams and springs were perennial in nature.
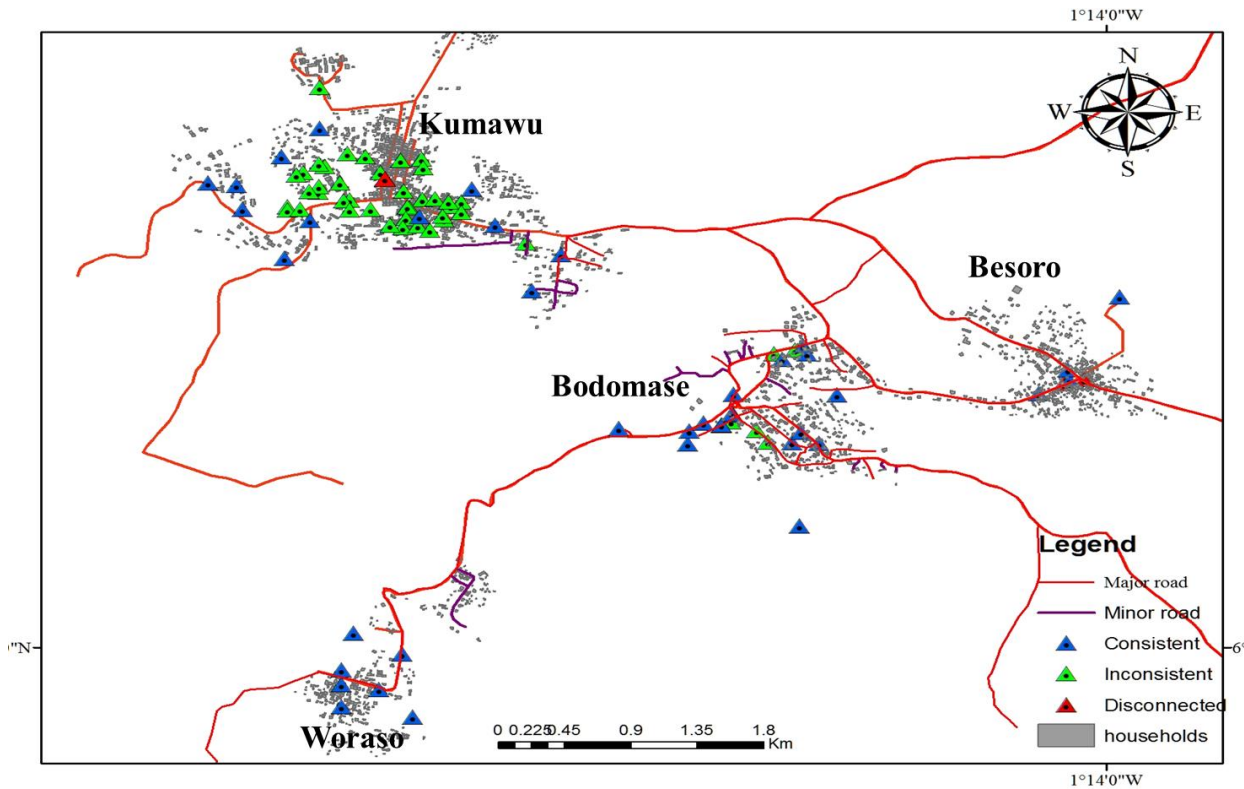
Figure 2: A map of Sekyere Kumawu District showing the study areas and the various water point sources
Source: Survey and Mapping Division of Ghana (2024)

Level of access of the water point sources in the district

According to Penchansky and Thomas (1981), access refers to a degree of fit between client and system. It involves the ability (thus monetary cost) and capability (thus distance, time, convenience and energy) of an individual to reach facilities that enhances one's wellbeing. Therefore, this study measured access based on these parameters; cost, quality, time and distance.

The cost of water

The cost of a 'kuffour gallon/jerry can' of water varied with regards to quantity or size (Figure 3) of the 'gallon/jerry can' and the income status of the area within the community. According to the manager of Ghana Water Company Limited in Kumawu,
"The smaller size (10 Litres) of a gallon is Gh0.10, the medium size (20 Litres) is Gh 0.20 and the bigger and longer one is GH 0.30 (25 Litres)" (Manager of GWCL, Kumawu).
An interview with a stakeholder in Besoro confirmed that:
"One is being sold for GHp30." However, the price of jerry can differ with respect to communities and the type of water vendor" (assembly man, Besoro).
Most of the water vendors in the medium and high-income areas have increased these charges to Gh 0.20, Gh 0.30 and Gh 0.40 respectively. This affects respondents with lower income status who live such high-income areas. Financially, they cannot afford this on a continuous basis because it have a huge toll on their income.

Figure 3: Type of containers used for water collection and their prices

Pipe stands owned and managed by the Ghana Water Company Limited, charged by the standard price given (Gh ¢0.30p per "large jerry can" and Gh¢0.20p for the medium and Gh¢0.10p for the "smaller jerry can"). This price, however, increases by Gh¢ 0.10 at the private commercial pipe stands in Kumawu, Bodomase and Besoro for profit for private operators.

Table 1: Household Monthly Water Expenditure

Amount	Frequency	Percentage
Gh¢1 – 50	135	57.4
Gh¢51 – 100	61	25.9
Gh¢101 – 150	4	1.7
Gh¢151 – 200	16	6.8
Gh¢201 and above	19	8.1
Total	235	100

Table 1 shows that majority of sampled population spent about Ghc 50.00 (Insert dollar equivalent) of their income on water for their homes. Quite a number of them (representing 8.1%) spent more than Ghc 200 and above on water monthly. Most of the respondents relied on imported water and sachet water for drinking than using the normal services (pipe stand).

According to the access model by Penchanksy and Thomas (1981), a facility or water point source is accessible if it is affordable. However, majority of the respondents spent a larger proportion of their average monthly income on water which affects their livelihood activities.

Table 2: Respondents' rate of affordability of water point source

Rate	Frequency	Percentage
Very affordable	28	7
Affordable	80	21
Not affordable	52	13
Expensive	230	59
Total	390	100

Table 2 indicates that majority of respondents (59%) rated the price of the pipe-borne water as expensive. Water as a basic human right should be available to all in the right quality and right quantity. However, in the Sekyere Kumawu District, this is not the case.

According to Penchanksy and Thomas (1981) on access model, when a water point source is not affordable, then it is not accessible and this affects the livelihood activities of the respondents as indicated by the livelihood framework. Consequently, Obrist et. al (2007) posited that any constraints to access to facilities will have a major effect on the level of its accessibility.

Table 3: How Respondents' rated the of quality of water from the available point sources

Rate of quality	Frequency	Percentage
Good	334	85.6
Salty	46	11.8
Coloured	7	1.8
Bad odour	3	0.8
Total	390	100

According to Table 3, over 85% of respondents rated the quality of water from the point sources as good (Refer to Table 3). This means, that the water quality was acceptable to majority of the respondents. Very few of them (0.8%) had issues with the odour of the water. In the access model, acceptability of what was being accessed was crucial because this affects the rate at which something was accessed by a person. However, though quality of water was rated high, access was hindered due to the expensiveness of the cost of water.

Table 4: Respondents' rate of access to water facilities in the district

Rate of access	Frequency	Percentage
Easy access	345	88.5
Access with some difficulties	28	7.2
Access with great difficulty	5	1.3
No access	12	3.1
Total	390	100

With regard to access to potable water in the district, Table 4 indicates that majority of the respondents had access (less than 30 minutes) to water facilities, followed by 7.2% of respondents who had access with some difficulties (more than 30 minutes). About 3.1% of respondents could not access water from the point source facilities because of the distance in making a round trip, the topography of the area or road, and the price at which the water was sold at the point sources.

Table 5: Time spent in accessing water per round trip

Community	Time for a trip for fetching water							χ^2
	10<	11-20m	21-30m	31-40m	41-50	51-60	Total	p-value
Kumawu	16	69	13	8	5	0	111(100)	χ^2=94.8
Bodomase	6	3	14	7	15	3	48(100)	p<0.001
Woraso	4	12	24	6	4	1	51(100)	
Besoro	4	4	9	1	10	1	29(100)	
Total	30	88	60	22	34	5	239(100)	

The differences in responses of the respondents from various communities were examined with Chi-square test goodness-of-fit and shown in Table 5. The result χ^2 (15, N=390, 94.78, p < 0.001) showed that there was a statistically significant relationship between the communities and the time respondents spent in a trip to access preferred water point source after public standpipes were installed (Table 5).

On average, most people spent about 11-20 minutes to access potable water per round trip. This was similar to that of Strand and Walker (2005) on 2600 households in Latin America that found that households spent on average

16 minutes a day to haul water. Despite the proximity of water point sources, it was still not accessible because it is expensive. According to Obriest et al (2007), when any of the principles of access is violated, then the facility is not accessible.

Measures to ensure sustainability of potable water sources

To ensure the continuous supply of potable water to community members, it was imperative to put in place measures that will ensure the sustainability of these water point sources. Sustainability enables the community settlers to have access to quality water in the needed quantities from these water point sources irrespective of their socioeconomic background.

Community members were asked to suggest best measures that should be employed to sustain these water point sources and the result was presented in Table 6. They suggested that structures should be put in place by both stakeholders and institutions to ensure the sustainability of these water point sources. The traditional authorities were the main key stakeholder for the management of water sources in the district with the help of other key stakeholder institutions within the local government system. These stakeholders or institutions include the assembly members, unit committee members, youth leaders, Water and Sanitation Committee (WATSAN) and the Ghana Water Company Limited (GWCL).

Observations revealed that there were frequent mains pipe burst in the various communities especially in Kumawu and this sometimes affect the other nearby communities. Also, there was no community participation with regards to plumbing works, repairing and maintenance. Moreover, the WATSAN committee do not meet regularly. This contradicts the views of Habtamu (2012) that, community participation, technology selection, site selection, demand responsiveness, construction quality, population and training, technical support, community and social satisfaction, institutional and policy, financial management and willingness to sustain the water project are the appropriate measures to sustain a water project (Nkongo, 2009).

On the other hand, it was found that the GWCL has adequate and needed spare parts on stock, qualified technicians and other logistics for repairs and maintenance of pipe-borne system in the district. Well financial structure and controls have been inaugurated for proper accountability. Accessibility to pipe-borne water connection has been increased through promotional activities.

Table 6: Respondents' views on ways to sustain water point sources

Measures	Frequency	Percentage
Seminars and training (education)	4	1
Passing outlaws	10	2.6
Attract water agencies (NGO)	3	0.8
Observing and abiding rules	82	21
Payment of bills	64	16.4
Maintenance	135	34.6
Cleanliness	92	23.6
Total	390	100

More than 34% of the respondents posited that maintenance should be the centre of sustainability. However, the assembly members and traditional authorities were reserved with regards to maintenance of the water point sources especially the public pipe stands since there was weak community participation on the project. One respondent in an interview maintained that;

"They have their own plumbers. I do not know any trained person from this town. After logging complains, we would have to wait for them to come around. The logged problem cannot be attended to unless the Water Works do that. The plumbers in this town are not allowed to attend to issues relating to waterworks since they are not their workers. Even if the pipes burst, we wait for them to attend to them. The local plumbers are not allowed to connect conduits to various homes. I do not know why it is like that. Dealing with the waterworks comes with a higher cost" (Male, 35 years, married with 2 children Assemblyman, Besoro).

Therefore, it was proposed that the Ghana Water Company trained the plumbers in the various communities and assigned specific roles or area of specialisation to the trained local technical men to effectively operate and

maintenance water systems in the various communities. This will promote community participation and involvement to the use and maintenance of the project.

Quite a number of the respondents (23.6%) maintained that these water point sources needed to be kept clean to promote its sustainability. Both the pipe-borne water, and water point sources such as streams and rivers should be cleaned from time to time. One of the assembly members (35 years old, married man with 2 kids) highlighted that;

"I have not seen the dam personally. All they need to do is to protect the dam very well from getting silted. If the dam gets blocked with silt and litre, then the government would have done a "COS 90" work. They have to remove all the blockages from the dam almost every two years. There is a possibility of filling the dam. Hence, they need to make sure these silt and plastic wastes do not choke the dam. Also, looking at how things are going with the pipelines bursting each now and then, a time is coming when all the pipes will not flow at Kumawu to the extent that all the pipelines will be damaged. Hence, changing them may take years to complete". (Assemblyman, Besoro).

Rules regarding proper management of water sources cannot be overlooked. Though the majority of the households were silent on the enactment of laws to govern the use and management of water point sources, the focus was on its adherence by community members. The management of Ghana Water Company Limited in Kumawu buttressed this by saying that:

"People are aware of the rules and regulations governing the protection of our pipeline network. Some people however, build on our pipelines network which is very bad. They always get away with these actions because nobody does anything to stop them. This exerts a lot of pressure on our pipelines causing frequent pipe burst." (Manager of GWCL, Kumawu).

Pipe-borne connection to homes

Most of the respondents (61.3%) do not have pipe borne water connection to their various homes due to high cost of connection, cumbersome procedure and difficulties in connecting to various homes because of the topography or landscape of the area. Among the communities, most of the respondents from Bodomase were connected to pipe-borne water as compared with respondents in Woraso.

Further analysis to understand where household's income had any relationship with pipeborne connection to homes, a Chi-square test of goodness-of-fit was run. The results in Table 7 ($\chi2$ (4, N=390, 20.73, p < 0.001) depicted that there was no statistically significant difference between income status and pipe-borne connection to the home. It was found that most of the respondents who earned Gh¢ 400.00 and more had pipe-borne connection to their homes as compared to respondents who earned below Gh¢100.00. The cost of connection was a bit high, especially among those who were far away from the main lane and hilly areas, making people who earned less than Gh400 less likely to afford it.

Table 7: Distance and to access potable water before and after pipe borne water connection

Distance per trip	N	Mean	Std Dev.	Statistic
Before pipe stand	239	2.45	1.25	t=12.61
After pipe stand	239	1.31	0.64	p<0.001
				df=238

The T-test was employed in analysing the effect of the intervention project (3K project) on access to potable water The result (t(238)= 12.063, p<0.001) showed that there was statistical significant difference between the distance that respondents covered to access potable water before and after the public stand pipes were installed (refer to Table 7). This implied that the people of Sekyere Kumawu District now covered shorter distances to access potable compared to times prior to the installation of public stand pipes. Among the communities, respondents in Kumawu now journeyed a very short distance to access water as compared with other communities. This difference was statistically significant as it was proven by a Chi-square test of goodness-of-fit and the result $\chi2$ (9, N=390, 19.31, p = 0.023). Regardless of the enhanced proximity to pipestands, some people in Woraso still prefer other water point sources such as "Asuo Kumawu" (spring) due to its taste among others. Studies have shown that reducing the distance to water sources significantly improves water access and usage. For instance, a study by Kremer et al.

(2011) found that providing closer access to water sources in Kenya increased water consumption and improved health outcomes. Similarly, research by Cairncross and Valdmanis (2006) noted that shorter distances to water sources directly correlate with better water quality and reduced waterborne diseases.

Conclusions and Recommendations

The people of Sekyere Kumawu District only have access to basic drinking water services due to expensive nature of pipe-borne water system. Among the water point sources such as pipe borne water, sachet/bottled water, river/stream, rainwater and water from mobile water venders, the people of Sekyere Kumawu preferred pipe-borne water for drinking.

Regardless of the hitches and challenges faced by Ghana Water Company Limited, they have been able to improve upon water accessibility in the district. Needed spare parts have been secured, qualified technicians, mobile collection service has been constituted, some springs have been fenced, WATSAN committee has be formed, promotion for pipe borne connection to peoples' various homes have been introduced. However, the Ghana Water Company Limited is understaffed. This caused delays in connection of pipe-borne water, repairs and maintenance of faulty or burst pipes.

The District Assembly should liaise with water and sanitation NGOs and GWCL to finance water projects expansion within the communities, especially areas where there were spatially deficiency in the water point sources or under-coverage and to newly developed areas in a bid to improve accessibility, especially to access safely managed drinking water services.

The PURC should collaborate with GWCL to come out with some kind of subsidy package that will also last long to ease households' burden of connecting to the main lines and also to make standpipes affordable.

The Ghana Water Company Limited should ensure a little community participation by training the local technicians such as plumbers and engineers and specify the kind and area of work they can address in the various communities with regards to the pipe-borne water connection and related issues. This will prevent frequent breakdown of pipe borne water system, reduce the workload of their staffs and technicians and loss of water due to frequent burst among others.

Finally, some structures were put up on the pipe lanes and little attention was given to streams, rivers and springs. The works department of the assembly may partner with the WATSAN, GWCL and Ghana Police to ensure that people adhere to the rules and regulations governing the use and management of pipe borne water.

The Sekyere Kumawu District Assembly should liase with the traditional council and WATSAN to educate and sensitize the households to protect water supply sources such as rivers, strings and streams by managing the available water sheds and reduce the cutting of trees along banks.

Lord Ebo Sampson considered the introduction and literature review
Richard Owusu Aboagye catered for the methodology

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