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WATER AVAILABILITY AND COMMUNITIES' ACCESS FOR DEVELOPMENT: A CASE STUDY OF THE GA EAST MUNICIPAL ASSEMBLY IN THE GREATER ACCRA REGION

BY

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THIS DISSERTATION IS SUBMITTED TO THE INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER), UNIVERSITY OF GHANA IN PARTIAL FULLFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS DEGREE IN DEVELOPMENT STUDIES.

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DECLARATION

I hereby declare that this study is the outcome of my own research under the supervision of Dr. Cynthia Addoquaye Tagoe. With the exception of references made to other people's work, which I have duly acknowledged, I am singularly responsible for all views expressed in this research as well as any shortcomings that may be found in this study.

Sign …… Sign……..

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Date……... Date ……

DEDICATION

I dedicate this work to Almighty Allah, my Father Alhaji Salifu A. Rahman, my mother Mrs. Abiriwa Salifu and my brother Zakari Salifu.

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ABSTRACT

The focus of most interventions in the water sector has been on the provision of water to communities and households. This notwithstanding, quite a number of studies has looked beyond water provision to issues surrounding access, functionality and affordability. This study focuses on these and further considers water availability all-year round and the effects competing economic use of water has on its availability for households all-year round in the Ga East Municipal Assembly. The data used for the analysis was gathered from 120 households, five key informants and three focused group discussions. The results indicate that access to water all-year largely depends on the community a household resides in and the source of water used. Though women dominate the water search process, access has nothing to do with a person's level of education and sex. Interestingly, the results further show that using water for income generation activities has very little effect on water availability for household use. The study recommends that more attention should be focused on the provision of water schemes for communities without reliable access to water, since it has proven useful in addressing household water needs in some parts of Ga East. The assembly should also initiate a process in conjunction with the Municipal Education Office to curtail the increasing involvement of girls of school-going age in searching for water, since it has the tendency of affecting their performance and retention in schools.

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CWSA	-	Community Water and Sanitation Agency
DESSAP	-	District Environmental Sanitation Strategy and Action Plan
GDP	-	Gross Domestic Product
GEMA	-	Ga East Municipal Assembly
GNI	-	Gross National Income
GPRS	-	Growth and Poverty Reduction Strategy
GWCL	-	Ghana Water Company Limited
KVIP	-	Kumasi Ventilated Improved Pit
MDGs	-	Millennium Development Goals
MHMT	-	Municipal Health Management Team
MWRWH	-	Ministry of Water Resources, Works and Housing
MWSMT	-	Municipal Water and Sanitation Management Team
PAWSDB	-	Pantang Area Water and Sanitation Development Board
PURC	-	Public Utilities Regulatory Commission
TBAs	-	Traditional Birth Attendants
UN	-	United Nations
WATSAN	-	Water and Sanitation
WC	-	Water Closet
WSDB	-	Water and Sanitation Development Board
WTP	-	Willingness to Pay
NDPC	-	National Development Planning Commission

CHAPTER ONE

INTRODUCTION

1.0 Introductory Background

According to the UNDP (2006), access to water is a right and a serious daily concern to millions of the world's poor. These people live in perpetual vulnerability, work under life-threatening conditions and are bedevilled with water access challenges that destroy their livelihoods on a high scale. In most instances, water crises situations do not receive the needed global attention as headlines. As compared to less devastating disasters, deprivation of water seems to be tolerated by those with access to the resource or with the technological and political power to mitigate its effects. In many parts of the world, the absence of water has demonstrated that it can hold back human development and contribute to swelling the ranks of the world's poor and vulnerable. Crises that are associated with water even perpetuate insecurity within and among nations. By the end of 2002, about 1.1 billion of the world's population was without access to safe drinking water (UN, 2013).

In the year 2000, global leaders at a summit came out with the eight (8) Millennium Development Goals (MDGs) among which they pledged to halve the proportion of the world's population without access to safe water by the year 2015 (UN, 2004). Despite these efforts and the subsequent declaration of the Millennium Development Goals, Sutton (2008) estimated that Sub-Saharan African will only reach its MDG water target by 2040. Lack of safe and adequate water supply is also responsible for about two million deaths in women and children in developing countries and four percent of global disease burden (WHO/UNICEF, 2008). World over, hardships associated with water and its competing use claim people's lives through diseases, widening inequality (by destroying livelihoods) and is a major cause of migration in certain parts of the globe. This development needs serious attention and well coordinated efforts at both national and international levels to ameliorate the situation.

Concerted and determined efforts in this regard should be aimed at developing water resources into tools that propels development rather than one that divides nations and rob people of their livelihoods (UNDP, 2006).

In Ghana, water resources are either surface sources or groundwater. The National Water Policy (2007) developed by the Ministry of Water Resources, Works and Housing (MWRWH) sees water as a "cross- cutting element" that is strategically linked to the nation's Growth and Poverty Reduction Strategy (GPRS II) and the Millennium Development Goals. Improving water services and access enhances the productive lives of people, reduces water search time for girls in schools, improves women's dignity, creates employment for many and reduces the incidence of morbidity and mortality. However, rapid urbanization, population growth and the emerging down-stream water-related industrialization has made water scarce for its competing developmental uses. Over the past years, the government has invested a lot in the provision of water to communities both for household use and for other industrial and commercial uses. In 2009, figures from the Government of Ghana's 2005 and 2007 annual budgets indicated that the country needs about US$1.5 billion investment in the water sector to be able to meet the nation's water demands by 2020. This follows investments of US$13.1 million, US$96.4 million and US$117.9 million in 2004, 2006 and 2007 respectively (GII, 2009).

Today, access to improved water supply has increased from 56 percent in 1990 to 82 percent in 2008 (urban 90 percent and rural 74 percent) which is above the Millennium Development Goal target of 78 percent (UNICEF/WHO, 2010). An average of 64 percent poor households have access to safe water mainly from boreholes and 96 percent of the rich access clean water mainly from pipes, with many others resorting to unsafe sources like rivers and dams for

other economic activities. Regionally, there are variations ranging from 52 percent in the Western Region to 77 percent in the Upper West Region (NDPC, 2010).

Table 1.1: Proportion of Population with Access to Safe Water in Ghana (%)

Region	**Percentage Covered**	
	Rural	**Urban**
Ashanti	73	39
Brong Ahafo	56	39
Central	57	51
Eastern	59	36
Greater Accra	59	74
Northern	61	68
Upper East	59	41
Upper West	77	10
Volta	63	46
Western	52	60
National	**62**	**58**

Source: NDPC, September 2010

However, water availability and use in communities vary from year to year and the spatial distributions of water resources within the country differ greatly. The per capita water availability is greatly affected by rapid population growth, pollution of river bodies, environmental degradation and climate change among others (GII, 2011). At the community levels, competing interests by different economic uses of water and household consumption make disparities in access at the community level a more complex developmental issue.

However, given the role water plays in the development of down-stream industries and in diversifying livelihoods, it is important to take a critical look at the different needs and concerns of all water users (sachet water vendors, block moulders, farmers, household use among others) and the sustainability of the sources they draw water from.

1.1 Problem Statement

In Ghana, the Ghana Water Company Limited (GWCL) is responsible for the production and distribution of water for all household and non-household uses in the urban centres. With growth in urban population over the past three decades and associated implications, urbanisation has far outstripped the capabilities of the GWCL to cope with increasing demand for water for household use. At 75 percent capacity utilisation, the GWCL is only able to produce 687,949.61 cubic metres a day of the 1,076,526.00 cubic metres daily demand (MWRWH, 2010).

With a population of 259,668, the Ga East Municipality has an intercensal growth rate of 4.2 percent and occupies 96 square kilometres of land. The inhabitants constitute about 82 percent urban/peri-urban population and 18 percent rural population. Residents of the area are engaged in a lot of economic activities like brick moulding, trading and sachet water making, operate washing base, food joints, and quarry and water retail services among others, with farming as their main economic activity.

Over the past two decades, population of the municipality has increased greatly with population growth rate exceeding the national average. The increased population of the area is largely driven by migration and urbanisation. This development does not only move the municipality from a mainly rural to peri-urban and urban, but also makes the responsibility of

providing social services cumbersome and overlapping in most cases (GEMA, 2010). In the area of water provision, the responsibility has shifted drastically from the Community Water and Sanitation Agency (CWSA) in many areas (Including Dome) to the Ghana Water Company Limited (GWCL). This emerging trend in development has created a situation where adjacent communities with similar socio-economic characteristics depend on different duty-bearers for water provision. It is therefore a common place in the Ga East Municipality to have adequate water in one community and incidence of water crises in another community.

Currently, the Municipal Assembly (represented by the Community Water and Sanitation Agency) in conjunction with DANIDA has provided water schemes at Boi, Sesemi and Oyarifa (now under La Nkwantanang-Madina Municipality) that serve large areas of the municipality.

Managed by the Pantang Water and Sanitation Development Board (PAWSDB), the Boi Water Scheme (see picture 1 and 2 in appendix 4) was commissioned in March 2006 and currently serves 10 communities through household piped-in and community stand pipes. The facility has a reservoir storage capacity of 200 cubic metres and deploys water to households using the gravity technology. Household connections are metered and billed on monthly basis whilst services are rendered on pay-as-you fetch basis at community stand pipes. The Sesemi Scheme serves about eight (8) communities and is powered by both solar and electric powered pumps (see picture 3 in appendix 4). Parts of Abokobi, Pantang, Teiman and surroundings are served by the Oyarifa Scheme. Majority of communities like Dome, Taifa, Agbogba, Kwabenya, Ashongman among others have limited or no piped connections and are served by water tankers at commercial rates and a few hand dug wells, ponds and some

boreholes. Water supply in these tanker-serving communities is unreliable, unsafe for drinking and characterised by high prices in many instances. This phenomenon of high tanker prices makes water inaccessible to majority of the urban poor and for other less competitive but important economic activities. In areas with water schemes, there is mounting pressure from households lying beyond the schemes' catchment areas to have it extended to them and for other commercial users like sachet water producers. These increasing tensions for water availability and use by community members stifle livelihoods (worsening poverty) and breeds tension among water users and communities. Other economic activities like washing base and brick moulding source water from rivers, well and dams that are not reliable all-year round (GEMA, 2010).

Moreover, the unavailability of potable water is seen in the increased incidence of water-related diseases within the municipality between 2011 and 2013. Statistics from the Municipal Health Directorate Mid-term Report (2013) indicate that diarrhoea incidence at the Out Patient Department (OPD) increased from 995 cases (5th most reported case) in 2011 to 1,739 cases (4th most reported case) in 2013. According to the Ghana Statistical Service (GSS), dehydration caused by severe diarrhoea is a major cause of morbidity and mortality among young children in Ghana. Exposure to diarrhoea-causing agents is frequently related to use of contaminated water and unhygienic practices related to food preparation, hand-washing and excreta disposal (GDHS, 2003). Frequent outbreaks of cholera in the municipality are also of great concern with sporadic cases been recorded in other parts of the municipality.

The hardships that accompany the inadequate water supply to households worsen the plight of vulnerable groups who can neither afford private tanker services nor adequately cater for their medical bills. In sickness, the affected community member and household do not only lose labour in man-days but also lose their meagre savings in treating the sick. During the dry season, water from the wells, ponds and community boreholes serving other economic activities and watering of farms dry up. This phenomenon limits the utilization of the full potential of businesses and farmlands, limiting income generation by the poor in most parts of the year.

In areas served by water tankers, community members do not only lose income through high tariffs but are also exposed to serious health dangers from contamination of the water they drink. Tankers serving water to these households are usually rusty, dirty and the water is contaminated by dirty water they might have carried earlier. Their services are sometimes unreliable. In the long run, these developments reduce incomes of community members within the municipality and put a lot of stress on national budgets and health facilities. Other household members also spend productive time searching for water and taking care of sick members of their families. At the same time, these people lose their livelihoods to the unavailability of water and in most cases are competed out in the water use chain. For the purpose of this study, focus was on Boi, Abokobi and Dome communities. The attempt to research into water access and availability all-year round in these communities gives rise to the following research question;

i. What are the sources and characteristics of water available for households' use?
ii. To what extent is water from these sources accessed by household members and what use is the water put to?

iii. What are the challenges involved in accessing water from these sources and in what ways can access be improved?

iv. What is the effect(s) of water use for livelihood activities on availability for households' use all-year round?

1.2 Research Objectives

The study generally sought to investigate issues around households' access to water in the Ga East Municipality. Further, it also examines the effect(s) of using water for livelihood activities has on households' access all-year round. Specifically, the study objectives are:

1. To identify sources of water and examine the characteristics of these sources available for households' use
2. To assess the extent to which household members are able to access water from these sources
3. To examine the functionality and reliability of these identified water sources in the communities
4. To assess the effect of water use as source of livelihood on water availability for household use

1.3 Research Hypothesis

H_0: The use of water as source of livelihood has no effect on water availability for households' use all-year round

H_A: The use of water as source of livelihood has an effect on water availability for households' use all-year round

1.4 Significance of the Study

This study is very important and will serve as an appraisal to the existing community water schemes within the Ga East Municipality. Results from the study will put managers of the scheme in an informed position to determine the impact of the water schemes in providing water for development and as to whether to expand it to neighbouring communities or not. The findings will further boost confidence of duty bearers to take definite decision on replicating or otherwise of the water scheme in other under served or non-beneficiary communities.

Further, the study sought to reveal other competing interest and livelihoods that are water-dependent and the extent to which those interests impact on water availability for household's use. By the end of the study, the effects of using water as a source of livelihood and its impact on household's access will be examined. This will provide a basis for more effective evaluation of competing interests in water use and allow policy makers and other stakeholders to fashion out modalities to satisfy all other categories of water users without compromising household's access.

The study will further add to the myriad of research works on water and development. More insight will be given to the various water delivery and access points available to community members and other water users. This will help identify and tailor appropriate water delivery options to specific user groups to achieve efficiency in the water delivery process so as to attain universal access.

1.5 Organization of the Study

The study is organized into five chapters. Chapter One discusses the background of the study, the statement of the research problem, research questions and objectives and the organisation

of the study. Chapter Two captures the review of relevant available literature on the topic under discussion. It also considers issues of water resources, water availability, potable water sources and water use and draws examples from other jurisdictions. The chapter concludes with a conceptual framework that explains and establishes relationships between variables of the study. Chapter Three elaborates in detail the research methodology employed for the study. The research design, sources of data, sample size and sampling procedures are all captured here. It also presents the profile of the study area with emphasis on the source of water and the distribution of the water points. Chapter Four looks at the empirical findings, results and analysis of the data collected based on the research questions and objectives. Chapter Five summarizes the major findings and draws conclusions based on the results. It also captures appropriate recommendations for the consideration of policy makers and other stakeholders in the water sector.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant literature that is pertinent to this study. The chapter looks at the general overview of water supply systems, water resources of Ghana, sources of water supply, definition of household access to water, seasonal variation in water supply, water availability and livelihoods. The chapter also covers institutional and legal framework of the water sector in Ghana as well as the conceptual framework of the study for further examination of variables.

2.1 General Overview of Water Supply System

According to the UN (2008), water use has grown at more than twice the rate of the population for the past century. Although there is not yet a global water shortage, about 2.8 billion people representing more than 40 percent of the world's population live in river basins with some form of water scarcity. More than 1.2 billion of them live under conditions of physical water scarcity which occurs when more than 75 percent of the river flows reduce or dry-up. Northern Africa and Western Asia are seriously compromised, as are some regions within large countries such as China and India. Symptoms include environmental degradation and competition for water. Another 1.6 billion people live in areas of economic water scarcity, where human, institutional and financial capital limit access to water even though water in nature is available locally to meet human demands. These conditions are prevalent in most countries in Southern Asia and Sub-Saharan Africa. Symptoms include lack of or underdeveloped water infrastructure, high vulnerability to short and long-term drought, and difficulty in accessing reliable water supplies, especially for rural people.

UNESCO (2006) asserts that, water is the source of life and it is critical for the sustenance of human life. Every person needs 20 to 50 litres of potable water a day for their basic needs such as drinking, cooking and cleaning, but more than one in six people do not have access to such an amount of potable water. Africa is endowed with abundant water resources but generally lack adequate supply. Africa has the lowest total water coverage than any region in the world, with only 62 percent of the population having access to improved water supply. Progress has been good on increasing access to improved drinking water and the global target of access to potable water is likely to be surpassed by 2015 (UNESCO, 2006). However, rural areas are lagging behind and more than one in ten people may still not have full access to safe drinking water by the end of 2015. In other parts of the world such as East and South-East Asia, they have already achieved the target with varying progress. Sub-Saharan Africa remains far behind with only 60 percent coverage in 2008 despite having almost doubled the number of people using an improved water source between 1990 and 2008 (WHO, 2009).

2.2 Water Resources of Ghana

According to the National Water Policy (2007), Ghana water resource potential can be categorised into surface and ground water sources. Surface water sources come from three main river systems that drain Ghana; the Volta, South Western and Coastal water systems. The Volta covers 70 percent of surface water resources and is made up of the Red, Black and White Volta Rivers and the River Oti. The South Western water system holds 22 percent of Ghana's surface water sources and is made up of the Bia, Tano, Ankobra and River Pra. The Coastal System covers eight percent of Ghana's surface and extends from the Densu to the Ochi-Nakwa and Ochi-Amissah River Systems.

Other water sources include rainwater harvesting which has a great potential throughout the country. Though rains decrease from 2,000 millimetres per year in the south-west to an average of 950 millimetres of rain per year in the northern parts of the country and 800 millimetres per year in the south-east, rainwater harvesting still remain a viable option in Ghana. With sustainable technology, rainwater harvesting has the potential of catering for a majority of household and institutional needs in Ghana, and reducing the burden on the country's pipe-borne system and other water resources (NWP, 2007). Of great potential to the water resource base of the country are runoffs and groundwater resource. Ghana records a total annual runoff of 56.4 billion cubic metres of water with the Volta River accounting for about 41.6 cubic metres. These runoffs are characterized by disparities between the wet and dry seasons, with the Volta, South-Western and Coastal systems contributing 65 percent, 29 percent and six percent respectively. Ghana's underlying geological formations undermine aquifer formation and recharge. There are also saline deposits along the shallow coastal zones and insufficient borehole yields in the Northern, Upper East and West Regions and some parts of the Brong Ahafo Region (Ministry of Water Resources, Works and Housing, 2007).

Ghana is endowed with numerous water resources, yet water demand far outstrip supply just as is the case in most parts of Sub-Saharan Africa. Karikari (2000) noted that the main sources of water for households are pipe-borne water supply (treated sources) and untreated water from boreholes (ground water sources), shallow boreholes, wells, and ponds, springs, lakes, rivers and streams.

2.3 Institutional and Legislative Framework of the Water Sector in Ghana

2.3.1 Ministry of Local Government and Rural Development

The Local Government Act, 462 (1993) establishes the local governance structure represented by the functions of the metropolitan, municipal and district assemblies to set up departments such as Environmental Health and Sanitation, Waste Management and Works Department to see to proper sanitation, hygiene and orderliness within the environment.

The Water Directorate of the Ministry of Water Resources, Works and Housing (MWRWH) serves as the focal point for coordination of drinking water supply and water related sanitation. It is responsible for policy harmonization, sector-wide monitoring and evaluation of the Growth and Poverty Reduction Strategy outcomes and the Millennium Development Goals targets as well as coordination of foreign assistance to the water sector in Ghana (MWRWH, 2007).

2.3.2 The Community Water and Sanitation Agency (CWSA)

The Community Water and Sanitation Agency (CWSA) Act 564 (1998) established the Community Water and Sanitation Agency to facilitate the provision of safe and related sanitation services to rural communities and small towns. The CWSA is expected to mobilise resources through projects and programmes to support the provision and management of safe water and sanitation services through the metropolitan, municipal and district assemblies and working with public and private sector organizations. The Act stipulates that the Ministry of Water Resources Works and Housing (MWRWH) may give Community Water and Sanitation Agency (CWSA) policy directives that appear to be in the interest of the general public.

2.3.3 The Water Resources Commission (WRC)

Act 552 (1996) created the Water Resources Commission with the mandate to regulate and manage Ghana's water resources through granting of water rights and water use permits and the coordination of government policies in relation to the use of the nation's water resources. The Act stipulates that the ownership and control of all water resources are vested in the president on behalf of the people.

2.3.4 The Public Utilities Regulatory Commission (PURC)

The Public Utilities Regulatory Commission (PURC) was established by the PURC Act 538 (1997) as an independent organisation to regulate and oversee the provision of utility services by public utilities to consumers. Their mandate is to check the quality of utilities (including water) provided to consumers, promote fair competition, examine and approve utility tariffs and protect the interest of the consumers and providers. The PURC can also act on public complaints that are not before the court. In the water sector, the PURC only looks at the urban water sector managed by the Ghana Water Company Limited (GWCL).

2.3.5 Environmental Protection Agency (EPA)

The Environmental Protection Agency Act 490 of 1990 established the Environmental Protection Agency (EPA) as the main environmental regulatory body in Ghana. For all water resources and supply in Ghana, the EPA is to ensure that the operations and activities of human beings and industries do not cause harm to the environment and all water resources. The Environmental Protection Agency also initiates actions that are geared towards conserving water, by providing guidelines for all projects and assessing their impact on the environment. This is captured in a form of laid-down procedures and processes in the entire project planning and execution phases.

2.3.6 The Conversion to Companies Act

The Statutory Corporations Act 461 (1993) served the purpose of converting some 51 state corporations into companies. This Act saw the conversion of the Ghana Water and Sewerage Corporation (GWSC) to Ghana Water Company Limited (GWCL). This conversion process made the GWCL a limited liability company solely responsible for urban water supply in Ghana (GWCL Act 461, 1999).

2.3.7 Water Use Regulations (2001)

In the year 2001, the Water Resources Commission established the water use regulations to provide procedures for allocating permits for all consumptive and non-consumptive water uses across all sectors of the Ghanaian economy. It stipulates that applications have to be made to the Water Resources Commission and involves payment of appropriate fees. These regulations provide backing for the Water Resources Commission (WRC) on the protection and use of Ghana's water resources. It further stipulates the procedure for allocating water resources for productive uses and appropriate fees levied for the use of the resource. This makes it possible for all water bodies to be protected and their full potentials harnessed to satisfy the water needs of Ghanaians now and in the future (WRC, 2001).

2.3.8 Ghana Standards for Drinking Water

The Ghana Standards for Drinking Water (1998) were adopted from the World Health Organization's (WHO) guidelines for drinking water quality from 1993 and less stringent in several indicators including turbidity and pH in reflection of the situation in Ghana. The guidelines indicate the required physical, chemical and microbial and radiological properties of drinking water.

2.3.9 Monitoring Drinking Water Quality

The Ghana Standards Board (GSB) has established drinking water quality standards. The Standards Decrees 1967 and 1973 of the National Redemption Council Decrees (NRCD) 173

and 199 respectively, empower the Ghana Standards Board to set standards for drinking water quality among others. For community water supply, the enforcement and monitoring is the responsibility of the district assembly, whilst the Public Utilities Regulatory Service supervises quality and tariffs in the urban areas (Nyarko et al, 2008).

2.4 Sources of Water Supply

2.4.1 Urban Water Sources

The Ghana Water Company Limited (established in 1999) is responsible for the planning, financing, construction, rehabilitation and management of all urban water supplies in 82 urban water supply systems and offices in 26 cities across Ghana. Drawing water from lakes and river, the GWCL treats water from these sources with dosing of chemicals for coagulation and chlorine for disinfection before supplying it through their built systems. The urban water supply system in Ghana includes household connections, yard taps and vendor-operated public standpipes (operated on pay-as-you fetch basis). About 43 percent of all urban household connections are not metered, and the urban poor are mainly served through local vendors-operated stand pipes with polythene surface or concrete ground tanks and water tankers. Most of the tankers are secondary providers, as they buy piped water from the GWCL and then sell to its consumers in the urban areas. The price at which they sell to their consumers is not regulated, as the PURC have already regulated the price at which they buy water from the GWCL (GII, 2011). In recent times, Sachet Water Producers (SWP) play a major role in serving drinking water to the general public. These are mostly small private companies that are packing water in small bags for consumption, and selling it partly through wholesale and retail outlets to consumers.

Water tariffs in urban areas are regulated by the PURC by taking into account consumer interest, investor interest, costs of production and financial integrity of the utility. The PURC makes a clear distinction between household tariffs and commercial tariffs, with the water tanker vendors falling under commercial tariffs, thus, increasing the cost at which urban poor buy from the tanker operators (PURC, 2005).

According to Karikari (2000), urban communities in Ghana take a large share of their water supply from rivers, dams and diversions structures which need to be treated to meet health standards. Surface water resources can probably serve all urban needs for the near future through corresponding programmes of development and conservation. Private individuals who can afford rely much on ground water supplies through either hand-dug wells (with or without pumps) or boreholes fitted with pumps.

2.4.2 Rural Water Sources

In developing countries, especially in the rural areas, community members and water users are responsible for collecting water for their own use. Most rural communities in Ghana have traditionally relied on surface and ground water sources for their water supply needs and some have a combination of protected and unprotected sources. According to Gyau-Boakye (2001), as cited in Sutton (2008), surface water sources used by these communities include dug-wells, ponds, dugouts, impoundments from dams, ephemeral streams and rainwater harvesting from roofs whilst groundwater supplies are obtained from hand-dug well with or without pumps, boreholes fitted with hand pumps, and springs.

According to Gyau-Boakye and Dapaa-Siakwan (1999), rural communities in Ghana can be categorised into two main groups; those that have benefitted from official water supply

schemes and those that have not. Even for those rural communities which have benefitted, there is sometimes the problem of reliability of the existing system. This problem sometimes compels beneficiary communities to return to their traditional sources of water supply much in the same way as those which never benefitted at all. These traditional systems are often insufficient both in quality and in quantity. Karikari (2000) indicates that the quality of groundwater in Ghana is usually good and accounts for the large share of the potable water supply in rural communities, except in some few areas where the water contains iron, manganese and fluoride deposits.

2.5 Access to Water

The definition of *"access"* to water has been a challenged position and will be in the years to come because of the increasing international priority on community development. World Health Organisation (1981), as cited in Cairncross and Cliff (1987), attempted to provide an earlier official definition to *"access to water"*. It proposed metrics to measure progress towards improving health for all citizens by 2000. The organisation suggested as a useful indicator the presence of a "safe and adequate" water source within a walking time, though no specific walking time thresholds were recommended. This emphasis on collecting water was supported by a case study from Mozambique (Cairncross and Cliff, 1987), which found out that, following the construction of a new water system in one village and a subsequent reduction in collection time from five hours to 10 minutes, water consumption in the village increased by a factor of 2.7 and incidence of trachoma dropped to half compared to that of the neighbouring communities.

Gadgil (1998) described nine different standards of measuring access to water adopted by various developing nations during the 1990s. Some measured walking time between

households and water sources (with access ranging between 5 to 30 minutes, each way), while others measured the linear distance (ranging from 50m to 2km, each way) between the two points. International institutions attempted to standardize the indicator, though their own was problematic. One early effort measured population with access to safe drinking water as the proportion of the population with access to an improved water source in a dwelling or located within a convenient distance from the user's dwelling. While "convenient distance" was defined for urban areas as not more than 200 metres, in rural areas it was simply described as the distance such that the people didn't need to spend "a proportionate part of the day fetching water" (Cairncross, 1990, p.12). The roots of the one kilometre definition of access to water was adopted by WHO and the United Nations Development Programme (UNDP) in the 1980s, and is now used to measure progress on the MDGs for access to water.

Another critique specific to access to safe water target of the MDGs was from the perspective of a national level case study in Kazakhstan. With regards to the definition of access itself, O'Hara et al (2008) argued that, distance between the water source and the household must not be looked at absolutely. Any good analysis of distance in relation to water access must consider the prevailing weather and life threatening circumstances along the water search route. O'Hara et al (2008) reinstated this point as follows:

> "*The emphasis on distance to source is an issue and there is a need to re-evaluate its use. Clearly, no one should have to travel far for their water, but while a supply 1,000 m away may not be a major issue for people in some parts of the world, for people living in areas where the climate is extreme, for example very cold and inhospitable, or where the terrain is difficult, going 1,000 m could be life threatening. As such, the maximum distance to source needs to reflect the physical conditions of a given region or country" (O'Hara et al, 2008; p.20).*

Simpson (2006) made a fundamental point on access to water that "local geography matters hugely, identical distance from water points can mean very different things in practical terms if there are, say, extreme climatic conditions or dangerous social conditions. He further argued that, distance does not measure factors as queuing time which depends on population density. Measuring a mere distance or time does not adequately describe whether or not there exist the conditions necessary for that individual to collect a sufficient quantity of water at a minimal cost of human energy.

On the demand side, the economic literature focuses on the valuation by households of different water sources and the analysis of determinants of water demand. Several studies conducted in developing countries over the past ten years have tried to evaluate the willingness to pay (WTP) for improved water supply (Whittington et al. 1991; Briscoe et al. 1990; World Bank Water Demand Research Team 1993). The empirical results of all these studies showed that more educated households were willing to pay more for improved water supplies. One of the possible reasons for this finding is that educated people could be more knowledgeable about the potential health problems associated with the consumption of unimproved water and for that reason; they were more aware of the health issues and therefore more likely to use the improved source.

Sandiford et al. (1990) investigated the factors affecting domestic water use in rural areas in Nicaragua. According to their findings, a decrease in the distance to the water source was associated with an increase in per capita water consumption. Similarly, families where the mother spent more years of schooling used more water than families where the mother had no

formal education. The same difference in the father's schooling was associated with greater per capita water consumption.

Similarly, Asante et al. (2002) analyzed the access to different types of drinking water sources and the choice among sources for households in the Volta Basin in Ghana. Their study found that between 25 to 75 percent of households in the region use improved water sources. However, due to lack of data, their analysis did not consider costs incurred by households using improved water sources, a possible omitted variable bias in their analysis. Indeed, the demand theory states that, as the price of a good increase, the demand for that good will decrease, ceteris paribus (Froukh 2001). Therefore, in this study, it was expected that price would negatively influence households' demand and access to water all-year round. In support of this assertion, Raje et al. (2002) and Snowball et al. (2007) demand curve for water was downward slopping. According to their research, household monthly water bill had a negative relationship with WTP for water service improvements.

Stefanie et al. (2005) examined access to, use and participation in decisions on improved water supply in the Volta basin of Ghana. The results indicated that probability of using the improved source decreases with price and increases with income. Although insignificant, larger households were less likely to use improved water sources in communities charging prices per bucket. For communities charging a per-bucket price, education had a significant positive effect. In the same vein, households that were headed by women were significantly more likely to use the improved source. According to the results, supply characteristics such as the location and pricing system were identified to have an effect on households' decisions to use the improved source. The study further revealed that opportunity cost also matters in

the sense that the further the distance from the water source as compared to the distance from the improved source, the more likely the household uses the improved source. In support of the findings for Stefanie et al. (2005), Gazzinelli et al. (1998) also noted that there is an opportunity cost of time used for fetching water. According to these authors, the farther away a source is located from the house and the longer one must queue, the less water from that source will be used. Thus, according to Gazzinelli et al. (1998), the time for fetching water is negatively related to the quantity of water use.

Arouna and Dabbert (2009) carried out a study on the determinants of domestic water use by rural households without access to private improved water sources in Benin. According to the findings, time required for fetching water negatively affected water demand. In addition, water demand from purchased sources was found to be price inelastic among the wealthier households. In support of these findings Sandiford et al. (1990) showed a positive relation between wealth and water use. In this research it was assumed that poverty negatively affects water use because poor people cook less and often have less clothing to wash. Also Arouna and Dabbert (2009) found village population having a negative sign and was significant for free and purchased water at the 10 percent and 5 percent levels, respectively. This shows that people in villages with more inhabitants consume less improved water. In the same study, Arouna and Dabbert (2009) found out that household size positively affects both free and purchased water demand. Moreover, the variable ratio of children to adults had a negative sign. This seems to show that a child uses less water than an adult. Last but not least, water price was negatively related to water consumption for households that use purchased water and those that use both free and purchased water. Nevertheless, the coefficient of this variable was not significant.

Occupation of household head has also been shown to be one of the significant determinants of the amount of domestic water use (Acharya and Barbier 2002 as cited in Arouna and Dabbert 2009). Thus in this study, it was hypothesized that households in paid employment and self-employment will be more likely to opt for non free water sources while those in unpaid family work will be more likely to opt for free water source. This is based on the demand theory which states that, as the price of a good increases, the demand for that good will, ceteris paribus, decrease (example, Zekri and Dinar 2003; Froukh 2001). Indeed, Pattanayak et al. 2006 (as cited by Kanyoka, 2008) results of the linear regression model to assess the determinants of water demand showed that poverty and costs of water as the main significant factors which affect the demand for water among households. Therefore, it is expected that unpaid family work will negatively influence the demand for paid water sources and overall access due to lack of adequate sources of income.

In relation to household location and choice of water sources, Stefanie et al.'s (2005) research in Ghana found household location as one of the supply characteristics that significantly explained differences in the use of water. According to Stefanie (2005), supply characteristics such as the location affect household decisions to use the improved water sources. In support of Pattanayak et al.2006 (as cited by Kanyoka, 2008) conducted a study to determine households' WTP for improved water services offered by the private sector in South West Sri Lanka using a contingent valuation to solicit for data on households' socio economic factors. A multiple linear regression model was used to assess the determinants of water demand. Household location was one of factors which significantly affected water demand, household access to alternative water source and households' perceptions of current water services.

Arouna and Dabbert (2009) contend that in an area where people rely mainly on public water sources (either free or purchased), per capita water use will decrease as the population increases. Furthermore, people can only collect a fixed quantity of water in order to allow everybody to have at least a small quantity of water. In a large population, a household member may have to queue several times before obtaining the desired quantity.

2.6 Seasonal variations and Access to Water

Over one billion people lack access to clean safe water worldwide and in Sub-Saharan Africa alone, up to 300 million people have no access to safe water supplies. If safe water sources are located far apart from dwelling places, the health and livelihoods of families can be severely affected (Bresline, 2007). Groundwater includes all the water found beneath the earth's surface in a saturated zone of the aquifer. Groundwater can be abstracted by means of hand-dug wells and boreholes at various depths. A large percentage of the world's population depends on groundwater as their main source of drinking water. This is because it is accessible anywhere, less capital intensive to develop and maintain, less susceptible to pollution and seasonal fluctuations and of natural good quality (Bresline, 2007; Habila, 2005).

2.7 Development, Water and Livelihoods

According to Todaro and Smith (2012), the term development is perceived differently by different groups of people. Traditionally, development has been associated with achieving sustained growth rates that exceeds a nation's population growth rate. Proponents of this definition of development have over the years, concentrated on economic growth rates, gross national income (GNI), and gross domestic product (GDP) among others.

Scholars like Amartya Sen viewed development in terms of an individual's capability to function in society. In his view, development is not growth in itself, but the ability of people within a state to make rational choices (including use of resources) in the pursuit of their goals in a healthy environment. Sen argued that, increased incomes are only necessary in widening the capabilities or choices of the individual (Todaro and Smith, 2012). Amanor (2013) sees development as a set of doctrines and theories premised on targeted interventions to be implemented to enhance societal improvement and wellbeing.

As cited in Edward (2003), the World Commission on Environment and Development looked at development on sustainable basis. They defined sustainable development as processes of improving life that meet the needs of the present generation and at the same time will not compromise future generation's ability to meet their own needs.

Inferring from the above arguments, development hovers around livelihoods (sustained income sources), choices, happiness and freedom from harm. For the purpose of this study, development is looked at from the point of livelihood options that water presents to households and to what extent it affects households' ability to access water.

2.8 The Conceptual Framework

The conceptual framework for this analysis helps us understand the arrangements of inputs and resources that shape water distribution and management and how it impacts on the poor, either positively or negatively. This framework is adapted from the work of Franks and Cleaver (2008) in which emphasis is on allocative and authoritative resources and how they reform human and social relations and water delivery. It also includes fundamentals of sustainable livelihood approaches and how people use resources to shape their livelihood

options. The framework depicts multi-dimensional constraints in social mobility and the lack of association and voice that make the poor incapable of accessing water in adequate quantities.

The framework is built on a number of key concepts: resources, actors, mechanisms, practices and outcomes. For the purposes of this framework, these concepts are defined as;

- Resources: They refer to the collection of materials from which human interaction and social institutions are built.
- Actors: These refer to people, groups and the state who use resources differently to construct a particular context-specific arrangements for water access.
- Mechanisms: These refer to the peculiar and specific ways and constructions of the various stakeholders in the water management process. Each actor believes in their construction as the surest way of ensuring good water governance.
- Practices: These refer to the activities that go on at each interface of the framework. Issues on the table at each time shape the thinking of actors who intend shape resources, mechanisms and outcomes of water governance decisions.
- Outcomes: These refer to the products that directly results from the interaction between the actors, mechanisms and the laid down processes that shape water access and availability to the poor and the ecosystems. These outcomes also determine the long term changes in water delivery and trends over time.

2.8.1 Resources

Resources on which water governance are constructed are both material or allocative (water sources, systems, pipe lines, pumps, boreholes and so on) and non-material social systems or authoritative (relationship between the people, social organizations over time and space, norms, practices and so on). These specifications are underpinned by the theory of structuration which holds that resources are the medium through which power is exercised.

However, the power to act offered by allocative resources is constrained by social structures. Community practices, norms and inequalities patterning to relation by virtue of class, gender, and ethnicity and so on, better place some individuals to deploy resources, shape rules and to exercise power than others. The idea of resources therefore implies social dynamics, natural features, power relations and all the processes and networks it is built on.

The framework recommends a number of resources: institutional resources, social resources, resources of rights and entitlements, human capacities, the natural environment and technology.

2.8.2 Actors

Actors refer to the individuals and actors who shape and are shaped by the resources, mechanisms and outcomes, through a range of gender-specific processes. Their interactions can be seen at all levels of the framework and are needed to turn idle resources into useful outcomes. Actors are motivated by three levels of consciousness; the unconscious (the underlying psychological and emotional motivators) 'practical' consciousness (habit, routine and the right way of doings things) and 'discursive consciousness' (where individuals reflect upon and explain their actions). The idea of agency is not an individual's act, but a flow of recursive activities or actions on daily basis that produces both intended and unintended outcomes and consequences (Franks and Cleaver, 2008).

2.8.3 Mechanisms

Various actors (individuals, groups and states) in the water system explore societal resources differently to construct arrangement that influences households and community's access to water. The focus here is on mediators of access ranging from formalised institutions, socially-embedded norms and practices of water use and appropriate technologies (hand pumps, pipes

and so on). Some mechanisms may overlap, for example, a particular technology may be associated with a specific institutional arrangement (Franks and Cleaver, 2008).

Mechanisms are not just fixed but are social arrangements that can be negotiated and have some influence on who gets water in the community. In water access negotiations, key outcomes are shaped by social resources including families, kinship groups or located gendered relations. Mechanisms drawing on the resources of rights and empowerment include legislated minimum quantities of water, local property rights and quotas for representation in governance bodies as well as socially understood entitlements of citizens in communities to claim access to water. While many of the mechanisms (such as rights and quotas) may appear to be fixed and defined, in practice most of them are malleable and negotiable, changing over time in response to changing conditions (Franks and Cleaver, 2008).

2.8.4 Practices

Practices consider the series of management issues through which water resources are transformed into accessible outcomes by specific mechanisms to improve water access for communities and households. This involves conscious and unconscious activities that include negotiations, allocation of resources, decision making and deliberate steps taken to produce changes in the existing status quo of water access and governance.

2.8.5 Outcomes

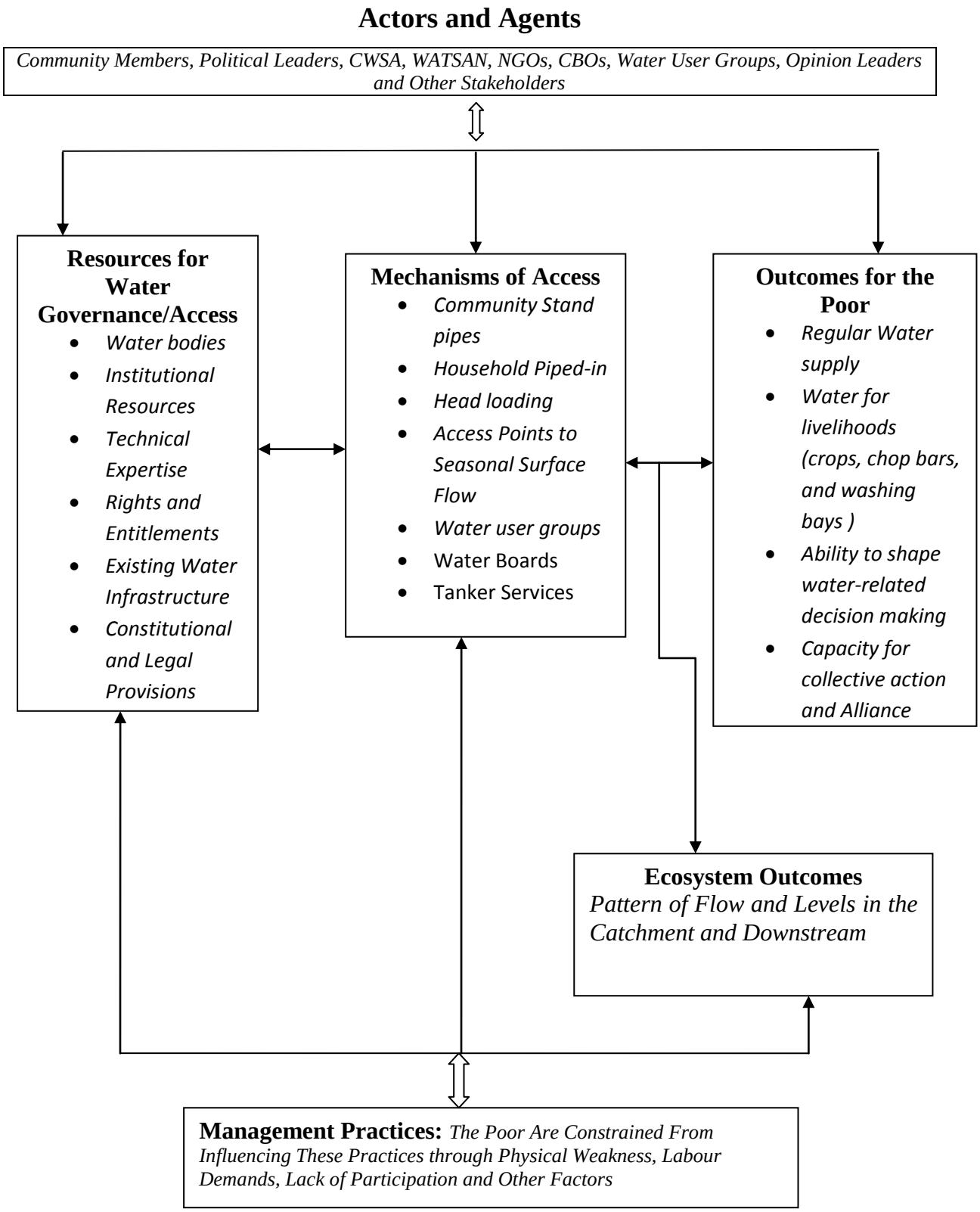
These are the results borne out of the interactions between various actors and mechanisms in an attempt to improve water access. Outcomes cover basic access and livelihoods, and the poor's utilization of water for supplementary income streams. Outcomes can be seen in terms of social relations (example in instances of inclusion and exclusion) and in changes in the structure of power relations and influence (example the poor gaining voice).

Outcomes are given priority because of the correlation between access to water, participation in governance and poverty (UN, 2005). The Millennium Development Goals have specified key gender goals that remain largely unattainable to date. Finally, most recent writings on water governance and access are gender blind.

The framework also reflects on ecosystem outcomes as they are crucial for other living organisms to multiply. These ecosystem outcomes may become apparent in a number of ways, from dramatic and immediate impacts on levels, flows and volumes, to subtle and long-term changes which are hardly detectable on a day-to-day basis but which may nevertheless have profound effects on the way poor people live their lives.

This is illustrated in Figure 2.1:

Figure 2.1: Conceptual Framework



Source: Adapted from Franks and Cleaver (2008).

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter explains the research techniques that were employed in collecting and analysing data and the study area. The chapter is divided into two broad sections. The first section discusses the research design, sources of data, sample size and sampling procedure, data collection techniques and ethical considerations. The second section provides a profile of the study area focusing on the socioeconomic services, access to water and the community's development activities that are directly dependent on water.

3.1 Research Design

Within the scope of this study, the research employed both quantitative and qualitative methods in its approach. Data was systematically collected from the field using closed-ended questionnaires to capture respondents' views on water availability and household access. Open-ended questions and interview guides were also used to collect and record respondents' unique experiences, challenges and the way forward. Data from the study area was generally collected using mainly the survey approach. Focused group discussions, key informant interviews and observations were also used to collect qualitative data from water user groups and also assess the state and conditions of water infrastructure in the municipality.

3.2 Sources of Data

The study used both primary and secondary data throughout the research. The primary data was collected using structured questionnaires, focused group discussions and interview guides. The primary sources of data consist of household members responsible for fetching

water, water user groups and community leaders in the three communities. Key informants within the study area were also interviewed.

Secondary sources of data were obtained mainly from bulletins, journals, working papers, published and unpublished works and reports from government institutions. Many other relevant and related literatures were obtained from the internet, journals and other sources. The secondary sources of data were mainly used in the literature review. All secondary sources are duly referenced.

3.3 Sample Size and Sampling Procedure

3.3.1 Sample Size

After the creation of Medina Municipality, the Ga-East Municipality was left with 21 communities. The list of names and population of all the communities in the municipality was obtained from the municipal assembly. Based on population, the communities were divided into two frames; urban and rural (urban gets water from the GWCL and the rural gets water from the CWSA). The urban frame had 9 communities and the rural frame had 12 communities (GEMA, 2010). The sampling was done in two stages; first for urban communities and second for rural communities.

The researcher decided to use a sample size of 120 households, five key informants and three focused group discussions in three communities due to time and financial constraints. The 120 was proportionately divided among the three communities thus, each of the stratum (communities) was allocated 40.

At the first stage, Boi and Oyarifa-Abokobi communities were purposively selected since they had existing water schemes. They represented the communities from which rural respondents were selected from. On the list of urban communities, Dome was randomly selected without replacement.

The average household size for the district (as it appeared in the district profile) was 3.8. Out of the total of 47,709 population in Dome, the estimated number of household was approximately 12,555 (i.e. 47,709/3.8=12,555). Out of the total 10,451 households, 40 households (which is the proportion allocated to Dome) were selected using systematic sampling technique. The systematic sampling procedure involved first, dividing 12,555 by 40 (12,555/40) = 313.875≈314 which is the selection ratio. This was added systematically to a randomly selected starting point. The selected number for the selection was 10. The selection ratio of 314 was added continuously until all the 40 households were fully selected.

The same process was repeated for both Boi and Abokobi with populations of 807 and 1,764 respectively.

According to the 2010 Population and Housing Census, the Ga East Municipality has a population of 198,220 inhabitants with an intercensal growth rate of 4.2 percent. The projected population for the year 2013 is 244,226, largely influenced by migration. The population is composed of 51 percent males and 49 percent females, with an average household size of 3.8 persons. The area is mainly an urban/peri-urban settlement (82%) while the remaining 18 percent dwell in rural areas towards the Akwapim Hills. The 2013 projected population of the study communities are; Dome (47,709), Abokobi (1,764) and Boi (807).

A total of one hundred and twenty (120) households, five key informants and three focused group discussions were held. Of the key informants, two Water Board Managers (from Boi and Abokobi), one assemblyman from Dome, one CWSA officer and one Municipal Water and Sanitation Management Team member were interviewed.

Forty (40) households connected to the water systems in Boi and Abokobi were randomly selected. In Dome where there is no water system, the 40 respondent households were selected as a control group. In all three communities, persons responsible for fetching water at the household level were selected and interviewed. Water Board managers of the two Water schemes serving Boi, and Abokobi were interviewed using interview guides. The assembly member of Dome was also interviewed since there is no water system in the community as at the time of this research. The managers and assembly member provided key information regarding water delivery, access, system management and challenges facing their respective areas with regards to water supply and access. A Municipal Water and Sanitation Management Team (MWSMT) and a CWSA officer were interviewed on their role in ensuring that communities within the municipality have access to safe and reliable water supply. Discussions exhausted the challenges faced in the water delivery process and the way forward. Three separate focused group discussions involving seven (7) water users were organized in each of the communities (Abokobi, Boi, and Dome). At these sessions, sachet water producers, washing bay operators, chop bar operators and construction workers deliberated on water sources for their activities, reliability of water sources, challenges and the way forward.

3.3.2 Sampling Procedure

The respondents for the study were selected using sampling procedures that are appropriate for the research design and data sources. A combination of both probability sampling and non-probability sampling techniques were employed to make the sample more representative of the population without compromising the quality of the data collected. The sampling procedures used are discussed below:

i. Simple Random Sampling

The research employed the simple random technique in selecting all the forty (40) households in Boi and Abokobi. In these communities, all houses were given equal chance of being represented in the sample. Since water in these communities gets to users through laid community stand pipes and household piped-inn, random sampling was the best selection option that will not disadvantage some section of the communities. The selection was effected by numbering all houses and selecting responding households one after the other without replacement. This process was repeated over and over again until all responding households in Boi and Abokobi were completely selected in each community.

ii. Cluster Sampling

This sampling procedure was employed only in Dome, since it is a big community with East and West Settlements. The community has limited pipe borne connection in the West with the East relying mainly on tanker services. Dome had no working water system as at the time of this research. Along the existing clusters (Dome East and West), twenty respondent households were randomly selected from the pool of households for the research. The technique was appropriate because the community has its water source outside of it. That not withstanding, Dome East and West had different means of water delivery and as such, are expected to have different challenges.

iii. Purposive Sampling

This sampling technique was used in all the communities to purposively draw people whose livelihoods were dependent on water for a focused group discussion. By this method, a group of seven (7) water users were selected in each community to participate in the group discussion. They were engaged in an interaction that sought to provide information linking their livelihood challenges to water availability and its competing use. Suggestions on the way forward, group's peculiar challenges and interests were collated at these meetings. Sachet water producers, washing bay operators, construction workers and chop bar operators were those used. This is because; they depended heavily on water for their operations.

3.4 Data Collection

Primary data was generally collected using household questionnaire, focused group discussions guide, observation and interview guides. The various data collection instruments that were used are discussed below.

3.4.1 Questionnaires

Structured questionnaires were used in the research. The structured questionnaire included closed-ended questions and some open-ended ones. The questions were constructed based on the objectives of the study. Section 'A' of the questionnaire elicited information on the characteristics of selected household. Section 'B' posed questions on the characteristics of potable water supply system and their effects on livelihood options. Section 'C' concentrated on gathering information on means of water supply to the various households and the reliability and sustainability of these means. Further questions were asked on domestic water use patterns in the household and methods of water storage. Open ended questions were

included in the various sections of the questionnaire as and when necessary to collect additional information on respondents' experiences.

Draft study instruments were pre-tested in some communities of the district in order to assess the ability of the questions to capture relevant information from the field.

3.4.2 Interview Guides

A flexible guide was used to interview key actors in the water delivery chain. Officials of the CWSA, Water and Sanitation (WATSAN) Committee Members and the Municipal Water and Sanitation Management Team members provided answers on thematic areas of interest and of their fields. These key informants elaborated into details the characteristics of water supply systems as well as management issues in the district and their specialised fields.

3.4.3 Focused Group Discussions

This tool was used to collect information from water user groups in each of the communities. Probing questions were posed at these meetings to enable participants to engage in a succinct dialogue. Issues surrounding water delivery, tariffs, reliability and challenges were discussed. Information provided at these meetings was immediately verified by other participants and additions were made as and when necessary. The composition of these groups was largely based on people whose livelihoods are entirely dependent on water. Since their interaction with water has to do with business, they offered market oriented and socially inclined suggestions for consideration.

3.4.4 Observation

Participant observation was actively employed in assessing the water delivery points and water infrastructure available to the various communities. Using this tool, hygienic conditions of water point and storage devices were assessed and proximity of access points and sources to households and communities verified.

3.5 Data Analysis

Quantitative data were screened, coded and analysed using STATA to generate statistical tables for discussions. Qualitative data that was collected on the field were transcribed and narratives generated. Pictures from the field were also referred to as and when appropriate. The results from these analyses were then described with reference to each objective and presented in the form of tables, graphs and charts.

3.5.1 Modelling Water Availability Using Logistic Regression

The logistic regression analysis allowed for the statistical analysis of association between variables where dependent variable is a dichotomous variable and independent variables are categorical and continuous variables. The study's dependent variable is household access to water all-year round which is coded as 1 = yes (respondent household has access to water all-year round) and 0 = no (respondent household do not have access to water all year round). The predictor variables are the household's socio-economic and geographic variables (household size, sex, age, highest level of education, use of water for livelihood activities, location of water facility, average cost, household location and occupation). Therefore the relationship between the dependent and independent variables can be modelled as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_n X_n \quad \ldots\ldots (1)$$

Where;

Y = Dependent variable

$X_1, X_2, X_3, \ldots X_n$ = the predictor (independent) variables

β_0 = constant or intercept of the regression line

$\beta_1, \beta_2, \beta_3, \ldots \beta_n$ = coefficients of the independent variables

Due to the issues such as vagueness of theory, wrong functional forms and intrinsic randomness in human behaviour that exists in collection and handling of data, an error term (μ) is introduced to the model to take care of all these biases. Therefore the model is;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_n X_n + \mu \quad \ldots\ldots (2)$$

Introducing the study variables into equation (2), we obtain;

Water availability (Y) = $\beta_0 + \beta_1$HHsize + $\beta_2$sex + β_3 age + β_4Ledu + β_5UseLAct + β_6 Dist+ β_7 Cost + β_8 HHLoc + β_9 Occ + μ..... (3)

Where;

HHsize = Household Size

Sex = Sex of household head

Age = Age of person responsible for water in the household

Ledu = Highest level of education for household head

UseLAct = Water use for livelihood activity

Dist = Distance of water source from household (Water source used by household)

Cost = Average cost of water per bucket

HHLoc = Household location

Occ = Occupation of household head

μ = Error term

A Prior Expectation of Determinants of Access to Water

Variable	Expected Sign	Comments/Expected Outcome
Household size	Positive (+)	Large household size positively affects water storage and access
Sex of household head	Positive (+)	Female headed households tend to do well in all-year water access than male headed households
Age	Positive (+)	As age increases, so does one becomes conscious of water and thereby improves access
Highest level of education (household head)	Positive (+)	More educated household are willing to pay for improved water sources and access
Water Use for Livelihood Activities	Negative (-)	Use of water for business activities reduces water availability for household use and access
Distance of Water Facility	Negative (-)	Increased distance between household and water source reduces per capita consumption of water
Cost of water	Negative (-)	Price of water negatively affects household demand and access
Household location	Positive (+)	Location of household significantly explains the water resources available for the household and decision options to explore
Occupation (household head)	Positive (+)	As a person moves from unpaid family work to paid employment, the more he/she is willing to pay for improved water source and thereby increase access

3.6 Profile of the Study Area

This section provides background information about the Ga East Municipal Assembly. It offers a brief description of the socioeconomic profile of the district, focusing on water sources and access by the various communities and water-use groups.

3.6.1 Water and Sanitation

i. Water

Like in all urban areas and municipalities in Ghana, potable water supply has been a major challenge for the Ga East Municipal Assembly, particularly that the assembly has no direct control over urban water supply. The Assembly is currently managing three small towns' piped schemes through the Water and Sanitation Development Boards (WSDB). These are Abokobi-Oyarifa Water Scheme located at Oyarifa, Sesemi Water Scheme located at Sesemi, and Pantang Area Pipe Scheme located at Boi. The three schemes cover twenty-three communities. This places an obligation on the Assembly to ensure that the facilities are managed in a sustainable manner. Areas like Dome, Taifa, Agbogba, North Legon Extension and Ashongman-Musuko have limited or no access to pipe-borne water and largely depending on tanker services and a few pipe connections and hand-dug wells for their water supply.

In general therefore, the price of water is fairly high in these urban communities. The situation is further worsened by the steadily increasing population through the influx of skilled and unskilled labour from the rural areas. To improve this situation, the District Assembly have supported and facilitated government strategies to accelerate the provision of safe water in the urban areas, especially the inclusion of rain water facilities when building.

The Municipal Water and Sanitation Team (MWST) has been established and trained by the Community Water and Sanitation Agency. The Team represents the Assembly in its water and sanitation activities to achieve favourable health outcomes, economic growth and sustained poverty reduction.

ii. Sanitation

Communities and households in the Ga East Municipal Assembly have both private and public sanitation facilities in their homes and within communities. Others also resort to indiscriminate defecation in gutters, school compound and public refuse dumps. Total sanitation coverage is estimated at 31 percent for household facilities and 29 percent for institutions. The types of facilities in use include WC toilets, KVIPs, Household VIPs and public KVIPs. Pit latrine even though not approved by the Assembly is being used by some households even in the urban communities.

The assembly is currently not participating in the District-based Water and Sanitation Component of the Community Water and Sanitation Programme and is in the process of sourcing funds to implement it. There is some serious attention needed to clear a backlog of waste in the urban areas. Areas of focus to improve sanitation in the municipality include social mobilization, and financial and legal processes (GEMA, 2010).

Some major challenges facing the municipality are poor sanitation and hygiene practices in the various communities and schools, inadequate sanitation facilities in the various schools, communities and other institutions like the markets and health facilities, Use of unapproved sanitation facilities in the various homes, poorly-equipped Public health Department, and bye-laws on sanitation not gazetted to facilitate prosecution.

3.6.2 Waste Management

With increasing urbanization and movement of people into the municipality, waste management is a serious issue in the Ga East Municipal Assembly. Huge amounts of both human and industrial waste are generated at an alarming rate. It is estimated that about 750

tonnes of solid waste is generated monthly out of which 490 tonnes are collected which represents 63 percent. This leaves a substantial amount of backlog that creates various kinds of inconveniences including health hazard and pollution of water bodies to people in the municipality. Out of the 490 tonnes collected the private sector collects about 81 percent through door-to-door collection.

Apart from the door-to-door collection, waste is collected in containers placed at vantage points by the Assembly. The situation is compounded by the inadequate machinery and equipment by the Assembly and the private collectors. The absence of a proper engineered final disposal site in the municipality is also a major constraint. In addition, solid waste is brought from neighbouring Assemblies that is the Adenta Municipal, Accra Metropolitan and Ga West Municipal Assemblies to the crude dumping site at Abloradjei. The constant burning of the waste at the dumping site is creating serious air pollution and threatening the lives of people in the surrounding communities. The soil in the area is also being polluted.

Details of the Assembly's waste management policy can be found in the District Environmental Sanitation Strategy and Action Plan (DESSAP) 2009-2015. In the DESSAP, inventory of type and quantity of waste to be disposed off has been estimated. The municipality will promote reclamation and recycling which is based on the polluter pays principles. The aim is to achieve the most effective and economic reduction of the nuisance and cost generated by waste. The municipality has also been zoned for the purposes of effective waste collection and management.

Some waste management challenges in the municipalities include soil pollution, hazardous waste disposal and handling, low levels of waste minimization, recycling of waste, poor

treatment of sewerage and liquid waste, poor land fill design, operation and maintenance, poor public attitude towards waste management, inadequate numbers of refuse containers for communal use, irregular and untimely refuse collection and lack of engineered final disposal site among others.

3.6.3 Health Service Delivery

The Municipal Health Management Team (MHMT) is responsible for health service delivery in the Municipality. The municipality is divided into four zones for the organization of primary health care services namely: Danfa, Taifa, Abokobi and Dome. A sub-municipal health management team is responsible for the delivery of health services to defined areas and population and has at least a health centre with either one or two community clinics. Curative and preventive health services are provided in these facilities and at the outreach centres. There are trained Traditional Birth Attendants (TBAs) and other care providers such as chemical shop dealers, maternity homes and traditional healers in the municipality.

Before the separation of the Ga East Municipality from Madina Municipality in 2008, there were 39 health facilities in the municipality including two government polyclinics, two health centres and a Community-based Health Planning (CHPS) compound. The polyclinics are Madina Polyclinic, Kekele and Madina Polyclinic and Rawlings Circle. The health centres are at Abokobi and Danfa whilst the CHPS compound is located at Taifa. There is no Municipal Hospital to cater for cases referred from the polyclinics and Health Centres, there is however a specialised hospital at Pantang which has become a general hospital for only Out-Patient Department (OPD) cases. The communities are however yet to recognize it as such.

There is a quasi-government facility at Atomic which serves the workers of Atomic Energy Commission and the community at Kwabenya and its environs with Alpha Medical Centre (a 40-bed hospital) serving large sections of Medina. Currently, Alpha Medical Centre serves as the municipal hospital since the other remaining facilities are of small capacity.

The doctor to population ratio of the municipality stands at 1:49,020 and the population to nurse Ratio is 2254:1. According to the Ga East Municipal Health Directorate (2010), malaria continued to be a major public health concern accounting for 33 percent of Out-Patient Department (OPD) attendance in 2009 with hypertension being the third most reported case between 2007 and 2010. Diarrhoea was the sixth highly recorded case in 2010 (GEMA, 2010).

3.6.4 Housing and Development Control

Access to adequate housing is an important ingredient in the Municipal Assembly's efforts to improve the livelihood of the people. The lack of sufficient housing units, especially in the urban areas of the Municipality has among other things contributed to overcrowding, development of illegal structures, conversion of commercial facilities to residential use, streetism and pressure on social facilities and amenities. This has resulted in the development of slums in areas like Dome, Taifa and Kwabenya.

To curb this situation, the Assembly plans to create an enabling environment for private sector-led estate development and also promote the construction of well-planned residential flats to ensure maximum use of the limited land available in the near future. Investment in housing and other social amenities, especially in the rural areas will help relocate and

decongest the urban areas. The assembly has also adopted a policy to formally acquire public lands and other vacant lands to facilitate the provision of infrastructure in the future.

Effective development control has seriously been hampered by the non-availability of layouts in a number of communities. Also the department of Town and Country Planning Department (TCPD) which is in charge of development control lacks the requisite logistic support like vehicles and office equipment. In-service training is not organized for the staff and only limited community layouts are available. Communities without planning schemes include the following: Addoteiman, Boi, KponKpo, Pantang Village, Abokobi, Sesemi, Comet High land, Akporman, and Aborman.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.0 Introduction

This chapter presents findings of the research on water availability and access for development in the Ga East Municipality. The respondents were household members who fetch water, key informants and water user groups selected from Abokobi, Boi water system area and Dome East and West. The data was collected using questionnaires (contained both open-ended and closed ended questions), key informant and focused group interview guides and observation. The results here present the demographic characteristics of the respondents, sources of water and responsibility at household level, choice of water source and level of education, water source used and availability all-year round and water availability for other livelihood options.

4.1 Bio-Social Characteristics of Respondents

As part of the data collection process, the research collected information on the socio-demographic characteristics of the respondents. A summary of the respondents' bio-social characteristics are presented in the following format: sex distribution, age distribution and marital status of respondents.

In Table 4.1 below, the sex distribution of respondents show that 63 percent of all respondents were females compared to 37 percent male. Since the focus of the questionnaires was on persons who are directly involved with water, one can say that women are more involved with water than men in the Ga East Municipality. This is shown in the Table 4.1:

Table 4.1: Sex Distribution of Respondents

Sex	Percentage
Male	37
Female	63
Total	100

Source: Field Data, 2014.

Further analysis of the data collected indicates that 49.2 percent of the respondents responsible for fetching water fell within the age group of 10 to 35 years of age, with 45 percent falling between the ages of 36 to 60 years of age. Only 5.8 percent of the respondents are 61 years or older. The lowest recorded age was 10 years old and the highest oldest respondent was 66 years of age. This is presented in Table 4.2:

Table 4.2: Age Distribution of Respondents

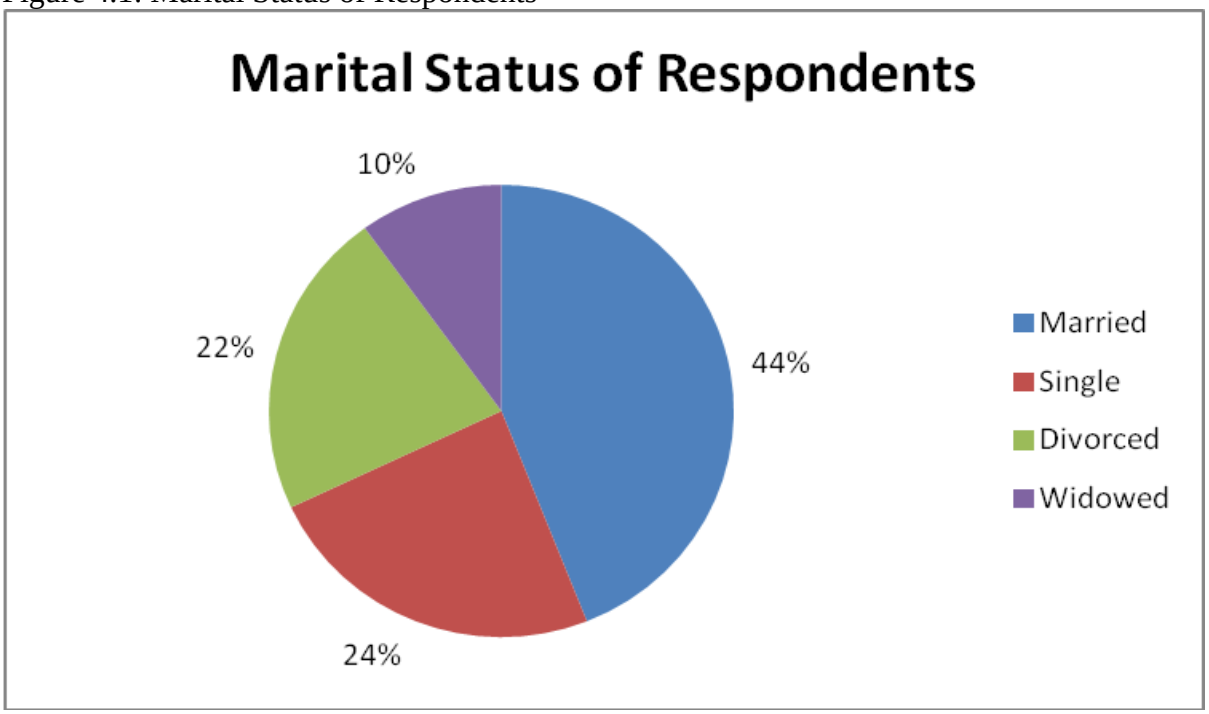
Age Group	Percentage
10 – 35	49.2
36 – 60	45.0
61 Above	5.8
Total	**100**

Source: Field Data, 2014.

From the Table 4.2, the findings indicate that the economically-active age group (15 to 60 years) were involved in this study. Since this age category is actively involved in the production of goods and services within an economy, reducing the time they spend in search for water for household use will increase productive time by 15 minutes and over for 92.5 of respondents in Dome (refer to Figure 4.5).

Of the total respondents in Figure 4.1, 44 percent of them were married, 24 percent single, 22 percent divorced and 10 percent were widowed. The smallest household size was one and the biggest household size was nine. Overall, the average household size stood at 3 persons per household. The marital status of respondents is presented below in Figure 4.1:

Figure 4.1: Marital Status of Respondents



Source: Field Data, 2014.

4.2 Sources of Water and Responsibility at the Household Level

4.2.1 Household Sources of Water

Though located in the same municipality, the study revealed that sources of water available to community members vary from one community to another. From Table 4.3 below, 75 percent and 70 percent of all households in Boi and Abokobi respectively get water from the DANIDA and Government of Ghana-Funded water systems in the area. The access points are mainly household piped-in taps and community stand pipes (refer to picture 6 in appendix 4). In Boi, the system currently serves over 15,000 inhabitants in its catchment area (though it

was designed for a population of 12,000). The rise in population of the area is largely driven by migration and urbanization, which has pushed about 10 percent of the inhabitants to depend on wells and ponds for water. At the same time, 12.5 percent and 17.5 percent of community members resort to the use of boreholes in Boi and Abokobi respectively.

Table 4.3: Location of Household and Source of Water

Location	**Water Sources Used by Household (%)**						**Total Number of Households**
	Water System	Well/Pond	Rain	Borehole	Tanker Services	Pipe-GWCL	
Boi	75.0	10.0	2.5	12.5	0.0	0.0	40
Abokobi	70.0	10.0	2.5	17.5	0.0	0.0	40
Dome	0.0	5.0	0.0	2.5	45.0	47.5	40
Total	48.3	8.3	1.7	10.8	15.0	15.8	120

Pearson Chi2 (10) =109.2111, Pr=0.000

Source: Field Data, 2014.

From Table 4.3 above, though there are existing water systems in both Boi and Abokobi, an average of 10 percent of the inhabitants still resort to well or ponds and rain water for their sources of water. This is unacceptable since those sources are unapproved for human consumption. On average, the over 70 percent access to potable water in Boi and Abokobi is however encouraging since it is close to UN Millennium Development Goals Target of 75 percent.

In Dome, 47.5 percent of households are connected to the Ghana Water Company Limited pipe network extending from Weija, though unreliable. These people are mainly concentrated in Dome West which experiences erratic water supply from Ghana Water Company Limited.

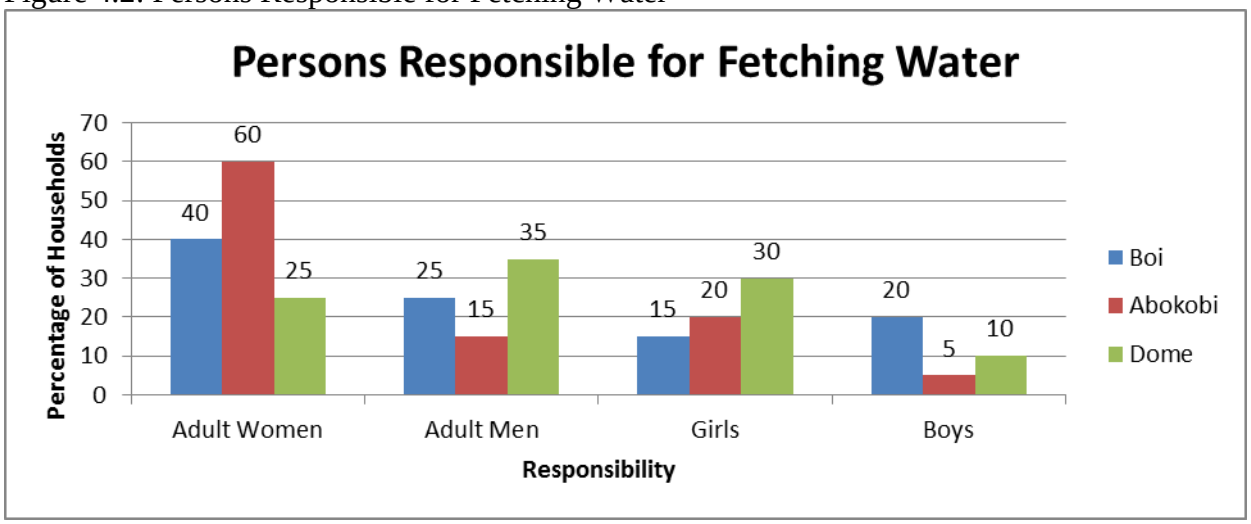
The taps normally flow once a week and in the middle of the night. Dome East have been disconnected from the Kpone Supply System since 2008. The essence was to reduce pressure on the Kpone system and improve production at Weija to cater for the shortage, but nothing has changed since and community members are left to themselves. From the study, 45 percent depend on tanker services for their household water needs at exorbitant prices. Though the source is outside the community and not from reliable sources, community members have relatively high confidence in this source in terms of availability. Five percent also depend on wells or ponds for their water needs raising the figure without access to potable water to 50 percent. This indicates that, one's access to potable water in the Ga East municipality has a lot to do with the community you reside in or hail from. The chi-square statistic of 109.2111 at ten degrees of freedom is significant at one percent. This implies that water source used by households is largely determined by the households' location or community.

4.2.2 Persons Responsible for Fetching Water

The responsibility of providing water for households within the communities is largely a burden for women. In Boi and Abokobi where water facilities are within the community, adult women expect women to provide water for household needs and other activities. In most cases, the adult women use girls and boys in fetching water. Boy and girls are either sent to community stand pipes or wake up in the morning to fetch water. From Figure 4.2 below, 60 percent of households have adult women responsible for fetching water in Abokobi against five percent boys. Boi however have 40 percent of adult women engaged in fetching water as against 15 percent of girls. Since water points in these two communities are either located within households or less than 200 metres from households, the stress of searching for water is minimal. Taps are normally opened in the morning or in the evening; this allows

inhabitants to use the hours between morning and evening for other economic and social engagements.

Figure 4.2: Persons Responsible for Fetching Water



Source: Field Data, 2014.

In Dome however, the responsibility of fetching water revolves around adult men and girls with 10 percent of boys involved in the fetching process. As high as 35 percent and 30 percent of girls and adult men respectively, are involved. This shift in responsibility from adult women in Boi and Abokobi to adult men and girls in Dome is largely attributed to the water source resorted to by the community and the search procedures involved (Refer to Picture 11 in appendix 4). As water systems which involve in-house and communal pipe networks are being used in Boi and Abokobi, tanker services are largely in operation in Dome. These tankers draw water from outside the community, mostly in inadequate quantities for the people of Dome. This makes access to water in Dome an outdoor phenomenon that involves long distance travels, struggles in some cases, and high unit cost refer to picture 12 in appendix 4). Young girls are engaged in the search of water here because of the long distance walks expected and the long queues that are characterised by

privately managed water points in the area. Clearly, this has the tendency of affecting the education of the girl child and time available for other economic activities.

4.2.3 Household Source of Water and Level of Education

Systematic analysis of the source of water used by households and respondents' level of education revealed that water is a necessity and its provision to communities is targeted at the poor, illiterate and marginalized and have no regard for one's level of education. However, the Chi-square statistic of 72.6470 with 24 degrees of freedom is significant at one percent, signifying that people with higher levels of education go in for potable and reliable sources of drinking water. This is illustrated in Table 4.4:

Table 4.4: Water Source and Respondents' Level of Education (%)

Source Used	**Highest Level of Education (%)**						**Total Number of Households**
	No Education	**Primary**	**JHS**	**SHS**	**College**	**University**	
Water System	14.3	6.1	22.5	32.7	14.3	10.2	49
Well/Pond	0.0	40.0	0.0	60.0	0.0	0.0	10
Rain Water	0.0	20.0	0.0	0.0	80.0	0.0	10
Borehole	0.0	0.0	23.1	15.4	30.8	30.8	13
Tanker Services	26.3	36.8	0.0	15.8	10.5	10.5	19
Pipe-GWCL	10.5	10.5	5.3	63.2	10.5	0.0	19
Total	11.6	15.0	12.5	32.5	19.2	9.2	120

Pearson Chi2 (30) =85.0845, Pr=0.000

Source: Field Data, 2014.

Of all respondent households surveyed in Table 4.4, 9.2 percent had university education, 12.5 percent had Junior High education, 32.5 percent had Senior High education and 11.6 percent had no formal education. Of households with water schemes as their water source, 14.3 percent had no formal education compared to only 10.2 percent and 14.3 percent with university and college education respectively. In the same category, 22.5 percent had Junior High education and 32.7 had Senior High education.

Of the households who depend on tanker services, 10.5 percent had university education, 15.8 percent Senior High and 26.3 percent with no formal education. Further from Table 4.4, no household with university education is connected to the GWCL and as high as 63.2 percent with Senior High education have GWCL connections. On households that source water from the borehole, none of the households had no education or primary education, with 30.8 percent having university education. The findings here indicate that, there is no direct relationship between a household's choice of water source and its level of education.

4.3 Households' Access to Water

4.3.1 Household Location and Access to Water

The general concept and policy of the Community Water and Sanitation Agency (CWSA) demanding that communities contribute five percent of the initial investment cost before benefiting from a water facility was relaxed here. For the Ga East Municipality, the essence was to ensure that communities have immediate access to water and innovative approaches to management and user friendly technology. In Boi and Abokobi, households made cash contributions towards the water systems averaging GH¢5.00 into the Water Board's account on completion of the water facility. To further enhance access, some households extended connections into their homes upon supervision of the management board for which billing

will be done monthly. There is no evidence that a targeted community was left out of the scheme as a result of their inability to contribute to the investment project.

In Dome where there is no water system, the frustrations households go through on daily basis to source water are captured in the words of a key informant below:

> *"Our water situation is worsened by the dry pipelines extending from Weija, they rarely flow. Most men and women have become full-time employees searching for water without pay. At the same time, we lose out on our paid jobs by going to work tired and exploited. .... The tanker service operators do not care..." (Assemblyman for Dome East, 18/07/2014).*

Dome is largely an urban area and falls out of reach for Community Water and Sanitation Agency's services. Currently, residents in the area depend on private tanker service operatives who buy water from the GWCL and then sell it to them at commercial rates. The Kpone Water System has extended pipes to some parts of Pantang and there are hopes that water supply will soon cover major areas of the municipality. The assembly is making strides at getting the Ghana Water Company Limited to extend pipe connections to many areas in the municipality including Dome East.

Results on households' access to water all-year round (in Table 4.5 below) show that 51.7 percent of all respondents have access to water all-year round against 48.3 percent who experience water shortages some time in the year. Of the residents in Boi, 82.5 percent have access all-year round, whilst 17.5 percent do not always get water during rainy and dry seasons. The results indicate that, access to water always is a challenge for 27.5 percent of households in Abokobi. These figures establish a positive relationship between access to

water all-year round and household's location or place of residence. This is captured in Table 4.5 below:

Table 4.5: Water Availability All-Year and Household Location

Location	Water Availability (%)		Total Number of Households
	Yes	No	
Boi	82.5	17.5	40
Abokobi	72.5	27.5	40
Dome	0.0	100.0	40
Total	51.7	48.3	120

Pearson Chi2 (2) =64.9388, Pr=0.000

Source: Field Data, 2014.

In Boi and Abokobi, access by washing bays operators, construction workers and sachet water producers is less than that of the household access. These three livelihood activities are barred from drawing water from the water scheme for their activities. They therefore rely on tanker services at relatively higher prices and water from ponds (not always available) to do their work. Food vendors are however allowed to use the water to prepare food for sale. The frustration of a washing bay operator in Abokobi is captured below;

> *"I fight with the revenue officer from the assembly always. You prevent me from using your water to work, yet you want me to pay income tax. I will not pay. I have always refused to pay that tax..." (A Washing Bay Operator in Abokobi, 17/08/2014)*

In Dome where community members rely heavily on commercial water tanker operators and few pipe lines, all the households (100%) considered for the study do not have all-year access to potable water. In times of shortages, they rely on well or ponds and others travel outside

the community for water. The source of the water that is supplied by tanker service providers could not be readily verified at the time of this research.

The Chi-square statistic of 64.9388 at two degrees of freedom is significant at one percent indicating that, a household's access to water all year round is significantly dependent on its location.

4.3.2 All-Year Access and Water Source Used by Household

Further analysis of the household's source of water and water availability all-year round in Table 4.6 below shows that, access to water all-year round stands at 82.8 percent by users of water schemes found in Boi and Abokobi. Respondents who rely on boreholes for their household water needs and experienced shortages within the year stands at 53.9 percent. The unreliability of the boreholes all-year is a result of breakdown and reduced water table during the dry season in most cases. All households that use pipe borne water have challenges accessing water all-year. The flow is erratic and unreliable, particularly in the dry season. Though the wells and ponds are reliable sources of water for some households in the municipality, water quality from these sources is not guaranteed and poses serious health risks to users. This is shown in Table 4.6:

Table 4.6: Water Availability All-Year and Source Used by Households

Source Used	Water Availability All Year (%)		Total Number of Households
	Yes	No	
Water System	82.8	17.2	58
Well/Ponds	70.0	30.0	10
Rain Water	50.0	50.0	2
Borehole	46.2	53.9	13
Tanker Service	0.0	100.0	18
Pipe-GWCL	0.0	100.0	19
Total	51.7	48.3	120

Pearson Chi2 (5) =63.5107, Pr=0.000
Source: Field Data, 2014

Tanker services are mainly used by residents in Dome and it is proved to be unreliable all-year with all respondents confirming it. At five degrees of freedom, the Chi-Squared statistic of 63.5107 is significant at one percent. This means that, household water access all-year round is dependent on the water source used by the household.

4.3.3 Water Affordability and Ease of Operation

From the data collected, 65 percent of households have their water sources outside their households with 35 percent sourcing water from in-house connections. Of the 65 percent whose sources are outside the household, 51.7 percent of them use the community shared stand pipes whilst the remaining 13.3 percent have their water source from outside the community. Households with water sources outside the household (65%) practice pay-as-you fetch method. This means that, majority of the people in the Ga East municipality pay at the point of fetching. This phenomenon may pose a financial barrier to access if charges are high. This practice also contributes to the pockets of households who still depend on wells or ponds

for water within the municipality. The remaining 35 percent of households have their water points extended into their homes. These categories of users are billed on monthly basis. The costs of extending the facility into their homes were borne by the households and extended under the supervision of a trained plumber from among the water board. This presents high tendency of households not paying their monthly bill. At the time of this study, some households were indebted to the Pantang Area Water and Sanitation Development Board (PAWSDB) to the tune of GH¢ 200,000.00 for the past eight years. As at July 2014, eight people were being prepared for court (Interview with the PAWSDB Manager, 2014).

Analysis of data from the study in Table 4.7 revealed that, 15 percent and 10 percent of households in Boi and Abokobi respectively consider the tariff regime as not affordable. Both communities again have recorded an average of 88 percent of respondents who consider the tariffs charged as affordable. This largely attribute to the use of the water scheme that is designed to cater for the poor at affordable rates. In both communities, consumers are charged as low as GH¢0.05 per bucket at the community shared stand pipes. Monies are paid at the point of fetching the water and the funds are managed by the water boards for the purposes or maintenance and repairs of the water facilities. The low figures that represent households who think the tariff is dominated by people who extend water into their homes. Serious attention still needs to be given to this category so as to curtail the possibility of some residents returning to unapproved sources for water. The affordability rating for the households is presented in Table 4.7:

Table 4.7: Opinion on Affordability of Tariff

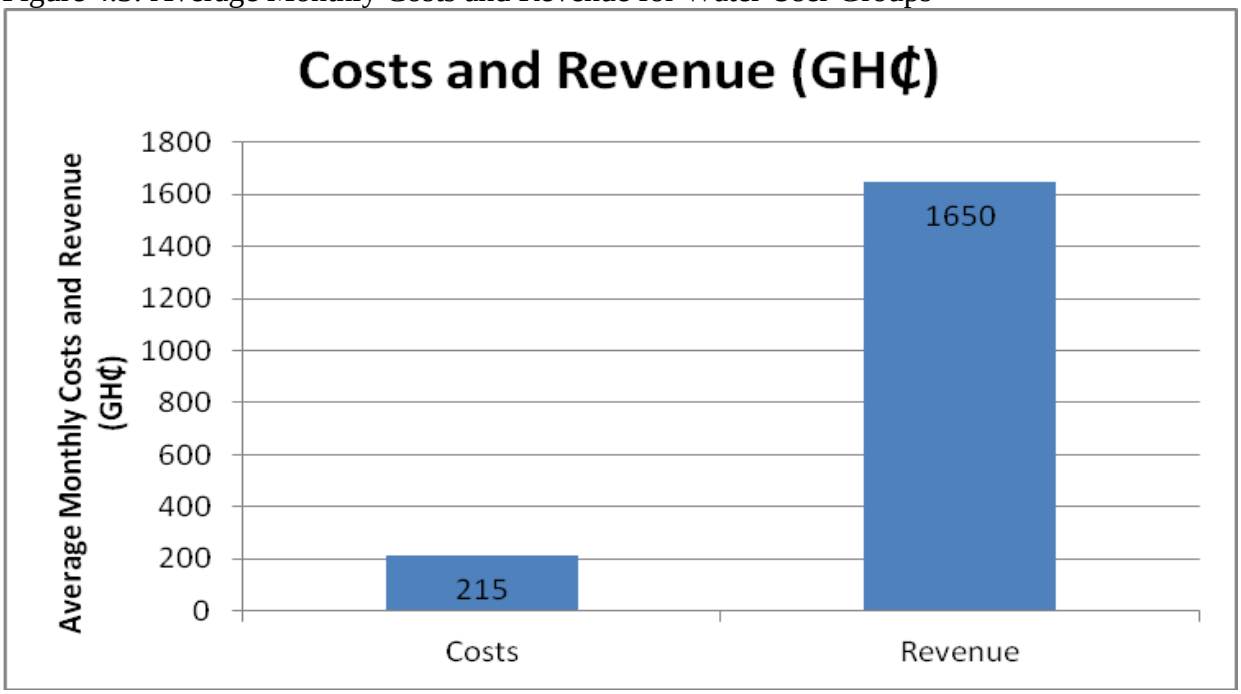
Community	Number of Households	Opinion on Affordability of Tariff (%)		
		Very Affordable	Affordable	Not Affordable
Boi	40	65	20	15
Abokobi	40	70	20	10
Dome	40	20	35	45

Source: Field Data, 2014.

From Table 4.7 above, as high as 45 percent of respondents see the tariffs charged as not affordable in Dome. This is largely attributed to the fact that the main source of water to the community is from commercial tanker operators who buy water from other sources for onward supply to the community members. Here, not only is the operator guided by profit motives, but the recent incessant increases in fuel and utility prices has further worsen their plight.

Figure 4.3 below presents the average monthly costs and revenue associated with using water for livelihood activities in the study area. Water for livelihood activities is largely drawn from water tankers and the few available water schemes in the area. The costs and revenue per month is presented in Figure 4.3:

Figure 4.3: Average Monthly Costs and Revenue for Water User Groups



Source: Field Data, 2014.

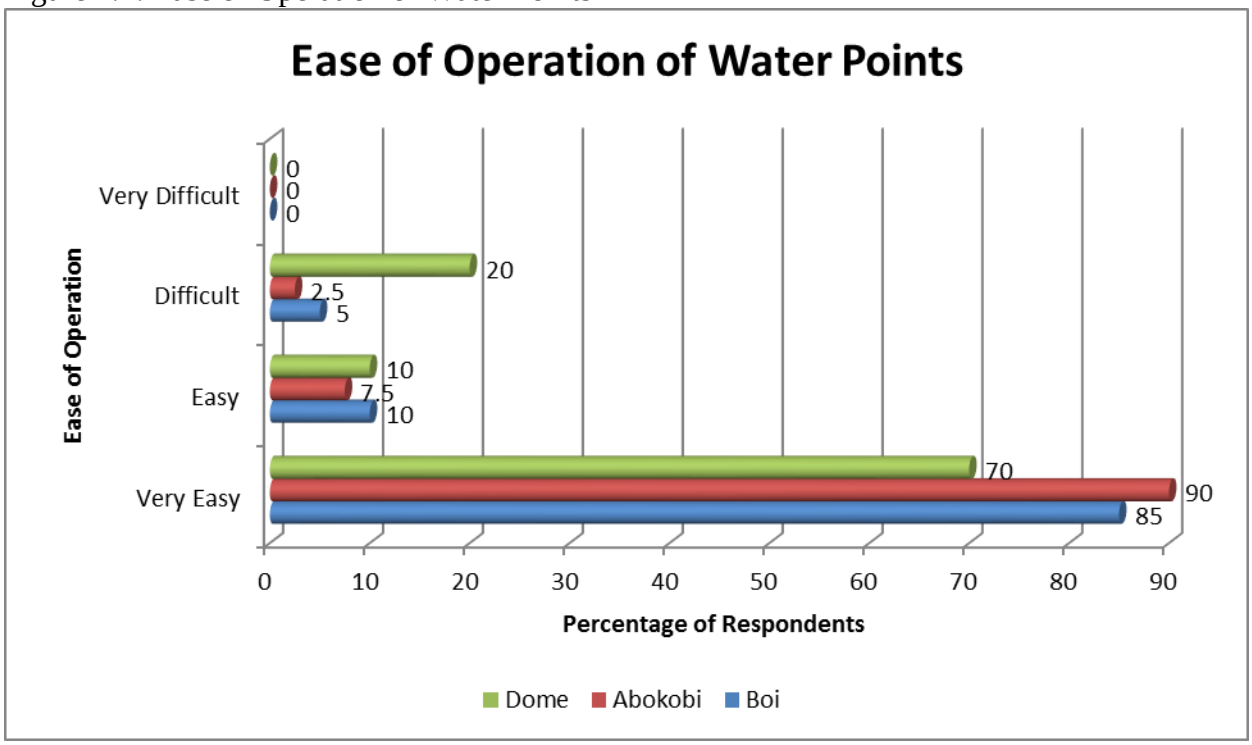
From Figure 4.3 above, an analysis of the costs and revenue of water users (people who use water for livelihood activities) revealed that they spend an average of GH¢ 215.00 on water monthly and earn an average of GH¢ 1,650.00 from their businesses. The revenue recorded here is crude, and other overhead costs and input prices will have to be debited against it to ascertain the average monthly profit.

This not withstanding, the water user groups have reiterated that the amount at which they pay for water is very expensive and affecting their businesses. This concern was emphasised in Dome where cost of water is relatively high. This concern was raised at a FGD session in Dome (refer to Picture 9 in appendix 4).

For ease of operation in Figure 4.4 below, the water points are generally easy to operate and do not require any technical expertise to operate. In Boi and Abokobi, operating the water

point requires a person to just turn the tap of stand-pipes to fetch water that is pumped from the reservoirs (refer to pictures 8 and 9 in appendix 4). In the case of a borehole, respondents just have to do a few strokes before water begins pouring from the borehole. That is, it is very easy to operate water points in Boi and Abokobi (85% and 90% respectively). This is presented in Figure 4.4:

Figure 4.4: Ease of Operation of Water Points



Source: Field Data, 2014.

In Dome however, 20 percent of respondents described the whole process of looking for a tanker driver and discharging the water into their reservoir as cumbersome. Moreover, 2.5 percent and five percent of households in Abokobi and Boi respectively felt that it was difficult operating the water points. A further analysis of this with respect to their age group is done below to reveal their true challenges.

Table 4.8: Age Distribution and Ease of Operation of Water Points

Responses (%)	**Age Group (In Years)**		
	10 – 35	**36 – 60**	**61 Above**
Very Easy	10.0	19.2	0.0
Easy	36.7	25.0	2.5
Difficult	2.5	0.8	3.3
Very Difficult	0.0	0.0	0.0

Source: Field Data, 2014.

From Table 4.8, operation of the water points is easy for respondents within the active age group. Between the age group 10 to 35 years, 36.7 percent find the operation of the water points easy, though 2.5 percent think it is difficult to operate. Within the 36 and 60 years group, 19.2 percent and 25 percent think the water point are very easy and easy to operate respectively as water is delivered by pressure from mechanized pumps (see pictures 2 and 8 in appendix 4). However of the aged group (61 years above), 3.3 percent of the respondents think it is difficult to operate the water points and 2.5 think it is easy to operate.

Though there are a few concerns over ease of operation of water points, one can conclude that the water points are generally easy to operate. However, further analysis of this category is recommended to ascertain their true profile.

4.3.4 Functionality

The Community Water and Sanitation Agency measures functionality of a water system based on the stroke and leakage tests conducted on the pump or source. However for the purpose of this study, functionality was approximated to the analysis of frequent breakdown

and the mean duration of breakdown or time taken to repair facility. An analysis of breakdown in the immediate past 12 months before this study is presented in Table 4.9:

Table 4.9: Water Facility and Average Down Time

Community	**Dominant Facility Type**	**Average Duration of Last Breakdown Before Repairs (in days)**
Boi	Water System	6
Abokobi	Water System	4
Dome	Tanker Services	21

Source: Field Data, 2014.

From Table 4.9, the average break-down time before repairs for the period preceding this study was six days for Boi, four days for Abokobi and 21 days for Dome. The down time for water systems are comparatively shorter than that of the tanker service providers. The relatively low breakdown periods for Boi and Abokobi compared to Dome may be a result of the water source being used and good management practices put in place.

4.3.5 Household Location, Age Group and Distance to Water Source

The distance between household and the point of water access differ greatly from one community to another. From Table 4.10, 80 percent and 90 percent of all respondents in Boi and Abokobi respectively spend less than five minutes between their households and their water points. This is so because water points are sited within households and surrounding making travel time shorter. In Dome where there is no water system, 92.5 percent of all respondents spend more than 15 minutes in fetching water for household use. The water

points are usually tanker and tricycle deliveries as shown in picture 12 (see appendix 4 attached).

The highest average time spent in search of water was recorded in Dome (180 minutes) and one minute being the lowest search time (recorded in Abokobi). This is illustrated in Table 4.10:

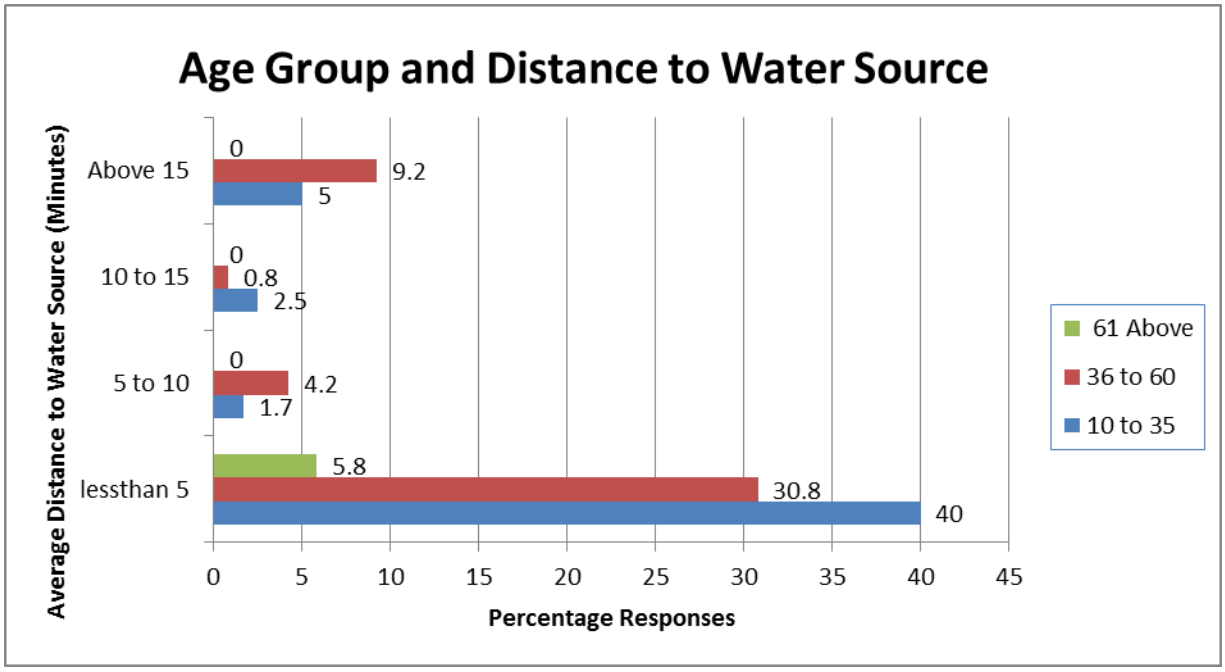
Table 4.10: Household Location and Percentage Distance to Water Source

Location	**Average Time in Minutes**			
	Less than 5	**5 to 10**	**10 to 15**	**Above 15**
Boi	80.0	17.5	2.5	0.0
Abokobi	90.0	10.0	0.0	0.0
Dome	0.0	0.0	7.5	92.5

Source: Field Data, 2014

From Figure 4.5 below, 40 percent, 30.8 percent and 5.8 percent of respondent households have their water sources located less than five minute to their homes respectively. Again, five percent and 9.2 percent of respondents between the age categories of 10 – 35 years and 36 – 60 years respectively spend above 15 minutes between household and water points. No respondent above 61 years of age spends more than five minutes between water point and home.

Figure 4.5: Age Group and Average Distance to Water Source



Source: Field Data, 2014.

Results in Figure 4.5 clearly indicates that water points are generally closer to households (particularly in Boi and Abokobi), with a few located far from the households, especially in Dome (refer to Picture 10 in appendices showing a tricycle being used in search for water).

4.3.6 Maintenance

Maintenance is executed in line with the Community Water and Sanitation Agency's (CWSA) operations and maintenance guidelines. This includes availability of area mechanics, availability of spare parts, preventive maintenance, and average pump break down. In line with the guidelines:

- The water systems in both Boi and Abokobi have one well-trained area mechanic each, who resides in one of the communities the water scheme serves and is accessible 24 hours. The area mechanic is responsible for conducting periodic checks

on the facility and repair works. In some cases, he may delay a day before coming to check a break down.

- Spare parts for repair works are available in Medina and Accra. This is to facilitate the acquisition and replacement of parts and repairs, in times of breakdown. Distance and travel time however delays the whole process.
- In order to prevent serious breakdown of the facility, the area mechanic conducts preventive maintenance on water systems at least once a year. No record of this could however be traced in both Boi and Abokobi.
- The Community Water and Sanitation Agency estimates that a pump or facility may break down about six (6) times a year, on average and each breakdown should not exceed three days before being fixed. The pump mechanic at both Boi and Abokobi try to follow this schedule, but evidence of adherence could not be ascertained due to the poor documentation and recall bias.

4.4: Water Storage and Water Use

Water storage looks at the mechanisms adopted by households in the various communities to hold or store water within the household to be used later. From the survey, water is mainly collected from service points by use of buckets and gallons. However, water is mainly stored in plastic barrels, metal barrels, poly tanks and jerry cans (see pictures 10 and 11 in appendix 4).

In Abokobi, Boi and Dome as in Table 4.11, water is largely stored in jerry cans and plastic barrels for household use. Other small pans are used to hold water for bathing, cooking, washing and for other household chores. With functioning and reliable water schemes in Boi and Abokobi, little efforts are made to store water in large quantities since large storage facilities (like poly tanks) comes with additional costs. In Dome however, water is stored in

poly tanks and in large quantities to avert the struggle and challenges that comes with water shortages. The distribution of the storage facilities used by households is presented below in Table 4.11:

Table 4.11: Water Storage Facilities and Duration of Stored Water

Storage Facility	Frequency	Percentage	Average Duration
Plastic Barrels	39	32.5	5 days
Jerry Cans	31	25.8	2 days
Poly Tanks	25	20.8	7 days
Metal Barrels	17	14.2	4 days
Bucket/Pans	8	6.7	2 days
Total	120	100	

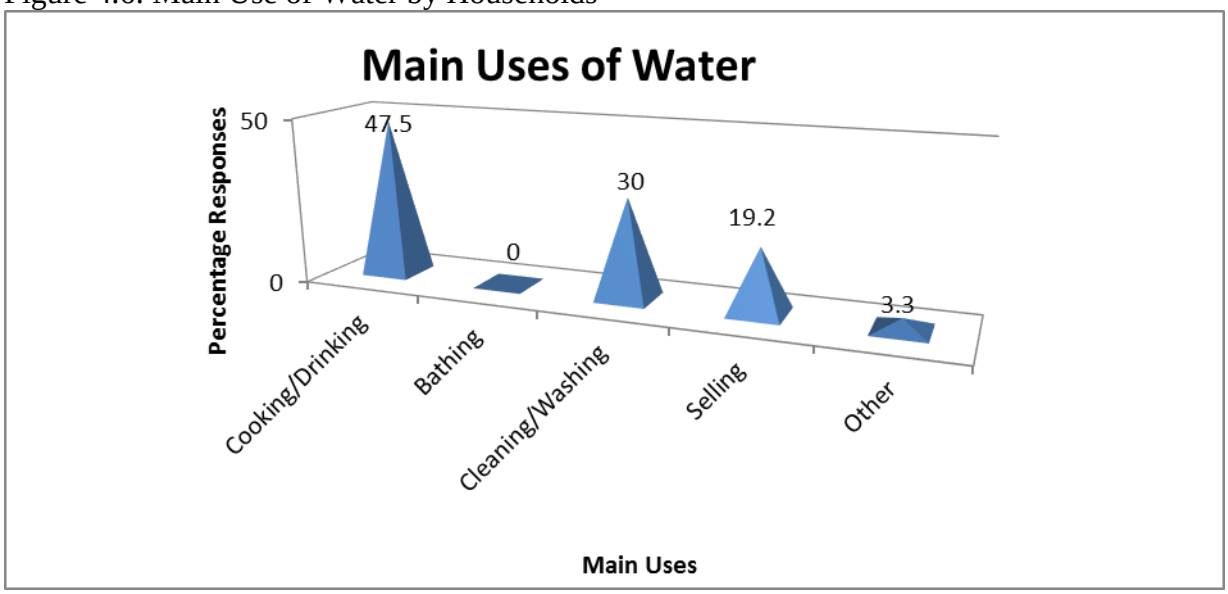
Source: Field Data, 2014.

From Table 4.11, 39 percent of respondents use plastics barrels in storing water, 31 percent use jerry cans, 25 percent use poly tanks and eight percent use buckets or pans in storing water. It takes an average of five days to use water in plastic barrels and seven days to use water stored in poly tanks. Poly tanks and big plastic barrels are mainly used by households in Dome, though some households use them in water scheme serving communities. The jerry cans are mainly used in Boi and Abokobi to store water.

In Figure 4.6, catering for household needs like cooking and drinking is the main concern of respondents. 47.5 percent of respondents will use their last drop of water to cater for their drinking and cooking needs. This is followed by 30 percent for cleaning and washing and then 19.2 percent for selling (livelihood activity). It is therefore clear that, though many

people sell water within the Ga East Municipality, many will still cater for their household needs before selling.

Figure 4.6: Main Use of Water by Households



Source: Field Data, 2014

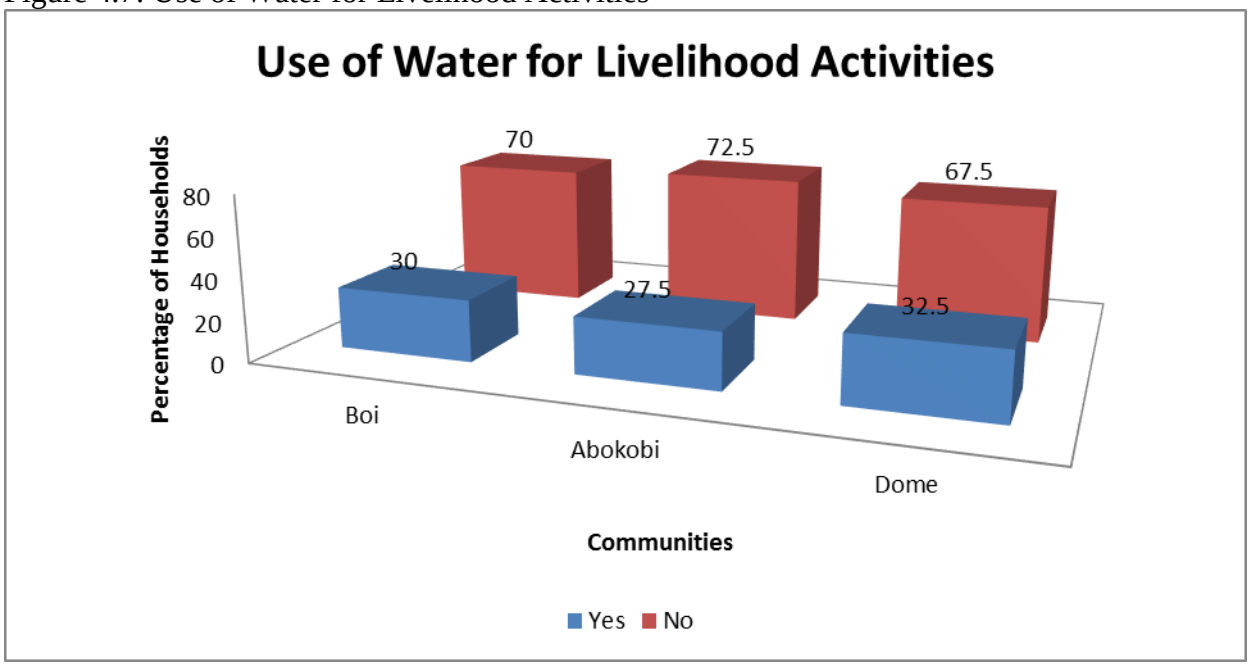
4.5: Effects of Water Use for Livelihood Activities and Household Availability

The study further establishes a relationship between use of water for livelihood activities and its availability for household use. Here, data was collected from water user groups using focused group discussions. It was expected that, the use of water for livelihood activities rather than the traditional household use will compromise uninterrupted water access by households for domestic use.

The analysis shows that, the use of water for livelihood activities is not really a serious issue in Abokobi. The Management of the water scheme in this area considers access for household use its primary objective, rather than use for livelihood activities. In this light, they have barred the use of water from the scheme for washing bays, construction and bagging sachet

water among others. Economic activities that registered the 30 percent in Boi and 32.5 percent in Dome are mainly food vendors in small shops. Their activities now do not pose any danger for the water schemes. However, their operations need to be monitored into the near future before they expand into entities that have the potential of siphoning water at levels that compromises availability for household use. This is shown in figure 4.7:

Figure 4.7: Use of Water for Livelihood Activities



Source: Field Data, 2014.

In Dome where regular water supply is a serious concern, 32.5 percent of households have their livelihoods dependent on either the direct sale of water to residents or are engaged in activities that rely heavily on water. The direct sale of water for residents is dominated by men, partly due to the hassle in securing water from tanker service providers and the lucrative nature of the business. Some of the women engaged in direct water sale either have their husbands supporting them or have been in the business for a long time.

This evidence of sale of water in the study area makes it prudent to assess its implications on water availability all-year round for households use. Results of a correlation analysis among water availability for households' all-year and related variables are presented below. Correlation results range from negative 1 to positive 1, with 0.5 to 1 indicating strong positive relationship between variables and 0 to 0.49 weak positive correlations. In the same light, -0.5 to -1 indicates strong negative correlation whilst 0 to -0.49 indicated weak negative correlation.

The correlation results in Table 4.12 indicate that, there is a strong positive correlation between household location and the water source used. This means that, a household's location within the municipality largely determines what water facility they use. This confirms the earlier findings that some water facilities are location-specific and almost all residents in that community uses that water facility.

Table 4.12: Correlation Results

(obs=120)	**Location**	**Source used**	**Cost per Bucket**	**Livelihood Activity**	**Availability All-Year Round**
Location	1.0000				
Source Used	0.7499	1.0000			
Cost Per Bucket	0.1260	0.1686	1.0000		
Livelihood Activity	0.0223	0.0145	-0.1103	1.0000	
Availability All-Year Round	-0.6740	-0.7092	-0.0948	-0.0218	1.0000

Source: Field Data, 2014.

Further in Table 4.12, the results between average costs of water per bucket are positively related to location and source of water used by the household. This relation is however weak and not of any serious concern in decision making processes. Likewise, the relationship between water use for livelihood activities to household location and source of water is positive but weak.

However, the correlations between water availability for household use all-year round to household location and source of water exhibit strong negative relations. This means that, as a household move from one location to another (in this context from either Boi or Abokobi to Dome), the household's access to water reduces. Again, if a household shifts from the use of one water source to another, its access to water all-year round reduces. Though access to water all-year round by households reduces as water use for economic activities increases, its overall effect is weak as indicated in Table 4.12 above.

It is worth mentioning that correlation results only examine the relationship between variables and whether the relationship is strong or weak, it does not indicate the actual effect of a variable on another. This weakness is addressed by regression analysis and Table 4.13 below shows the logistic regression results with water availability as the dependent variable against economic use of water, costs, location of water facility, source used by household and the community a household resides in.

Almost all households would want to get water from the best possible and accessible improved water sources. However, their decision to use this source depends on a number of socio-economic factors within and outside the home. This study sought to analyze the major

factors that affect household's access to water all-year round. In this analysis, several factors were hypothesized to significantly contribute towards improving household access to water. The results of the econometric analysis are presented below;

Table 4.13: Logistic Regression Results

Water Availability All-Year	**Coefficient**	**Standard. Error**	**z**	**P>z**
Household Size	-0.38674	0.251248	-1.54	0.124
Sex_1	-0.91309	0.734825	-1.24	0.214
Age	0.094466	0.216768	0.44	0.663
Age squared	-0.00011	0.002569	-0.04	0.966
Highest Level of Education_1	0.125413	0.202293	0.62	0.535
Water use for Livelihood Activities	-0.00634	0.635251	-0.01	0.992
Location of Water Source_1	0.316525	0.431665	0.73	0.463
Average Cost of Water	-7.31115	1.745997	-4.19	0.000
Water Source used by Household_1	0.365169	0.120421	3.03	0.002
Occupation	-0.19329	0.157127	-1.23	0.219
_Constant	0.009045	4.965715	0.00	0.999

Number of observations = 120, LR Chi-squared (10) = 56.46, Prob > Chi-squared = 0, Pseudo R-squared = 0.000, log likelihood = 0.4378

Source: Field Data, 2014.

In Table 4.13, most of the coefficients in the main equation had the expected signs. However, there were only two parameters which were significant at 1% level of significance. These are average cost of water and water source used by household. In order to make an approximation of how much the dependent variable (water availability all-year) was expected to increase or decrease for a unit change in an explanatory variable, the marginal effect and their standard errors were computed using STATA after regression commands. This involved calculating the derivatives of the marginal effect with respect to all coefficients. The results are summarized in Table 4.14 below;

Table 4.14: Marginal Effects After Logit Regression

Water Availability All-Year	**Marginal Effects**	**Standard. Error**	**z**	**P>z**
Household Size	-0.0762566	0.04835	-1.58	0.115
Sex_1	-0.180043	0.14706	-1.22	0.221
Age	0.0186266	0.04274	0.44	0.663
Age squared	-0.0000218	0.00051	-0.04	0.966
Highest Level of Education_1	0.0247288	0.03992	0.62	0.536
Water use for Livelihood Activities	-0.0012503	0.12538	-0.01	0.992
Location of Water Source_1	0.0624121	0.08308	0.75	0.452
Average Cost of Water	-1.441607	0.33801	-4.26	0.000
Water Source used by Household_1	0.0720037	0.02449	2.94	0.003
Occupation	-0.0381129	0.0295	-1.29	0.196

Source: Field Data, 2014.

Like the binary logistic model results in table 4.13, average cost of water and water source used by household are still significant at 1%, with the same expected signs. This means that, the results of the marginal effects showed significant influence between the derivatives of the parameters and water availability for household use all-year.

In other words if the cost of water increases by a unit cost, the propensity of a household having access to water all-year round will reduce by 44 percent. This conclusion is in line with the findings of Asante et al (2002) in their study of water sources options in the Volta Basin of Ghana. In that study, they concluded that the price of water negatively affect household demand and access in Ghana. This point was buttressed by the findings of Arouna and Dabbert (2009) that so long as the price of water increases, it will continue to be out of reach for the world's most poor households.

Similarly, the results further indicates that, households with water schemes as their source of water have seven percent more chance of having water all-year round against using other

sources. Since water schemes comes with household and community piped-in water serving points, they reduces the distance and travel time in search for water thereby increasing water availability and access. This finding is found to be in line with the conclusions of Sandiford et al. (1990) in their studies in Nicaragua which concluded that, a decrease in distance of water source increases the per capita water consumption. The finding is also in line with that of Arouna and Dabbert (2009) and Gazzinelli et al. (1998) that time required in fetching water negatively affects its demand.

Even though Whittington et al. (1991) and the World Bank (1993) suggests that ones level of education plays an important role in their choice of water source and thereby improves access, this study reveals the opposite of that. This lack of link to their findings may be due to the fact that supply side factors (like provision of water schemes and boreholes) have the tendency of limiting choices of consumers and captured in Stefanie (2005). However, a more thorough study will be required to ascertain its true profile.

4.5.1 Chi-Square Test of Hypothesis

From Table 4.13 above, the disparities between water availability for household use all-year round and use of water for livelihood activity gave us an insignificant p-value. This resulted to the conclusion using water for livelihood activities do not significantly affect water availability for household use. However, it is important to ascertain whether this observation occurred by chance due to anomalies in the sample or it actually occurs in the entire population. This is done using the t-test. Given the hypothesis:

H_0: The use of water as source of livelihood has no effect on water availability for households' use all-year round

H_A: The use of water as source of livelihood has an effect on water availability for households' use all-year round

A Chi-square test of the significance of the relationship between water availability for household use all-year round and use of water for livelihood activities is given below in Table 4.15:

Table 4.15: Chi-Square Test of Hypothesis

Water Availability All-Year Round for Household Use	**Use of Water for Livelihood Activities**		**Total**
	Yes	**No**	
Yes	18	44	58
No	18	40	62
Total	36	84	120

Pearson Chi2 (1) = 0.0572, Pr = 0.811

Source: Field Data, 2014

From Table 4.15 above, the Chi square statistic is 0.0572 at one (1) degrees of freedom gives us a probability of 0.811 (P>0.05). Since the p-value (0.811) is greater than the standard 5% (0.05) error term, our chi square test is insignificant. Hence, we accept the null hypothesis and reject the alternative hypothesis.

Therefore, we accept:

H_0: The use of water as source of livelihood has no effect on water availability for households' use all-year round

And then reject the alternative hypothesis that:

H_A: The use of water as source of livelihood has an effect on water availability for households' use all-year round

4.6 Challenges and Potentials to Improve Water Supply

This section catalogues the constraints and potentials that can inhibit or increase existing water delivery infrastructure for increased water supply to households and other user groups in the Ga East Municipality. The items discussed here emanated from discussions with duty bearers and water user groups.

4.6.1 Challenges to Reliable Water Delivery

Increasing Population Growth in the Ga East Municipality has been a major setback to water delivery efforts in the area. The 2010 National Population and Housing Census put the Municipality's population at 259,668 comprising of 49 percent males and 51 percent females. It has 66,286 households and a household size 3.8. The growth of the population is mainly due to the influence of migration inflows with concentrations mainly along the urban and peri-urban areas of the municipality particularly along the border with Accra Metropolitan Assembly (AMA) to the south. These include Dome, Taifa and Haatso just to mention a few. This continues growth puts a lot of pressure on available water facilities with population growth out-stripping the capacities of existing water schemes. For instance, the PAWSDB was commissioned in 2006 to serve 12,000 people but the area now has over 15,000 inhabitants.

Another issue a grave concern is the non-payment of monthly water bills. Currently, the survival of the existing water schemes is threatened by bill default on the part on beneficiary households. At the time of this study (2014), beneficiaries in the Pantang Area owed the PAWSDB Water Scheme to the tune of GH¢200,000.00. The manager of the scheme lamented that this situation was dwindling the prospects of the scheme and that efforts were being made to prosecute some of the defaulters.

Moreover, inadequate investment in the Sector has stifled expansion in water infrastructure in Ghana at large. Over the past years, governments' actual budgetary allocations to the water sector have dwindled tremendously with actual allocations being far below the budgetary allocations. This has crippled overall progress in Ghana's water sector. For instance, the 2014 Budget Statement allocated an amount of GH¢ 531,389,023.00 to the MWRWH down from GH¢ 598,902,647.00 to the sector in 2013 (Government of Ghana, 2013 and 2014). Of these budgetary allocations, less than the allocations are actually paid to the sector thereby crippling efforts at infrastructural developments.

4.6.2: Existing Potentials for Water Supply in the Municipality

According to the Abokobi Water Scheme Manager (2014), the Abokobi – Sesemi stretch has underground water table and aquifer layers. The layers facilitate the ground-water recharge necessary for the running of water schemes. This under-utilised resource has the potential of supporting two more water schemes in the area with the needed investment. This when explored, will serve many more surroundings and even Dome with potable and reliable water for both households and other uses.

Again, existing boreholes in the area are still productive and can serve some outlying areas in the municipality. There are about eight under-utilised boreholes in the Pantang area alone, which when put to full use, will complement the water schemes in providing water for residents. People in the area have resorted to over-reliance on the water scheme, focusing on in-house connections and no longer use these boreholes regularly.

Further, the existence of Water Management Boards and Water User Groups presents enormous potential in the water delivery structure. These bodies help in the management of water infrastructure and also represent consumer interests on pricing and other issues. Their presence in the Municipality will foster collaboration and participation in not only the provision of water infrastructure, but also in the management of water resources and sustainability. These groups when put to good use, can even contribute to reducing project costs, provide local expertise and facilitate implementation processes.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The study sought to investigate the sources of water available to communities, household's access to these sources, the functionality, reliability and maintenance of these water sources and how its economic use can jeopardize availability for household use in the Ga East Municipality. Descriptive statistics were mainly used in presenting household characteristics, water sources and access. The logit and correlation analyses were employed to ascertain the effects of household location, source of water, costs of water among other on water availability for household use all year round. The findings are presented below.

5.1 Summary of Findings

5.1.1 Bio-Social Characteristics

From the study, 63 percent of all respondents were females and 37 percent were males. Of these, 49.2 percent fell within the ages of 10 to 35 years, 45 percent fell within 36 to 60 years and 5.8 percent were 61 years and above. Forty-four percent were married, 24 percent single, 22 percent divorced and 10 percent widowed. The smallest household size was one person and the largest household size was nine persons, with an average household size of three persons.

5.1.2 Sources of Water and Responsibility at Household Level

In Boi, 75 percent of respondents source water from the water scheme through community shared pipes and household connections with about 12.5 percent resorting to the use of borehole as their main source of water. Seventy percent of residents in Abokobi also use the water scheme in the community, whilst 17.5 percent use boreholes. Ten percent resorted to

the use of well or ponds in both Boi and Abokobi. In Dome, 47.5 percent of people depend on the Ghana Water Company Limited for water whilst 45 percent depend on tanker services for their household water needs. Again, 50 percent of all residents in Dome depend on unapproved sources for their water needs.

At the household levels, adult women are mainly responsibility for fetching water, with 40 percent and 60 percent involvement recorded in Boi and Abokobi respectively and Dome recording the least adult women involvement (25%). Due to the longer distances and stress associated with securing water in Dome, the responsibility of fetching water lies heavily with men and young girls (30% and 35% respectively).

Relating the water source used by household to respondents' level of education, the findings indicate that of all users of water schemes, only 10.2 percent have university education, 32.7 had Senior High education and 14.3 had no formal education. For those who rely on tanker services, 10 percent had university education and 26.3 percent had no formal education. No household with university education is connected to the GWCL pipe connection and 63 percent had Senior High School education. Of those who use borehole as their source of water, 30.8 percent had university education.

5.1.3 Households' Access to Water

Of all the respondents, 51.7 percent have access to water all year round and 48.3 percent do not have access to water all-year round. Respondents in Boi recorded the highest all-year round access to water of 82.5 percent, followed by Abokobi with 72.5 percent with no respondent in Dome having access to water all-year round. Water availability all-year round is associated with source being used by the household with those using water schemes

recording access levels of 83 percent. This is followed by users of wells or ponds (70%) and then users of borehole (46.2%). Of households that depended on pipe connections from the Ghana Water Company Limited and on tanker services, none has access to water all-year round.

The pay-as-you fetch practice dominates the municipality with 65 percent of households in that category. The remaining 35 percent with household connections are billed monthly. This category owed the Pantang Area Water and Sanitation Development Board (PAWSDB) to the tune of GH¢ 200,000.00 as at the time of this study. This makes the pay-as-you fetch a better alternative.

Tariff regimes are generally affordable in Boi and Abokobi, with 85 percent and 90 percent respectively responding in the affirmative. About 45 percent of households in Dome consider the regime not affordable. In Boi and Abokobi, households pay as low as GH¢ 0.05 for a bucket of water whilst in Dome they pay about GH¢ 0.75 per bucket.

Water points are generally easy to operate in all communities with Boi, Abokobi and Dome recording 85 percent, 90 percent and 70 percent respectively for ease of operation of facilities, with some 20 percent finding it difficult to operate in Dome.

Forty percent and five percent of respondents within the age group of 10 to 35 years spend less than five minutes and more than fifteen minutes respectively between home and water point. For those within 36 and 60 years, 30.8 percent spend less than five minute and 9.2

percent spend more than fifteen minutes in fetching water. Respondents who are 61 years and above (5.8%) spend less than five minutes in fetching water for household use.

Functionality of the water system approximated to frequent breakdown and time duration for repairs indicated that Dome has the lowest functionality rate with 21 days' duration. Boi and Abokobi recorded six and four days respectively.

Maintenance of the water facilities is in line with the Community Water and Sanitation Agency's guidelines. The facilities in Boi and Abokobi have made provisions for a 24-hour standing trained pump mechanic in the area. Spare parts are also readily available in Madina, Accra and Cape Coast. Preventive maintenance is also conducted on the facilities at least once a year to prevent any serious breakdown.

5.1.4 Water Storage and Water Use

Water is mainly stored in plastic barrels (32.5%), followed by jerry cans (25.8%), Poly tanks (20.8%) and then buckets or pans (6.7%). Buckets and jerry cans are mainly used in Abokobi and Boi for household water use only. Respondents whose livelihoods are dependant on water and most home in Dome use large plastic barrels and poly tanks to store water.

Though there are many competing uses of water, satisfying household needs like cooking or drinking remains important to the respondents (47.5%). This is followed by cleaning and washing (30%) and then selling of water to others stands at 19.2 percent.

5.1.5 Use of Water for Livelihood Activities and Availability for Household Use

An average of 30 percent of respondents used water for other economic activities rather than household use, with serious concentration of such activities in Dome. Correlation results in this light have shown a weak negative relationship between water use for economic activities and its availability all-year round for household use.

Since this does not indicate the actual effect the use of water for livelihood activities has on availability for household, a further logistic regression analysis was conducted. The logistic regression results confirmed that the use of water for livelihood activities has no significant relationship on households' access to water all-year. Since the probability of 0.811 from the chi-square statistic is greater than 0.05, we accept the null hypothesis and reject the alternative hypothesis.

Washing bay operators, construction workers and sachet water producers resort to tanker services, wells or ponds and underground water respectively for their activities. They do not rely on water schemes for their operations. Food vendors, however, use water from the water schemes for running their operations.

5.1.6 Challenges and Potentials to Water Delivery in the Municipality

There are three main challenges of water supply in the Ga East Municipality. The major challenge is increasing population growth, mainly driven by migration. Another issue that threatens the survival of the existing water schemes is non-payment of water bills. Lastly, inadequate investments in the water sector in Ghana also posses serious threat to water delivery in the municipality.

There are some potential that can be explored to increase water delivery in the municipality. Firs and foremost, the large aquifer layer stretching from Abokobi to Sesemi serves as a reservoir for underground water. Again, the existence of under-utilised boreholes in the Municipality can complement water delivery in out-lying communities. Further, the existence of Water Boards and Water User Groups present a great opportunity for community collaboration in the water delivery efforts.

5.2 Conclusions

The research recognises the fact that issues that shape and influence communities' access to potable water are multi-dimensional and draw resources from the socio-cultural, political, economic and institutional spheres of life. The findings show that the main determinants of community access to water all year round are the location of the community and the source of water used by the community. It is interesting to note that one's level of education and the use of water for economic activities have nothing or very little to do with household's access to water.

The study further revealed that, the responsibility of fetching water for household use rests mainly with adult women in Boi and Abokobi. In these two communities, adult women fetch water from community shared stand pipes or household piped-in points or sources. This makes sourcing water less risky and less time consuming, allowing more time for other economic activities. A lot of policy issues emerged from Dome, a community with high population density and yet without any reliable source of water for household use. Majority of the people here depend on pipe lines extended from the Ghana Water Company Limited, this is however not reliable as water rarely flows to the community. The second largest source of water used by households is tanker services which are not only unreliable, but are

expensive, time-consuming and in most cases contaminated from source. The sources drawn by these tanker operatives are outside the community and transportation is done using trucks which adds to the cost build-up for water. This ties the price of water (a necessity) to the fluctuating fuel prices and the discretion and profit motives of tanker operators.

5.3 Recommendations

Based on the findings and the conclusions drawn from the data collected from the Ga East Municipal Assembly on water availability and communities' access for development, the study recommends the following;

First and foremost, the limitation of the study was the inability to explore more perspectives of the term "Development". In this study, development is looked at from the point of generating income from water so as to improve households' range of choices. This view could have been expanded to look at the extent to which the water facility has reduced incidence of diseases, the happiness index associated with having potable water, savings on water among others. Given the inability of this study to explore these and more perspectives, I will recommend that attention of future research works around water can focus on any of these aspects of development.

Again, it was found in many instances that the average cost of water has a negative relationship with water availability and access for household use all-year.. This trend, as depicted by the findings is worrying and condemns many others who are poor and can not pay the full costs of water services into perpetual denial of access. Access to water is a fundamental human right decreed by the United Nations and stipulated clearly in the 1992 Constitution of the Republic of Ghana. Denial of access to water based on cost of the

commodity is therefore a breach of the constitution. The study therefore proposes that the assembly and other stakeholders in the water industry should have a serious look at this and initiate processes at reversing this trend.

Further, there is enough evidence pointing in the direction of water schemes as the cost effective, reliable and user-friendly way of providing potable water to communities without compromising its sustainability. Future efforts by government, development partners and other stakeholders should be geared towards collaborating more in the area of raising funds to provide more water schemes for the people of the municipality. Special interest should be given to Dome and other communities that share in its plight. The invisible boundary between the Community Water and Sanitation Agency and the Ghana Water Company Limited should not deny people access to a basic right and necessity. If necessary, water schemes or boreholes should be provided for the people of Dome (urban area and it is GWCL's responsibility to provide water for them in the long term. The pay-as-you fetch practice should be adopted going forward since billing households monthly has the tendency of crippling the whole scheme through non-payment of water bills.

Of serious concern is the increasing use of young girls of school-going age in search for water, particularly in Dome. This practice has the tendency of affecting the girls' performance and retention in school, and subsequently, facilitating their drop-out from school. As a matter of urgency, the Municipal Assembly should liaise with the Municipal Education Office to find a lasting solution to the problem before it gets out of hand.

More so, immediate steps should be taken by the Municipal Assembly and other duty bearers to assess the productivity and reliability of existing boreholes in the municipality for

mechanisation purposes. This should be done with the backdrop of putting all available water points to full use to serve the growing population in the Municipality.

In the interim, water user groups and associations in Dome should be sensitised to verify the suitability of sources from which tanker drivers draw water from. If their capacity is built in that direction, they can engage both tanker operators and the assembly on realistic measures that will provide the community with potable water and reasonable prices.

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APPENDICES

APPENDIX 1

HOUSEHOLD QUESTIONNAIRES

INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER)

UNIVERSITY OF GHANA

MASTER OF ARTS IN DEVELOPMENT STUDIES

WATER AVAILABILITY AND COMMUNITIES' ACCESS FOR DEVELOPMENT: A CASE STUDY OF THE GA EAST MUNICIPAL ASSEMBLY

DECEMBER 2014

Introduction

My name is **Shamwuna Salifu**. I am a student of ISSER, University of Ghana pursuing a Master of Art in Development Studies Degree. As part of the requirement for the award of the degree, I am undertaking research into "**Water Availability and Communities' Access for Development: A Case Study of the Ga East Municipal Assembly".** The interview will be approximately 15 minutes and all responses given are solely for academic purposes and will be kept confidential and anonymous. Participation is voluntary, but I will appreciate it if you will spend some time for this interview.

IDENTIFICATION
1. Community ……
2. Number of Water points in the community? .....
3. Water point code: .....

Interviewer's Name:…… Questionnaire ID:……

Date:……. Time Started:……

Time Ended:……

SECTION A: DEMOGRAPHICS OF HOUSEHOLD MEMBERS

Number	Name	Relation to Head of HH	Sex	Age (Yrs)	EDUCATION				LITERACY	OCCUPATION	Marital Status
					FOR 10 YEARS AND ABOVE		5-14 YEARS		5 YEARS +	15 YEARS +	
					Did (NAME) ever attend school? IF NO, SKIP TO 14?	What is the highest level and class (NAME) has achieved)?	Is (NAME) currently in school?	What kind of school does (NAME) attend?	Does (NAME) know how to read and write?	What is (NAME) main occupation?	1-Married 2-Single 3-Divorced 4-Wodow
04	05	06	07	08	09	10	11	12	13	14	
			M-1 F-2		YES NO	LEVEL CLASS	YES NO	1-GOV'T 2-PRIVATE	YES NO		
01			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		
02			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		
03			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		
04			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		
05			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		
06			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		
07			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		
08			1 2	☐☐	1 2	☐ ☐	1 2	1 2	1 2		

Key:

06	10		14
	LEVEL	CLASS	
1=HEAD, 2=SPOUSE, 3=SON/DAUGHTER, 4=FATHER/MOTHER	1=PRIMARY	1=P1, 2=P 2 ,3=P 3, 4=P 4, 5=P5, 6=P 6	00= NO OCCUP, 1=AGRICUL., 2=PASTORALIST , 3=FISHER, 4=ARTISAN
5=BROTHER/SISTER; 6=GRAND SON/GRAND DAUGHTER	2=SECONDARY/HIGH	1=JSS 1, 2=JSS 2, 3= JSS3 4= SHS1, 5=SHS 2, 6=SHS 3, 7=SHS 4	5=TRADER, 6=PAID EMPLOYEE, 7=STUDENT, 8=APPRENTICE
7=UNCLE/AUNT, 8=NOT RELATED, 9=OTHER (SPECIFY)	3=COLLEGE/UNIV.	1 = 1st YEAR, 2 = 2nd YEAR, …,4=4th YEAR	9=HOUSE WIFE, 99=OTHER (SPECIFY)

B: Characteristics of Household Potable Water Source

15. What is the main source of water available in this community? 1. Dam 2.Borehole 3. Well/Ponds 4. River 5. Pipe borne water 6. Small town Water System 7. Tanker Services 8. Other (Specify)……
16. Which source of water is mainly used by your household? 1. Dam 2. Borehole 3. Well/Ponds 4. River 5. Pipe borne water 6. Small town Water System 7. Tanker Services 8. Other (Specify)…….
17. Who provided the water source used by your household? 1. Government/District Assembly 2. NGO 3. Community 4. Household 5. Other (Specify)……
18. Where is the water source located? 1. Inside House 2. Outside House (community shared) 3. Outside Community 4. Other (Specify)……
19. What was the household /Community's contribution or role in the provision of the water facility?.....
20. Who is responsible for managing the water source? 1. Government/Assembly 2. Community 3. WATSAN/Water board 4. A Private person 5. Other (Specify)..

C: Access to Water

21. How far is the water source from household?.....(minutes)
22. How will you describe the operation of the water facility? 1. Very Easy 2. Easy 3. Difficult 4. Very Difficult
23. By what means do your fetch water to the home for use? 1. Carry head pan/bucket 2. Household Pipes-in 3. Use of a truck 4. Other (Specify)……
24. Who is responsible for fetching water from the source to the household? 1. Adult women 2. Adult men 3. Girls 4. Boys 5. household head 6. Other (Specify)….
25. Is water from source free or paid for? 1. Free ( ) 2.Paid ( )

26. If "Paid" to QUE. 25 above, how much do you pay per bucket of water?.....GHC
27. How do you feel about the amount you pay for a bucket? 1.Very Affordable 2. Affordable 3. Not Affordable 4. Indifferent
28. How many times has the water facility/source broken down in the past 12 months?.....
29. How long did it take for the facility to be re-stored/repaired? 1. Within a week 2. Two weeks 3. One Month 4. Other (Specify)……
30. Is water from this source available for household use all-year round? 1. Yes 2. No
31. If "no" to QUE. 30, what other sources do you resort to? 1. Dam 2. River 3. Borehole 4. Wells/Pond/Spring 5. Other (Specify)……..
32. Is the emergency/support source potable for human consumption? 1. Yes 2. No

D: Water Storage and Use Patterns at Household Level

33. Does your household store water at home? 1. Yes 2. No
34. If "Yes" to QUE. 33, what kind of storage facilities is used in storing the water? 1. Clay Pot 2. Metal/Plastic Barrel 3. Buckets/Pans 4. Jerry cans (Kuffuor gallons) 5. Other (Specify)……
35. Are the storage pot/cans/drums covered? 1. Yes 2. No
36. If "YES" to QUE. 35, how long does the stored water last? 1. One Day 2. Two Days 3. Three Days 4. One Week 5. Other (Specify)……
37. What do you mostly use water for in the household? 1. Cooking 2. Cleaning 3. Washing 4. Bathing 5. Drinking 6. Other (Specify)……
38. Aside household use, do you use water for any income generation activity? 1. Yes 2. No

39. If YES to QUE. 38, what income generation activity do you use water for? ……

40. Is the water available all-year round for that income generation activity? 1. Yes 2. No

41. What is the monthly average income from this activity?.....GHC

42. Do you get enough water to satisfy all household needs and also for this income generation activity all year round? 1. Yes 2. No

43. If NO to QUE. 42, what other sources of water do you resort to? 1. Dam 2. River 3. Well/Ponds/Streams 4. Borehole 5. Pipe Borne Water 6. Other (Specify)…….

44. Is this income generation activity your main source of income? 1. Yes 2. No

45. Given just one (1) gallon of water, what use will you put it? 1. Household Consumption 2. Income Generation Activity 3. Other (Specify)…….

46. What challenges does your household face in terms of water availability and access?.....
.

47. Suggest ways of improving household's access to potable water in your community……..

48. Suggest ways of improving water availability and access for livelihood activities in your community without compromising household use under current challenges……..

THANK YOU

APPENDIX 2

FOCUSED GROUP DISCUSSION GUIDE FOR WATER USER GROUPS (CHOP BAR OPERATORS, WASHING BAY OPERATORS, SACHET WATER PRODUCERS AND BLOCK MOULDERS)

1. What are the uses you put water to?.....

2. From which source do you draw water to support your livelihoods?

3. How reliable is this source of water for all-year round activities?

4. What activities compete with you in your quest to access water for your activities?

5. What relationship do you have with the community, CWSA, WATSAN, MWSMT and other stakeholders in the water sector?

6. What challenges do you face with regards to water access for your activities?

7. How will you describe your relationship with other stakeholders in the water sector?

8. What is the average monthly cost of accessing water for your activities?

9. In what ways do you think water delivery for your activities can be improved?

10. Is your group prepared to pay for the costs of providing potable and reliable water supply for your activities?

11. What potentials do you think can be harnessed to effectively deliver water for your use?

12. In what ways and sectors do you think competing water uses can be harmonized given your available resources?

13. Any other comments?……

APPENDIX 3

INTERVIEW GUIDE FOR KEY INFORMANTS (CWSA, WATER BOARDS, WATSAN)

1. What are the main water sources available to the communities?

2. What is the role of your institution in the whole community water delivery, access and management chain?

3. What have your institution done in the past 12 months to improve the communities' access to potable water for household use and for other economic activities?

4. Which of these sources is recommended for human and household use and why?

5. Is this source available for the community's use all year round?

6. Is there a tariff or user fee for water use from this system? If yes, how much is charged?

7. How long does it take to order and receive spare parts in days when you have money on hand?

8. Who mainly repairs the water system and is the person located within the district?

9. What is the main source of water for drinking, cooking, cleaning and washing cloths in the community?

10. What challenges are faced by your institution in its bid to ensure water access by all community members and for all productive activities?

11. What potentials exist in the communities that can be harness to improve water supply to the communities?

12. Suggest measures to put in place to improve demand side challenges for water delivery in the communities.

13. What concrete interventions will you suggest to be implemented or replicated in other places within the municipality to improve access to water?

APPENDIX 4

Picture 1: PAWSDB Pump Station (Boi)

Picture 2: Boi Reservoir

Picture 3: Sesemi Reservoir

Picture 4: Community Stand Pipe

Picture 5: A male Resident Searching for Water in Dome

Picture 6: A Female Resident Paying for Water in Dome

Picture 7: A Focused Group Discussion Session with Water Users in Dome

Pictures 8 & 9: Mechanized Pumps that Feeds' Reservoirs in Boi and Abokobi

Pictures 10: Water Storage Pans and Barrels

Picture 11: Plastic Barrel for Water Storage