UNIVERSITY OF CAPE COAST

ACCESS TO AND MANAGEMENT OF POTABLE WATER IN THE GA WEST MUNICIPALITY

BY

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: …….. Date: ……

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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ABSTRACT

The supply of potable water to the home is vital because water is a prerequisite for existence. Due to the growing scarcity of fresh water which is a result of increased needs for water, management becomes the essential component needed to ensure its sufficient and continuous supply. The Ga West Municipality faces the problem of inadequate potable water supply hence the need to manage the water resources available to them. The study was conducted to assess the mode of obtaining potable water and how the system of accessing it was managed.

Data was gathered from a total of 274 respondents using questionnaires and interview guide. It was found that the major sources of water for households were river water, groundwater (wells and boreholes), harvested rainwater and imported tap/sachet water. As a management strategy, these sources were accessed in order to minimize cost, time and energy spent in accessing water. However, thirty percent of households tried to improve upon the water quality by using methods such as filtering and boiling before it is used in the home.

Water required for each personal or domestic use must be safe. The District Water and Sanitation Team should educate community members on simple but effective methods of improving upon the quality of the available water sources to ensure efficient domestic utilization of available water sources and also encourage rainwater harvesting in larger quantities.

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DEDICATION

This work is dedicated to my family-the Adjakloe family.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ACRONYMS

CPRC	-	Chronic Poverty Research Centre
CWSA	-	Community Water and Sanitation Agency
DFID	-	Department For International Development
DWST	-	District Water and Sanitation Team
GWCL	-	Ghana Water Company Limited
GWDA	-	Ga West District Assembly
GWP	-	Global Water Partnership
HHEP	-	Household Economic Portfolio
HWTS	-	Household Water Treatment and Safe Storage
IWRM	-	Integrated Water Resource Management
TAC	-	Technical Advisory Committee
UN	-	United Nations
UNDP	-	United Nations Development Programe
UNICEF	-	United Nations International Child Education Fund
WHI	-	Water Health International
WHO	-	World Health Organisation

CHAPTER ONE

INTRODUCTION

Background

Water supply systems are important facilities to every society. Provision of potable drinking water to homes and industries is necessary for development. This is because water as a resource is a necessity for existence. "Water sustains life in the same way that food does" (Abane, 2005: p107). It facilitates other natural cycles including the hydrological, biogeochemical and climatic cycles. According to Simmons (1991), water is the commonest compound on earth and it is not only essential for life but has become interwoven with human livelihoods in various inextricable ways. Many do not consider it as a nutrient but it forms greater proportion of our diet. Therefore, any environmental factor that affects the activity, structure or physical state of water poses a threat to life (Somero, Osmond & Bolis, 1992). Aside this issue, any human activity that reduces the quantity (i.e. sufficient water supply for personal or domestic uses) and quality (i.e. safe water for personal or domestic use) of water may affect its access and management at all levels (World Water Council, 2005).

Though water resources are in abundance, it is unevenly distributed on earth. Some areas, especially those in low lying tropical areas have more water resources than the arid areas such as the Namib and Sahara deserts, hence, the

need for the management of water resources to cater for the demand of water (Mattelet, 2006).

More than 1.1 billion people in low and middle-income countries (representing about one in every five people) lack access to clean, safe drinking water (MercyCorps, 2006). The issue of water scarcity in parts of the world has affected its accessibility. Available fresh water is also reducing by quantity and quality due to human development processes such as construction projects in water ways and pollution by industrial waste. Lack of potable drinking water may also cause insanitary conditions leading to ill health. The most affected are people in the developing countries with a greater majority being children. About 4,500 child morbidity cases reported each year is said to be the result of the consumption of unsafe water, and in total about five million deaths are caused by water-related diseases each year (Cunningham & Cunningham, 2004; WHO, 2004).

The human right to water as declared by the UN Committee on Economic, Cultural and Social Rights in 2002 entitles everyone to sufficient, affordable, physically accessible, safe and acceptable water for personal and domestic uses. However, despite major efforts to deliver safe, piped, community water to the world's population, the reality is that delivering safe water will not be available to all (Agarwal, 1981). The cost of accessing potable drinking water can be expensive depending on its quantity and quality. This has its own implication on accessibility.

Potable drinking water standards are based on two criteria which are the presence of objectable tastes, odours or colour and the presence of substances with adverse physiological effects (Davis & Dewiest, 1966).

Potable water or fresh water is water that is low in minerals, silt, biological content, and is abiotic (i.e. must be free from any life form such as bacteria, worms, larvae, etc) (Simmons, 1991). According to Sincero and Sincero (2003), there should not be any noticeable taste at a point of use of any drinking water. Redefined by the Drinking Water Review Panel (2002), potable water is water that does not contain micro-organisms or any other substances at concentrations that presents danger to health.

About 60 percent of the population on the African continent has access to safe drinking water supplies (Sobsey, 2007) which come from hand pumps, wells, (which has its source from groundwater) and treated surface water supplied as tap water. This percentage however, masks the uneven distribution and access to potable drinking water. For instance, while about 88 percent of the population in Mali has inadequate access to clean water, it is better off when compared to Ethiopia which has about 94 percent of its population have inadequate access to clean water, though both countries are located on the African continent (Cunningham & Cunningham, 2004).

In Ghana, over nine million people have inadequate access to potable water (WaterAid, 2006). In most cases, it is the cost involved in accessing potable water that determines its accessibility. The policy of the then Ghana Water and Sewage Corporation (GWSC) included the supply of potable water to rural communities based mainly on groundwater sources because groundwater is considered not only feasible but also as the most economic source of rural potable water supply (WaterAid, 2006). But the use of groundwater sources is actually not feasible for all communities. This is because, though groundwater might be one of the inexpensive ways of

supplying water in some areas such as the Northern part of Ghana, the situation is different in some areas in the South. Water from some wells and boreholes in the South has some level of salinity, which either limit their functions or render them unproductive (DWST-GWDA, 2007).

Most of the localities in the Greater Accra Region depend on rivers, streams and canals for their water supplies (Sarpong, 2004). Though this region hosts the capital city of the country, it is no exception when it comes to issues surrounding access and management of potable drinking water. It is expected to have better condition than the other regions in the country since it is the seat of government. However, due to the unequal distribution of facilities, increasing population resulting in competition between industrial and domestic water demands, many communities within this region still have inadequate supply of potable water.

Communities with water supply systems that constantly supply homes with potable water even sometimes face acute water shortages. Some communities have not had any form of town supply systems to provide their homes with potable water. Therefore, people spend quite some time in accessing potable water; and this is mostly carried out by females and children in the home.

Statement of the problem

Efforts made by the government to improve water supply has not yielded the expected results because potable water is still lacking in many communities. This brings along with it various challenges in accessing potable water for domestic use. The communities in the Ga West Municipality are no

exception. In 1999, the Ga District placed first in the incidence of the Buruli Ulcer, a disease which was partially caused by inadequate potable water supply (Kofie & Nabila, 2004).

The 2000 population and housing census showed that the area had a density of 491 persons per sq. km which was much higher than that of the national average (i.e. 79.3 persons per sq km), indicating greater pressure on resources including water. Though, some of the communities in the municipality have boreholes and private wells, high levels of salinity and mineral content render them unproductive (DWST-GWDA, 2007). In addition, one of the main rivers in the municipality (i.e. the Nsakyi River) is polluted due to development and poor sanitation conditions rendering it unsuitable for drinking without any prior treatment (Johannesson & Olsson, 2009). When the supply of water available from a source is insufficient (in terms of its quantity and quality) to cater for the needs of its population, its users most often than not devise individual and collective responses to water scarcity (Drinking Water Review Panel, 2000).

What seems to have worked, historically, is the highly individualized and localized strategies of accessing and managing the available water resources in the municipality (Das, 2006). This involves providing safe drinking water for household consumption through the use of the knowledge and skills acquired (or experienced) over a period of time (Shiva, 1989).

The former district capital (Amasaman), which has been maintained as the capital for the Ga West Municipality has always been the centre for planning and the seat of administration since the creation of the Ga District in 1988 (Ga West District Assembly, 2006). Currently, only 17.5 percent of the

population in the municipality has access to potable water, while nationally, it is above 70 percent (DWST-GWDA, 2007). This raises a number of questions:

- What challenges do people face in trying to access potable water?
- What do the selected communities perceive as potable compared to that of water suppliers?
- How successful are the adopted water management strategies in these communities?

The study therefore sought to find out the major sources of potable water in the Municipality, its management strategies adopted by the people, and the challenges faced while accessing potable water using time, distance, convenience and monetary cost as key variables.

Objectives of the study

The general objective of the study was to assess the mode of obtaining potable water and how the system of accessing it is managed. The specific objectives were to:

- Identify major sources of water in the selected communities;
- Discuss the challenges faced by these communities in their quest to find potable water;
- Examine the quality of water accessed by the people in these communities using their perception of potability and that of the water supplier agencies; and
- Discuss the adopted management practices of potable water at the household level in the Municipality.

Research Hypothesis

The research is guided by the following hypotheses;

- Ho: There is no significant relationship between location and time spent in accessing water.
- H_1: There is a significant relationship between location and time spent in accessing water.
- Ho: There is no significant relationship between perception of potable water and age
- H_1: There is a significant relationship between perception of potable water and age.
- Ho: There is no significant relationship between level of education and management strategy.
- H_1: There is a significant relationship between level of education and management strategy.

Rationale for the study

Water is a basic need for survival. This very important element of life is in abundance (i.e. from surface water and groundwater) in most parts of the Ga West Municipality such as Pokuase and Amasaman communities but the concern is about its potability. Information on quality of water in the selected communities and the people's perception of potable water would inform policy makers in their plans concerning these communities. This is because as a strategy of the first Millennium Development Goal, it is having access to pure and clean water that would reduce the incidence of poverty and promote good health by preventing waterborne diseases.

Since most water sources are located away from homes, many community members may face several challenges in accessing potable water. Information on these challenges would suggest solutions to reducing the inconvenience, energy, cost and time in accessing potable water.

Due to the challenges faced by the people from the selected communities, many people have also adopted management strategies in their home to ensure the constant supply of potable water. Assessing the management strategies would also capture those ones which have been successful over the years for most households in these communities. This would contribute to the educational awareness on potable water management in these communities and the need to pay some attention to traditional or indigenous methods in making water potable. The research findings would also serve as a platform for further research.

Justification for choice of the study area

The Ga West Municipality is one of the newly created districts in the Greater Accra Region of Ghana since the year 2004 (Ga West District Assembly, 2006). Formally known as the Ga district, the area has now been divided into three municipalities (i.e. the Ga West, East and South Municipalities) as part of the government's initiative to promote decentralisation in the country. However, the former capital (Amasaman, created in 1988) still remains the district capital for the Ga West Municipality.

The Ga West Municipality is one of the fastest growing districts in the Greater Accra Region. Water which is a basic necessity was assumed to be available and accessible to the majority in this municipality. However, the

situation is different and most people in the municipality still do not have adequate access to potable water to improve their quality of life.

Chapter organization

The research is arranged into seven chapters. Chapter One outlines the background of the study. Following this is the second chapter which reviews related literature. This involves discussions on the available body of knowledge concerning water, its accessibility, management strategies, water quality and the challenges people face in accessing it. Chapter Three also reviews theoretical issues and the conceptual frameworks for the study (i.e. IWRM, the Water Governance Framework, the Household Economic Portfolio (HHEP) and the DFID livelihood framework). Chapter Four examines the methodology including the instruments for data collection and sampling procedures.

Chapter Five presents the results and discussion of data from the field. The summary, conclusions and recommendations are presented in chapter six.

CHAPTER TWO

ACCESS AND MANAGEMENT STRATEGIES OF POTABLE WATER

Introduction

This chapter reviews literature related to access and management of potable water. It discusses issues such as the importance of potable drinking water, access to potable water and challenges people face in accessing potable water for household consumption. The chapter also covers issues surrounding the management of water and various strategies adopted in managing potable water in the home.

Importance of Potable Drinking Water

The earth is the only place where liquid water exists in substantial quantities (Cunningham & Woodworth, 1997). Satellite photographs of the earth confirm that this is a water planet; that element giving it a delicate blue colouring. Indeed water is the commonest compound on earth and not only essential for life but has become intertwined with all aspects of human lives in various complex ways (Simmons, 1991). Because all cells, at least those that are metabolically active are approximately 85percent - 95percent water, it is a truism to state that any environmental factor that affects the activity, structure or physical state of water poses a threat to life (Somero et al, 1992). Also, the biological and genetic make up of humans show that we are made up of water,

therefore, we cannot survive without it. Clean and safe drinking water is a necessity and an essential part to our diets (Medicinal Food News, 2008).

Water also plays a fundamental role in the climate regulation cycle and studies are not actually required to demonstrate the immense value of adequate potable drinking water in ensuring good health (Shiva, 1994). For good health and economic development, water is essential. The availability of potable drinking water improves hygiene and prevents some communicable diseases and as well serves as an indirect way of helping to reduce poverty.

As a strategy for ensuring environmental sustainability, the seventh Millennium Development Goal (2000) notes the need to make water in available quantities to all. That is, to reduce by half the number of people without access to clean water by 2015. This is imperative because its helps to protect both environmental and living conditions of people through environmental management. This directly links issues about management of the environment to economic growth and poverty reduction by involving the participation of the members in the community who will be accountable to protect the environment using simple management skills. This includes rehabilitation and biodiversity conservation sites (Stockhlom Environmental Institute, 2008).

Adequate potable water supply for domestic use especially is often used as a yardstick for measuring the level of the socio-economic development and health status of human communities. To support a country's population and economic goals, the requirements is to have a steady supply of high quality fresh water (National Academy of Science, 2006). Socially, reliable potable water provides relief for those involved in its access such as women

and children (Essaw, 2001). Individuals, families and industries all depend, to a large extent, on the provision of clean, potable and affordable water (Eguavoen, 2008). The water required for each personal or domestic use must be safe and therefore be free from micro-organisms, chemical substances and radiological hazards that may constitute a threat to a person's health. It must also be acceptable in terms of colour and odour so that individuals will choose it rather than polluted alternatives that may look more attractive (World Water Council, 2005).

Though water sources (mainly ground and surface water) are supposed to be potable water sources, human contact through development activities has reduced not only the quantity of available freshwater but also the quality through contamination, making these sources not potable for drinking in its raw state. This makes water from such source require some form of treatment and management in order to make it potable for drinking.

Access to Safe Water

Though water is essential to life, only less than a percent of the world's total supply is accessible fresh water creating its scarcity in some parts of the world (Cunningham & Cunningham, 2004). This is also coupled with the contamination and pollution of water resources, especially surface water in some areas by human activities. The result of this affects the availability of fresh water which then will have implications on its access. Groundwater is a safer source compared to surface water sources since it is protected from direct contamination and filtered through the soil (VanCalcar, 2006).

Access refers to one's ability (i.e. monetary cost) and capability (i.e. distance, time, convenience and energy) to reach those facilities that will enhance one's living condition (Abane, 2005). The issue of accessibility also involves the facility being located within safe physical reach, being affordable and being accessible in law. Also the information on the facilities is to be made available to the users of those facilities (World Water Council, 2005).

Access to facilities such as potable water supply, healthcare, clothing and education can be cumbersome making some homes having little or no access to them (Moe & Rheingans, 2006). According to the estimates of WHO/UNICEF (2006), households which are found in the low income areas are over five times more likely to lack access to improved water supply than households in the high income areas in the same country. Blakely, Hales, Kieft, Wilson, & Woodward, (2005) observed that households that earn less than a dollar a day may be almost nine times more likely to lack access to improved water or sanitation than those earning more than two dollars per day.

Access to sufficient potable drinking water has been declared "a fundamental human need and, therefore, considered as a basic human right" (Annan (2002), quoted in WHO 2002). Encumbered by the continuous increase in the world's population, the security of water has raised much attention in the world. Low income and middle income countries are especially faced with the competition of access to facilities because of rising population numbers which affect the poor (UN-Habitat, 2006). Annan (2000) warns that the world's security is dependent on solving the water crises without which seeds of violence may sprout.

Inequitable access to water and sanitation is usually the result of disparities in fresh water resources, income, power and sometimes institutional capacity which is mostly present within countries (Moe & Rheingans, 2006). This disparity exists between the rural and urban communities concerning access to basic utility services such as water (Sarpong, 2004). This is because many people may lack the ability (i.e. in terms of monetary cost) or economic power to access a utility. The issue of disparities in access to water is complex. There is, therefore, the need to improve financial sustainability in the provision of these basic services to all. Universal access to affordable household water treatment such as the Pure Home Water treatment system, and safe storage of water can be provided for those who still rely on existing but unimproved water sources such as water from rivers or streams (Moe & Rheingans, 2006; VanCalcar, 2006).

Challenges in Accessing Potable Water

Comparing the various regions in the world, some households have to resort to the use of multiple water sources whenever and wherever possible (Engel, Iskandarani, & Useche, 2005). This is dependent upon their perception of quality and availability. It also makes water users dynamic because households have to come to a decision on the source of water to access and its use in the home during the various seasons of the year (Eguavoen, 2008).

The supply infrastructure for water supply systems is fixed while that of the demand for water keeps on rising because of the increasing need for it. This results in water supply shortages because the supply of water is not

moving at the same pace as that of demand (Stockholm Environmental Institute, 2008). This problem may be the result of the rising needs for water. For example water is needed for industrial, domestic and agricultural purposes. However, water is now a scarce natural resource that needs management to sustain its continuous supply (Moe & Rheingans, 2006).

Depending on the location and quality of a facility or utility, access to it could be either easy or stressful. For instance, women in developing countries, especially those in Africa, have to face the daily task of accessing enough water to meet the needs of their families by walking long distances and spending much time in accessing it. Of more importance is the condition of the water source which most often than not contaminated. Water accessed should be safe and its source protected from contamination and other human activities (World Water Council, 2005). Good quality supply of water alongside health and education has been accepted as the only certain method to help provide efficient domestic utilisation of any water resource (Tenkorang, 2002).

Doyal (1995) citing Rodda (1991) stated that the stress involved in accessing facilities especially that of water depletes more than a quarter of the energy gained from the daily food intake of women. In rural areas and villages without regular water supply, women and children devote about 15percent - 25percent of their time to obtain water for household use (Essaw, 2001). They usually carry very big pans and containers to enable them carry as much water as possible at a time. The heavy load on their heads and long distance they have to walk drains much of their energy which reduces their level of productivity (WaterAid, 2006).

Basically the collectors, transporters, users and managers of water, women are also to decide on where to collect water for the various household purposes during the different seasons of the year. These decisions include the quantity and quality of water to collect and for which purpose in the home. This they do by considering the choice of water source which is based on the condition of access, time, effort, quality and quantity and then their reliability (Tenkorang, 2002).

Studies also show that people use an average time of two hours to access water for their households in the developing world (Cunningham & Cunningham, 2004). In Ghana, however, the average minutes spent per day to fetch water is about forty-three while that of the Greater Accra Region is about twenty-four minutes (Ghana Statistical Service, 2002). Because of recent water shortages, communities are obliged to travel long distances to fetch water, which may be less in both quality and quantity (Sobsey, 2007). Quantity of water used differs based on the distance from the water source and climate. In situations where people spend more than 30 minutes in accessing water, they tend to reduce the per capita water used (usually between five to ten liters per day) (Gleick, 1996). These situations faced by most people coerce them to adopt new management strategies to help reduce some of the challenges they face in accessing those utilities.

Though various governments have devised various management strategies to ensure constant supply of water to the majority of its people, the basic fact is that, it is nature and not water supply schemes, which supply water (Doyal, 1995). Therefore, the issue of supplying potable water to all is

still a difficult target to reach for most governments especially in developing countries.

Only a small portion of the population on the African continent has access to safe water supplies (World Vision International, 2007). In Ghana for instance, the percentage of people with access to safe water between 1993 and 1995 was 76percent in urban areas and 46percent in the rural areas (National Water Supply and Sanitation Survey, 1993). Though this coverage has since increased to about 76percent for both rural and urban communities in the nation (United Nations Development Programme, 2006), expanding the water supply is now more politically expedient than raising the charges (Kendie, 2002).

The main reason for poor access to safe water is the inability to finance and adequately maintain the necessary infrastructure. The increase in demand resulting from population increase and the rise in new needs for water such as irrigation and agriculture coupled with the scarcity of water resources have become the contributing factors.

The issue of inadequate potable water supply may sometimes not be the result of the lack of facilities, but dependent on the public policies and decisions made by government on the allocation of resources in these communities (WaterAid, 2006). For instance, the government privatizing the supply of water usually called the “commoditisation of water” could have implications on the financial cost of the water accessed which will affect the poor. This calls for the proper management strategies by governments to help make affordable potable water available to the majority of its population.

Management of potable water in the home

According to the Ghana Poverty Reduction Strategy's Annual Progress Report, management involves the implementation, monitoring and evaluation of proposed policies that will improve accessibility to amenities by all (Ghana Statistical Service, 2008). In addition, management ensures that there is an increase in both the quality and quantity of a resource or facility by the use of strategies that have been developed using challenges experienced in the past. On the other hand, water management comprises the actual processes by which water resources are allocated and delivered (www.id21.org, 05/2009). Therefore central to the provision of water are the issues of water quality, sufficiency and the continuity of supply. These also involve the allocation of available water for its effective use to ensure its sustainable supply (WaterAid, 2006). Due to the unavailability of large infrastructure systems to supply rural and periurban settlements, individual water treatment at the household level and safe storage is of importance (Sobsey, 2007). Water management in the context of the research therefore, primarily involves the household's method of water collection, sources from which water is accessed, its treatment, allocation and storage.

Water resources management and development are central to sustainable growth and poverty reduction. Though there is a growing scarcity of water resources, proper management starting from the household level will help provide adequate water for all. Doyal (1995) stated that lack of water makes domestic task more difficult. Management of water supply should be a shared responsibility between the government and the local community (Essaw, 2001).

The new policy introduced in 1993 in Ghana by Ghana Water Supply and Sanitation aims at ensuring the provision of sustainable water and sanitation facilities. These are provided through a demand responsive approach and a shift from the dependence on government towards greater self-reliance by user communities and the household or individual level. In rural areas for instance, these policies include the provision of services through community participation in terms of ownership and management of the facilities, especially that of water (Ghana Water Supply and Sanitation Policy, 1993). For instance, the Clean Water Act of the United States which focuses on improving water quality by establishing standards and financial assistance to address the causes of pollution has enabled the USA to have one of the safest water supplies in the world. Therefore, communities should have useful access and knowledge of their drinking-water quality which should involve its monitoring and assessment (Sincero & Sincero, 2003).

Simple management strategies at the household level can help provide both safe and affordable water for household consumption even in cases where there is no major water supply systems to supply homes with potable water. Though some rural communities may have access to community water supply systems it is not all rural communities that may have access to these systems. Therefore there is still the need for household management strategies which should involve techniques in making water potable and proper allocation of water from different sources for different purposes.

The year 2005 saw a start-up social business which was named the Pure Home Water (PHW) in Ghana. Since access to improved water supply by homes is not available to all it was part of the management strategy to help

make available water potable for domestic use. Some people still rely on water from rivers, streams, ponds or unprotected springs and hand dug wells for drinking and other purposes in the home. There is therefore the need to promote and sell household water treatment and safe storage (HWTS) technologies while people wait for improved water supply (VanCalcar, 2006).

There is now conclusive evidence that simple, acceptable, low-cost interventions in the home and even at the community level are capable of dramatically improving the quality of water for household use and as well reduce the attendant risks of diarrheal disease and death (Sobsey, 2007). On the other hand, it has been noted through micro-level studies in some rural areas that have adequate access to potable drinking water that hygiene-related diseases still occur. This is because unmanaged improved water supplies coupled with inadequate sanitation and poor hygiene practices can escalate hygiene-related diseases (Kendie, 2002). New methods which are effective but inexpensive have been developed to ensure the availability of quality or potable water to all especially those in developing countries.

Though there are various water management strategies developed by scientist to help improve the quality of water accessed in the face of increased pollution and contamination, it is only through education that it may be adopted by people. A growing concern on water crisis had to be addressed very differently from previous reform strategies in order to ensure available potable water for all (Suresh & Prabhu, 2007). This is because former strategies have failed in assuring adequate access to potable. For socio-cultural acceptance and changing people's beliefs and behaviors towards the use of new management strategies, public education is very important in achieving

sustainability and affordability in the provision of safe water (WHO, 2008). Some of these strategies have been tested and implemented to some extent in both developed and developing countries (Sobsey, 2007).

Domestic Water Management in Ghana

At the household level, water needed for drinking, cooking or food processing, waste disposal, childcare, washing and even keeping animals, requires careful management, though allocation can be affected by water quality and availability (Doyal, 1995). Management of water resources are most often necessitated by the continuous emergence of new needs including the opportunities as well as problems limiting water availability (Lane, 2006).

Proper management techniques go a long way into providing improved water supply for use. A survey conducted in the Upper regions of Ghana showed that over two-thirds of the compounds studied had their stored domestic water polluted. This pollution was a result of the conditions under which the water was collected, carried or transported home and stored for use (Kendie, 2002). In managing water in the home, Johnson (2007) noted that regardless of whether or not collected household water was initially of acceptable quality, it often becomes contaminated during the transportation and storage due to unhygienic storage and handling practices. This involves the type of vessel used in accessing the water, the storage condition and more importantly, how the water is retrieved for drinking (Kendie, 2002).

Issues about the household method of water collection involve the containers used in collecting water and the mode of transporting the collected water from the collection point to the home. Most rural areas in Ghana use

bowls, gallons, and pans among others to collect water from the source. These containers are then carried on their heads or in some cases conveyed to the home on locally made trolleys which need manual energy to move. This depletes a lot of energy, especially for those who live in deprived areas and are refused some of the basic facilities such as a water supply facility (Rodda, 1991, cited in Doyal, 1995). Unlike most urban areas, potable water is provided in the comfort of ones home as tap water making access easy and less stressful (Cunningham & Cunningham, 2004).

The sources of water are usually from nearby streams or rivers, wells or boreholes and sales point of imported tap water. Most of the household water sources are however protected by various ideologies such as religious rites which are characterized by considerable variations, but then, it controls the collection, use and allocation of water (Sobsey, 2007). Following the emergency caused by the reduction of quality and the quantity of water, families frequently lack access to a safe source of drinking water. It is critical in this situation to communicate to families on the need to make water safe by themselves, at home or in shelters, to protect themselves from diseases (WHO, 2007).

Though there are new technologies in making potable water available to the household by way of using simple but affordable strategies of making water potable in the home, education and sensitisation is yet to take effect. Already known to the lot is the use of manufactured water filters which in most cases are a little expensive for the poor to purchase. Traditionally, because women are victims of the burden of providing water, they also have been the source of traditional knowledge and skills to treat and make water

potable, one of which is through boiling the water to kill present bacteria or by using the slow sand filter (Shiva, 1989).

One of the latest inexpensive ways of making water potable is the use of the Ultra Violet radiation (UV light) which is now being used in many rural communities in developing countries such as Tanzania. According to scientists, the UV light (from sunlight) has a bactericidal effect that enables it to sterilize water and make it potable. This can be done by introducing water usually in small amounts to the sunlight for some time (Masschelein, 2002). These methods have limitations which sometimes makes them unsuitable for use on a large scale. For instance, using the UV lights to sterilize water can only be done in small quantities at a time while boiled water needs to be used within a few days or they might be attacked by bacteria.

The use of the available technologies to treat and safely store water in the home is best accomplished when it is accompanied by programmes designed to support community participation, education and other efforts to achieve acceptance and sustainability. The most practiced technology by households in the treatment of their water is filtration with locally made ceramic filters in Ghana (Sobsey, 2007).

The allocation and storage of water in the home is done interchangeably. Water is essential for a range of purposes. With the increasing scarcity, users have to decide about the allocation of water for different purposes. However, though, the allocation is mostly done before the storage of water, most homes prefer to store the water for drinking separately from that of the rest such as that for cooking, washing and keeping animals. In some situations, the allocation is done because the water might have been

accessed from different sources. In other homes, however, since the water is from the same source and considered as potable, there is really no allocation before storage.

Households choose the kind of water treatment depending on the choice of water source and the type of treatment. Also imperative are methods of source water collection and conditions of treated water storage and use. Some of the key factors in providing safe household water include the conditions and practices of water collection and storage and the choice of water collection and storage containers or vessels (WHO, 2008). Still widely used are cisterns and other basins for bulk storage near or adjacent to dwellings, as they have been since ancient times (Sobsey, 2007).

Above all this, it is the affordability, costs and the willingness of the household to pay for water treatment technologies that needs considerations for their implementation, use and sustainability. Also of significance is the convenience associated with the method of treating water. How easy and cost effective it is to provide potable water on a sustainable basis influences the choice of method of water collection, treatment, storage and allocation.

Evolution of water supply in Ghana

Water resources were vested in land owners such as families, individuals and chiefs long before the creation of the statutory laws that vested water resources in the state using both statutory and customary laws under the 1992 constitution. This was followed with the establishment of the Water Resource Commission in 1996 to manage water resources (Sarpong, 2004).

Therefore, any water body found on one's land is now considered to be for the state who is partly the owner of all lands in the country.

Water resources were traditionally used mainly for domestic and limited agricultural use. However, due to development and rising new needs for water such as water for industry and irrigation, water become pluralistic, having both the customary and statutory laws coming into play (Ghana Water Resources Management Study Report, 1998). This has limited both the quantity and quality of water not only in Ghana but the world as a whole.

The provision of basic services such as potable water to the society was viewed to be the government's responsibility. Though established water supply programme were centrally managed by the government, the government was also responsible for raising funds for maintaining it (Lane, 2006). The supply of water to homes and industries in the country was first undertaken by the Water Supply Division of the Public Works Department (PWD) in 1928 where water was supplied through a water supply system in Cape Coast and then later extended to both rural and urban areas in Accra. By 1958, the water supply division was placed under the Ministry of Works and Housing, and later transformed into the Ghana Water and Sewerage Corporation.

One of the central responsibilities of the Ghana Water Corporation then was to supply water to both rural and urban areas. Taking the broad spectrum of the activities of the Ghana Water and Sewerage Corporation (GWSC), it was then considered by the government to create a semi-autonomous body to take care of the rural aspect of the supply of water. Therefore, the Community Water and Sanitation Division under GWSC was

established in 1994 and became fully independent four years later when the name was changed from a division to an agency. The GWSC, now known as the Ghana Water Company Limited (GWCL), was now responsible for the provision of water to urban areas while the CWSA took care of the water supply for the rural areas.

While the CWSA sought to help communities in the co-financing of their own facilities including the full financial responsibility in the case of its maintenance and operation, the GWCL was also responsible for increasing the role of the private sector in urban water supply (www.afrol.com, 04/2009). Table 1 shows the various transformations of the GWCL and CWSA along with other sub committees created over the years went through.

Table 1: **The evolution of Ghana Water Company Limited (GWCL) and Community Water and Sanitation Agency (CWSA)**

Year	Key Event
1928	First development of public water supply systems, operated by the Hydraulic Division of the Public Works Department
1965	Ghana Water and Sewerage Corporation (GWSC) established to be responsible for urban and rural water supply.
1986	Removal of operational subsidy on water supply
1991	GWSC efficiency increased by cutting 1400 jobs and recruiting more qualified personnel
1995	The operation of rural and small town water supplies moved from GWSC to be community managed. Semi-autonomous Community Water and Sanitation Division established to be responsible for facilitating the community water supply management.
1996	Stakeholder meeting selects the 'lease option' for restructuring the urban water sector.
1997	Public Utility Regulatory Commission established (PURC)
1999	GWSC replaced with the publicly owned Ghana Water Company Ltd (GWCL) in urban areas and the Community Water and Sanitation Agency (CWSA) in rural areas. Responsibility for urban sanitation transferred to ministries of local government.
2003	Modification of water sector restructuring project so that management contract option is also available to urban water project.
2004	Preparation of a National Water Policy

Source: WaterAid Ghana, 2005.

Households in various parts of the country were supplied with water by various means. Some were supplied with pipe water from treated surface water sources, others from untreated ground water sources while those in mostly rural areas accessed their water from point sources such as shallow boreholes, wells, and in other situations from surface water sources such as from ponds and rivers (Peletz, 2006). Table 2 shows the various sources of water in both urban and rural areas in Ghana.

Table 2: Sources of Drinking Water in Ghana

Source of drinking water	Ghana	Urban	Rural
Pipe-borne	41.6	80.3	18.8
Well	33.9	10.8	47.2
Natural Sources	24.6	8.8	33.9
Total	100.0	100.0	100.0

Source: Ghana Statistical Service (2003)

Government's Policies on the Provision of Potable Water

The International Drinking Water Supply and Sanitation Decade which started from 1981 and ended in 1990 was closely monitored by the Ghanaian government, and the innovations associated with it was adopted. However, it has not really solved the problem of inadequate access to potable water. It is assumed that water scarcity would be tackled by the Millennium Development Goal in the International Decade for Action –'Water for Life' (WHO, 2006).

Recently, population increase has put pressure on demand and made it difficult for the GWCL to single handedly provide this service to the growing population. The government was prompted by the GWCL's concerns about its

operation cost to reform the corporation and give part of its share to the private sector to come in and support in the provision of potable water to urban areas. One of the aims of the reform was to facilitate the movement of a state's approach to a wider individual and private participation.

This entailed giving over thirty percent of GWCL's share to the private sector, though this came along with its own complications such as the rise in the price of potable water. The adoption of the community-based management approach in the National Community Water and Sanitation Program (NCWSP) in1998 was also to help with the direct involvement of water users. This was assumed to lead to more equity in access as well as better sustainability of water and water resources in the country. The Community Water and Sanitation Agency (CWSA) was created with a number of project by-laws. One of the laws called for the payment of a five percent capital cost towards construction of the pump by the community in need of a water supply system. Included in the condition was that there will be a hundred percent local operation and maintenance of these pumps (Eguavoen, 2008). One of the problems associated with this by law was that those communities which were unable to raise the five percent of total capital cost did not have the privilege to enjoy such water facilities.

Since part of the shares in the supply of water is in the hands of private organizations, some water related non-governmental organizations such as the Water Health International under the Safe Water Network and WaterAid have come to join in making potable water accessible to all at an affordable price. However, Gleick (2003) was emphatic on the issue of where and when such aids from these non-governmental organizations go to. He stated that only

twelve percent of water related aids goes to countries where a high proportion of the population have no access to improved water supplies and this suggests that water aid is most often than not used as a political tool rather than as a means to reduce disparities in access. This is because some governments in most developing countries use this means as a strategy to score more political points with communities within their countries.

Access and Management of Potable Water in the Ga West Municipality

The Ga West Municipality situated in the Greater Accra Region has no form of major water treatment plant that provides potable water to its communities. The Weija water treatment plant now situated in the Ga South municipality has since been the only major water system that supplied water to most areas in the Accra metropolis and parts of the Ga West municipality. However, due to pressure from population increase, the treatment plant has come under pressure, with most areas in the municipality not having access to potable water. Some of the areas that are fortunate to be supplied with potable water were served periodically, forcing people to rely on other sources which are in most cases not potable (DWST-GWDA, 2007).

Subsequently, the provision of boreholes and wells has increased in the Ga West municipality but patronage of these facilities is very low. This is because of the low water quality (caused by the salinity level) from this source. The pressure on the Weija Water treatment plant however, prevents all communities in the municipality to have access to potable water. Areas such as New Achimota, Tantra Hill and McCarthy Hill in the municipality have periodic access to potable water from the Weija water treatment plant while

the municipal capital and its surrounding communities are not supplied with potable water from this water treatment plant. As at midyear (2009), the Ghana Water Company was unable to connect communities of Amasaman, Pokuase and Ofankor zonal councils (DWST-GWDA, 2007).

Another major issue is about the level of salinity in ground water coercing community members to either import treated water from outside their communities or depend on the available surface which is mostly polluted by the activities of the community members themselves. According to researches conducted by some of the NGOs including the Water Health International (2008) the main source of water for the home in the municipality is water from the river (Nsakyi). Other researches conducted by the District Water and Sanitation Team (DWST- GWDA, 2007) revealed that several attempts made by the District Assembly to drill boreholes in some selected communities in the municipality resulted in dry wells. Those which were successful had majority of them being saline. This situation renders most of the water facilities unproductive and leads to their abandonment.

One of the major goals of the municipality is to improve the availability of the quantity of potable water to all communities within the municipality at least by thirty percent by the year 2010. This goal is intended to be achieved through ensuring that broken down wells are rehabilitated while the number of boreholes are increased. To support this, the WATSAN committees and mechanics are expected to be trained and motivated to ensure effective coordination and proper maintenance of the existing hand dug wells and boreholes (Ga West District Assembly, 2006)

CHAPTER THREE

THEORETICAL AND CONCEPTUAL FRAMEWORKS ON MANAGEMENT OF WATER

Introduction

This chapter reviews frameworks and theoretical issues on the access and management of water. It also discusses the strengths, weakness, opportunities and threats of the various frameworks and adopts the one that addresses the issues in this research. Four frameworks discussed are the integrated water resource management, the water governance framework model, the household economic portfolio and the DFID sustainable livelihood framework.

Integrated Water Resource Management (IWRM)

Over the years, resources including water have come under pressure. This is due to of population increase and pollution which reduces available fresh water for use by people. Growth in population, increased economic activity coupled with improved standards of living lead to increased competition for and conflicts over the limited freshwater resources and their supply.

Taking these issues into consideration, the Integrated Water Resource Management developed to provide a practical way of solving the issue of water scarcity in the world. IWRM is a process that helps to promote the coordinated

development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Integrated water resource management (IWRM) involves making common sense decisions while considering water quantity and water quality needs. Water Resource Management, is thus the integrating concept for a number of water sub-sectors such as hydropower, water supply and sanitation, irrigation and drainage and the environment. IWRM's relations to these sub-sectors include the management of water for the environment, people, industry and other uses through management instruments, institutional roles and the protection of the environment as shown in Figure 1.

An integrated water resource perspective ensures that the social, economic, environmental and technical dimensions are taken into account in the management and development of all water resources in an area. It is integrated because all management and uses of water are considered holistically. As shown in Figure 2, the social dimension considers the roles institutions play through the management of boundaries to protect the environment while the economic dimension considers the allocation and the regulation of the management instruments. The environmental or ecological dimension enables the policies and other legislations to be implemented to protect environment and promote its sustainability. This dimension also addresses water as a resource in its many dimensions, serves to assess and disseminate emerging lessons and shared experiences that will help to publicize policies and guidelines. It helps to facilitate cooperation on water

issues and to address issues of knowledge generation, management, and enhancing skills.

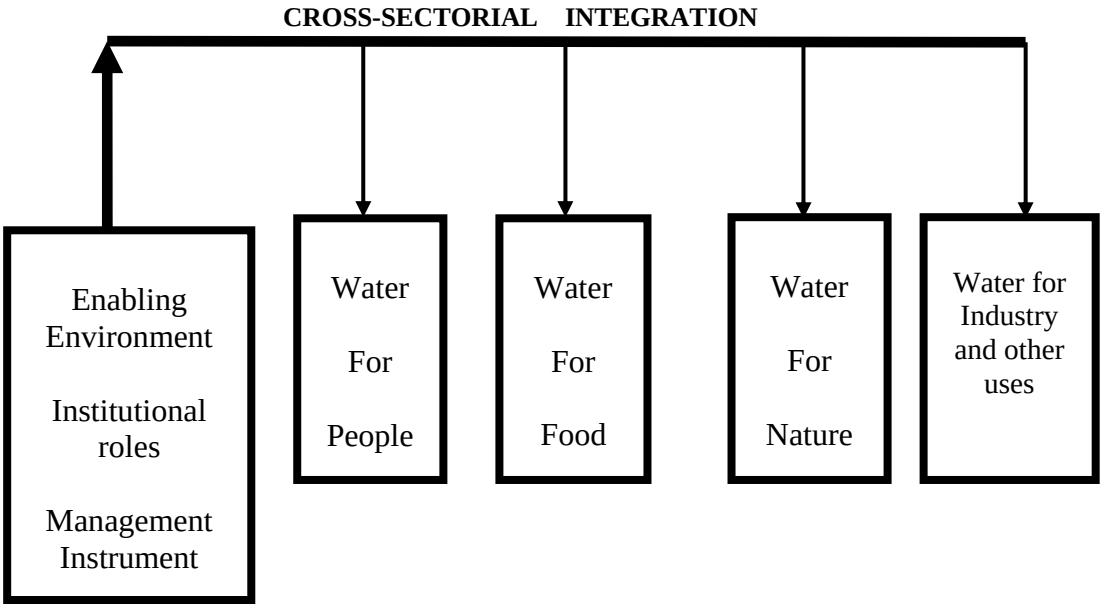


Figure 1: Integrated Water Resource Management and its relations to other sub-sectors

Source: Global Water Partnership, 2000

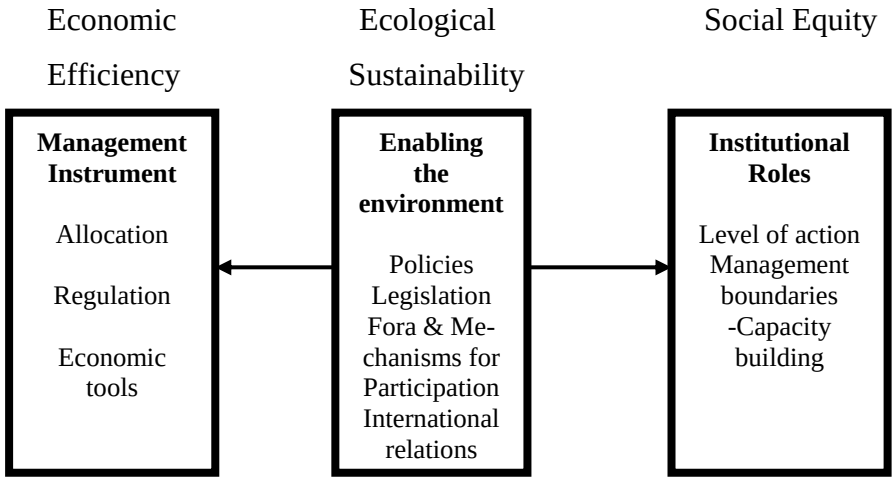


Figure 2: General Framework for Integrated Water Resource Management showing the breakdown of main sectors

Source: Global Water Partnership, 2000

IWRM addresses water issues using various principles. One of such principles is that it considers water as an infinite and vulnerable resource and this is measured by a holistic approach to management which involves the consideration of the demands placed on the resource and the threats to it. Another principle of the IWRM is that it considers everyone to be a stakeholder; therefore participation by all stakeholders is a key factor. Other principles relates to gender issues. Since women are usually the main providers, users and managers of water, the third principle considers the participation of women. This helps to involve women in decision making about issues concerning use and allocation of water. The fourth principle however, involves treating water as an economic good and not a free good. This is to draw more attention to the effective and proper use of water and its management.

The seventh Millennium Development Goal (MDG, 2000) aims to ensure environmental sustainability. Its first target involves the integration of the principles of sustainable development into country policies and programmes and the reversal of the loss of environmental resources. With respect to water resources, however, the World Summit on Sustainable Development held in Johannesburg, 2002 resolved to include the formulation of national plans for Integrated Water Resources Management (IWRM) and for water use efficiency in this target.

A basin-wide approach to water resources development and management has immediate repercussions for the MDG targets (Global Water Partnership, 2000) which are seen to relate to the following:

- The reduction of poverty and hunger which can be accomplished through the development of irrigated agriculture and the provision of access to safe drinking water,
- The promotion of gender equality and the empowerment of women using the medium of change in gender roles in the management of land and water resources,
- The reduction of child mortality which may be accomplished through its positive impact on the risk levels for water associated diseases such as diarrhea ,
- Combating key communicable diseases, in particular malaria by using improved water management and the reduction of mosquito breeding places, and
- Better access to safe drinking water which can be holistically tackled through an effective allocation of water to different user groups.

One of the strengths of the framework (IWRM) is that it addresses rare issues such as economic efficiency in achieving ecological sustainability which may have some effects on the management of potable water. For instance, though the IWRM is a systematic process for sustainable development, allocation and monitoring of water resource use in the context of social, economic and environmental objectives, it also considers the issue of community participation, and the role women play in the management of water. It considers the holistic use and management of water.

However, it does not consider demand priorities and supply preference which may have an implication on the access and management of water

resources. It does not also critically address the issue of vulnerability such as seasonality and population trends that might affect the access to potable water by each of the sectors in the community. IWRM also considers demand and management of water in an integrated context which looks at all sectors such as domestic, industrial and agricultural demand which leaves little room for the critical examination of a particular component. IWRM is complex in the sense that it needs skills from all fields and critical analysis from the various sectors to arrive at a decision.

The Water Governance Framework

Water governance is the range of political, social, economic and administrative system that is in place to develop and manage water resources (Roger & Hall, 2003). This also includes the delivery of water services at different levels of society. The idea is built on the principle of both government and management forming part of the wider system of governance in mediating people's access to water. It has also adapted the concepts of power and agency because they help to shape management strategies and the delivery of water.

Other organisations define governance in a different perspective though not totally different. Governance may focus on how power is exercised in a country's management considering its social and economic resources for its development. According to the definitions given by the UNDP (2006), governance involves exercises which include the economic, administrative and

political authority to manage the affairs of one's country at all levels. This is made up of processes, mechanisms, and institutions through which its citizens and groups can express their interests and exercise their legal rights, meet their obligations and mediate their differences. This shows the general coverage in the pragmatic application of the concept of government (Grindle, 2002).

Good governance is inextricably associated with strategies and aims of sustainable development. The adoption of the element of good governance as part of the mechanisms to help in the achievement of the Millennium Development Goal (i.e. halving the number of the people without sustainable access to potable water by the year 2015), is considered as a 'self-evident way' of 'doing things better' (Cleaver & Franks, 2005).

Governance is sometimes used interchangeably with management. Though management involves the collective allocation of resources to achieve specific objectives, in association with governance, it involves the processes of decision –making related to resources.

The framework helps to understand water governance as a multi-layered, multi-dimensional and dynamic issue. Therefore, water governance is viewed as a system of actors or resources, mechanisms and processes which mediate society's access to water drawing on government which is made of formal structures and management.

The analytical framework of water governance was developed to understand how its arrangements can shape and impact (both positively and negatively) on the poor. The framework was generated by insights from

reflections on the current thinking of governance and also from some empirical data. The framework adapted concepts which were derived from various theories such as the social theory (Giddens, 1984) and the post-institutionalism concept. It also drew on some of the ideas from the sustainable livelihoods framework (Ellis, 2000) and topical issues on chronic poverty (Chronic Poverty Research Centre, 2004).

Cleaver and Franks' Water Governance Framework (2005), access to water is dependent on quite a number of key concepts one of which is resources. Resources in this context refer to the materials from which human interaction and social structures are constructed. Actors or agents on the other hand refer to the individuals, groups and the state which help to construct the mechanisms of water governance. The mechanisms are the arrangements for organizing access to water. The outcomes consider the results of all these on the poor, the ecosystem and how they are shaped by the mechanisms as shown in Figure 3. Mechanisms are shaped from the resources by the management and practices of the governance of water. Each and every interface shapes the actors' decisions and activities.

The framework has few weaknesses which renders it unsuitable for use as the conceptual framework for the problem under study. It generally lacks the understanding of the way local interactions shape and influence governance processes. It also does not consider vulnerability that affects the mechanisms for the access and management of water in the home. Finally, and with specific reference to the MDGs and the water sector, the issue of the unspoken assumption of the necessity of good governance for pro –poor governance is questionable because this might not be so in all situations.

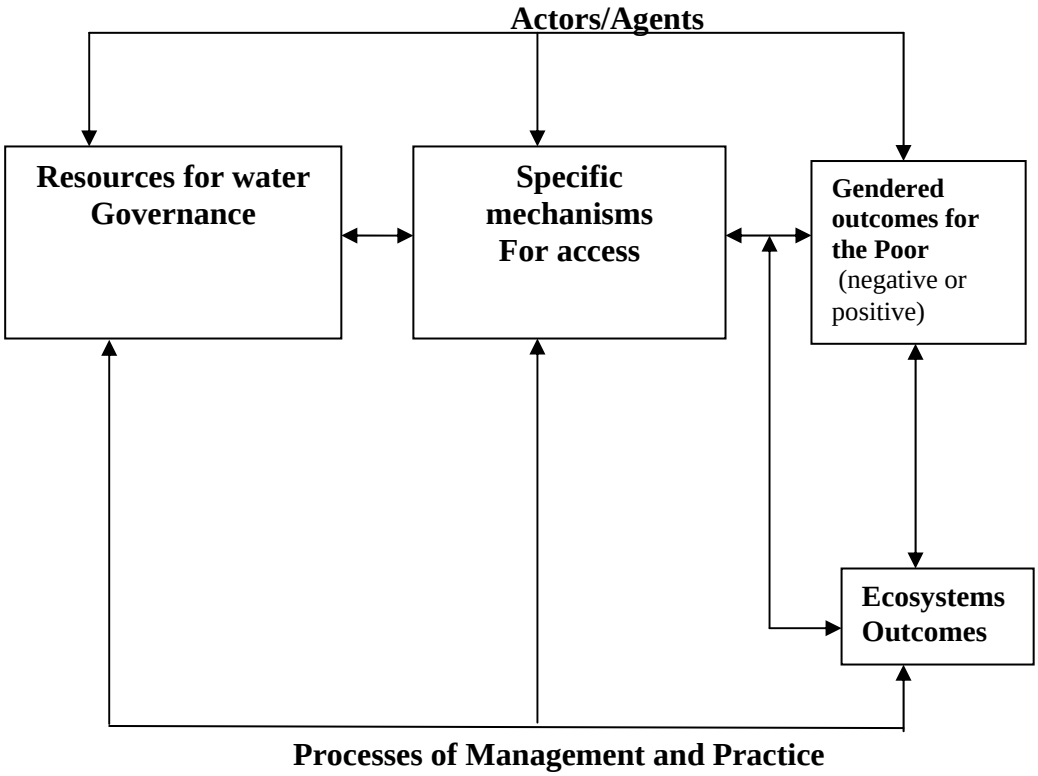


Figure 3: Water Governance Framework

Source: Cleaver & Franks, 2005

The Household Economic Portfolio (HHEP) Model

Three or more decades ago, development in the analysis of household has been three folds. These represent the gradual emergence of several disciplines such as feminist scholars and economists. The developments included the ways households were approached especially in the domain of the social sciences. These were developments in the analysis of household which were:

- The gradual movement from the models on households on the concept of sharing and mobilization towards studies in connection with competition in terms of rights and obligation within the home to allow for the critical analysis of events. The dynamics of the concept

sometimes saw the bargaining of power and the possible emergence of conflict within the home (Moore, 1994).

- The next development views the household from the dimension of a part of a system or organization rather than a single unit. According to Guyer and Peters (1987), production, investments and other decisions are exposed to both internal and external forces, which shape them.
- The third development in the analysis of a household depends on the composition and structure which more or less varies due to different cultural and economic backgrounds of households. Apparently, this is the normal situation of various societies over time.

Several models have evolved as a result of the changing trends of household development. For instance, the economic models of decision making in the home evolved in place of production and consumption models. Efforts were made to develop models to involve the effects of individual preferences and resources in the decision making at the intra-household level. The risk involved in taking certain decisions affects the management strategies of the household.

Based on concepts from the various disciplines (economic, anthropology etc), Chen and Dunn (1996) developed the household economic portfolio model consisting of resources, activities and flows components. Resources consider the available resources to the home to aid in the access of the household needs and wants. The activities however, are informed by the economic activities undertaken by members of the household to aid the production, consumption and investment. These are activities that may help

provide the needs of a household on a sustainable basis such as the provision of potable water and food to the home depends on the resources available to the household like human and physical capitals. Flows, on the other hand, involve the linkages between the resources and activities. This basically relies on the management of available resources to the household. It also includes the allocation of resources such as water to activities such as cooking and cleaning the home.

As indicated in Figure 4, there is a link between all three variables (i.e. household resources and its activities with the flow showing the direction and allocation of these resources in the home). It is also imperative to note that resource generation using available assets such as human and physical assets in addition to the unused resources are used to secure a resource base for the future periods. This provides security to the household.

The HHEP model facilitates the critical analyses of the economic activities within the household including how resources are allocated to household activities and managed. It also allows for the examination of possible risks that emanate from decisions made in the home during allocation of resources and how they are shaped by the risk environment. Risk management actually influences all components of the household economic portfolio. The model also allows for the variety of both joint and individual arrangements in the organization of resources and its allocation through management strategies in the home. It assists in understanding the influence of internal and external environment on decision making in the household.

One of the weaknesses of this model is that it is unable to critically examine the external environment as much as it does the internal environment

though it is clear that the external environment (such as institutional, policies and processes) does contribute to the modification of the management and strategies of the household. This makes it unsuitable as a tool of analysis for the external environment. HHEP also focuses basically on the internal activities of the household while viewing the external environment in terms of the strategies that households adopt in response to the external environment (Scoones, 1998). Figure 4 shows the HHEP model.

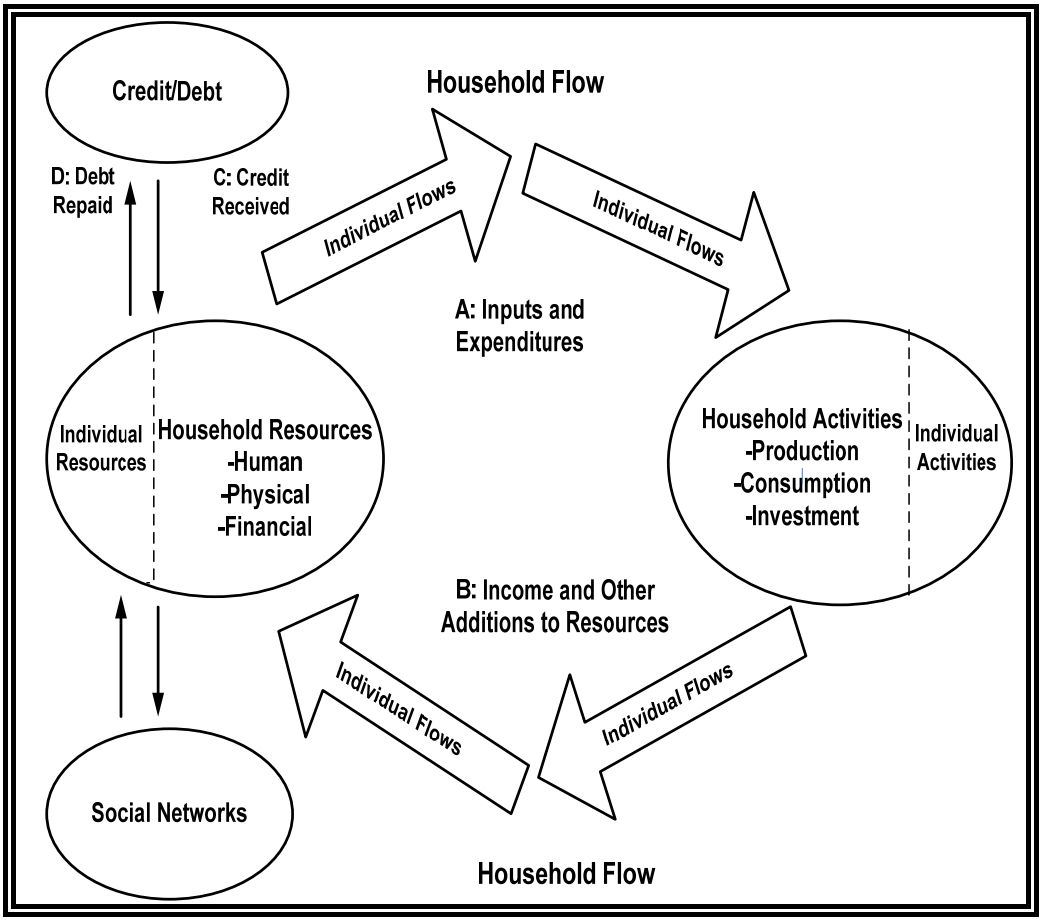


Figure 4: **Conceptual Model of the Household Economic Portfolio**

Source: Chen & Dunn, 1996

The Sustainable Livelihood Framework

The idea of livelihood thinking is not new but dates as far back as the 1980s. Though this was modified by Chambers (1992) and others much more lately, livelihood concepts have been adopted by many agencies. For the Department for International Development (DFID), the Sustainable Livelihood Framework is seen as an approach that represents a new departure in both policy and practice. This is because DFID aims to increase the sustainability of the livelihoods of the poor through promoting the access to facilities such as access to financial resources and management of resources. The framework identifies and analyses the shocks and vulnerabilities, assets, structural mechanisms and its outcomes. Made up of various assets, the framework is used to assist in the alleviation of poverty by tackling the various complexities of poverty. This involves the need to understand people's condition in the terms of access to livelihood opportunities and decision making power.

Livelihood, according to Chambers and Conway (1992), comprises the capabilities, assets (including both materials and social resources) and activities required for a means of living. Household, on the other hand, is a person or a co-resident group of people who contribute to and/ or benefit from a joint economy in either cash or domestic labour; that is, a group of people who live and eat together (Rakodi, 1999).

At the centre of the framework (mostly in the shape of pentagon as shown in Figure 5) are the assets on which households or individuals draw on to build their livelihoods. The poor are usually vulnerable because they are disempowered in the ability to access these assets as a result of shocks, trends and seasonality of assets. These assets which are grouped into five are

influenced by policies, organizations and relationships. The assets are the natural capital (involving the natural resource stocks from which resource flows useful to livelihood are derived), social capital (involving social networks etc), human capital (involving skills, knowledge, ability to work etc), physical capital (i.e. the basic infrastructures) and financial capital (which are the fiscal resources available to people).

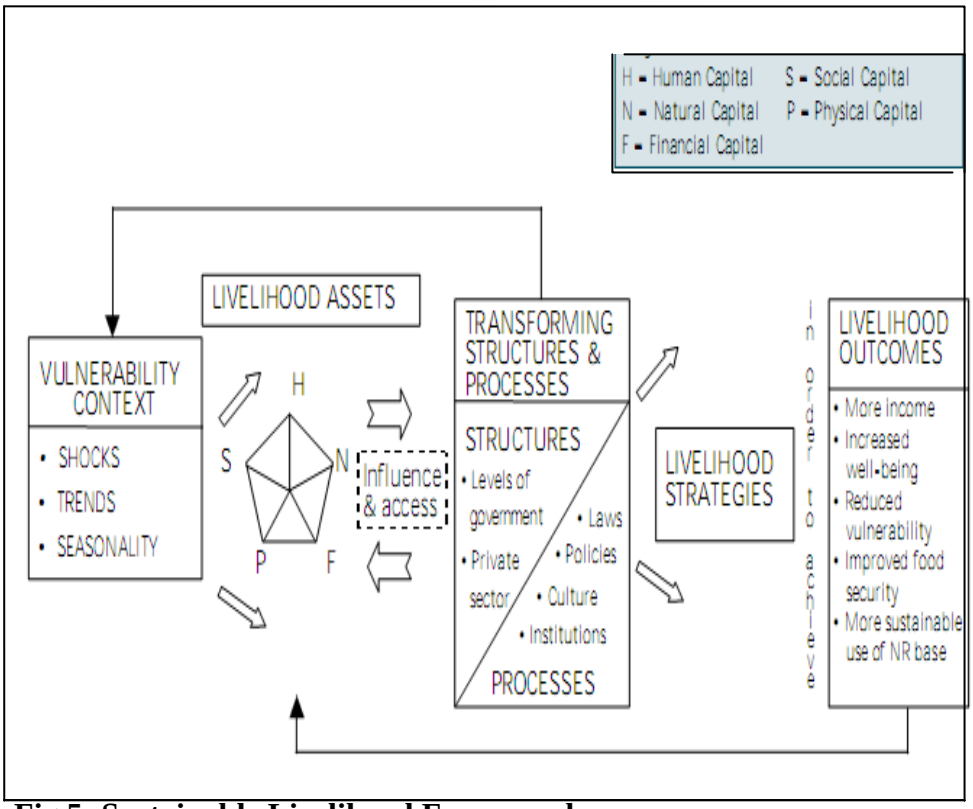


Fig 5: Sustainable Livelihood Framework

Source: Department for International Development (DFID) Sustainable Livelihood Framework (1999).

Beyond these assets are the vulnerability context which considers the stress, shocks and the impact of seasonal changes on the livelihoods of the household. Moser (1996:2) defines vulnerability as;

> *The insecurity of the well-being of individuals, households or communities in the face of a changing environment. Environmental changes threatening welfare can be ecological, economic, social or political…with these changes often come increasing risk and uncertainty and declining self- respect. Because people move into and out of poverty, the concept of vulnerability better captures processes of change than more static measures of poverty.*

Vulnerability in other words involves the combination of risks and exposures and the ability of an individual or households to cope with these risks and be able to recover from the shock of their current status (Chambers, 1989). Infrastructure, policy, institutions and livelihood opportunities all facilitate and shape livelihoods and also enable households to access their basic needs on a sustainable basis.

The framework suggests that there is a close link between the overall asset status of a household and the resources on which it can draw on in the face of hardship and its level of security. Options available to poor households for the management of their assets include the sacrifice of the ability to access and utilize an asset in the future because of short- term shocks or stresses.

Strengths of this framework are that it addresses a lot of issues the vulnerable poor goes through frequently. The framework is people-centred and it views the world from the point of view of the individual households who are pursuing livelihood management strategies in a volatile and an insecure condition with limited assets and resources.

The framework also recognizes the fact that households construct their livelihoods both on the basis of the assets which are available to them and

within a broader socio-economic prospect. This involves the physical context which underlies recent attempts to devise a schematic model of the factors that need to be taken into account in analysis and policy.

The framework identifies the various shocks and vulnerabilities along with its outcomes. People's ability to function and gain access to and power over resources is viewed from the perspective of the poor. This involves understanding poor people's conditions, namely the concept of access to livelihood opportunities and decision making power. Unlike the household economic portfolio model, the sustainable livelihood approach examines the economic, social, political and institutional processes that shape the way households allocate their livelihood resources (Scoones, 1998).

Though this framework is people centred, one of its weaknesses is that it does not allow for issues such as economic alternatives to be properly addressed. Also, according to Cleaver and Franks (2005), it does not provide more issues concerning gender sensitivity to be treated as a limitation to the access to facilities. This is because when it comes to the subject of vulnerability, women are more vulnerable in the context of access to resources though they become the managers of these resources in the home. However, for the fact that it is able to address most of the issues this research seeks to address, it makes it suitable to adapt this framework.

Sustainable livelihood framework adapted

In adapting the livelihood framework, the heart of the framework which considers the various assets will be modified to fit the scope of the research which deals with access and management of water in the home.

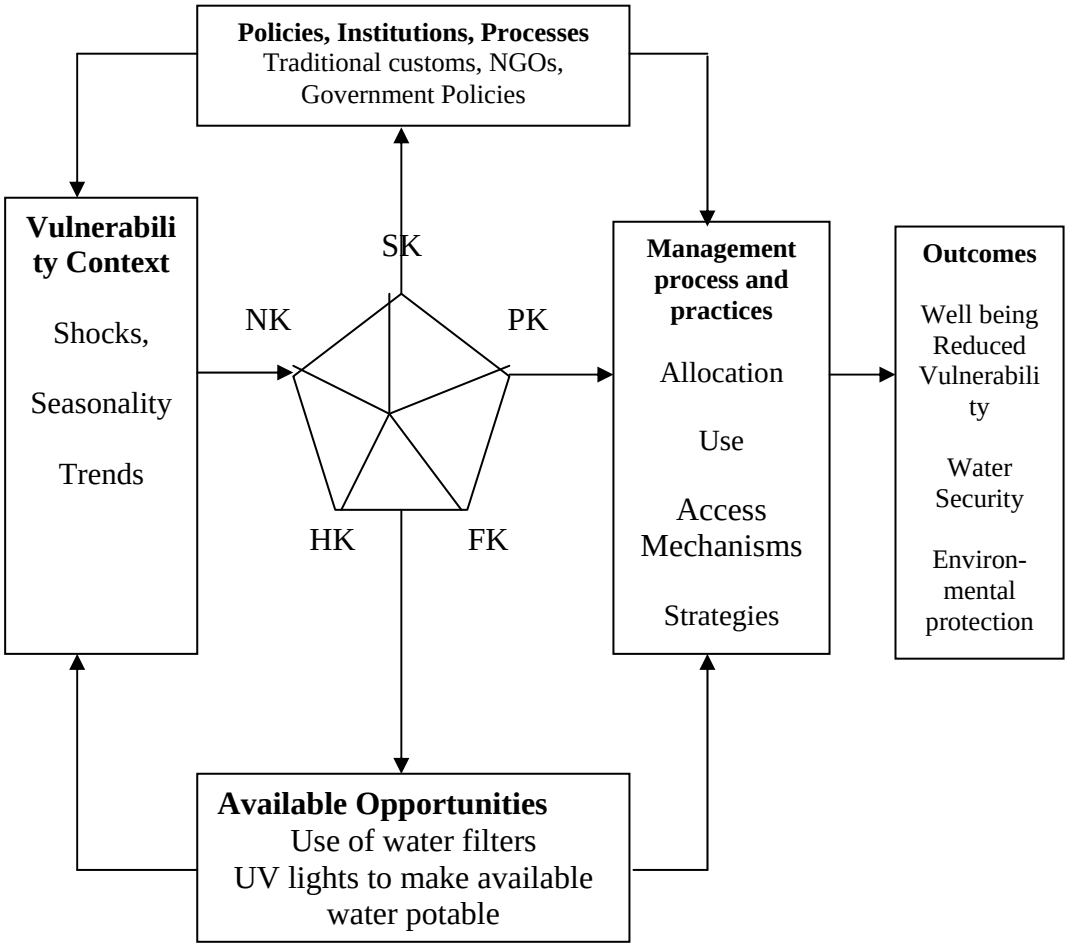
Therefore at the centre of the framework will be the household's assets drawn on in accessing potable water. Using the various assets available to the household influences the strategies they will adapt in the management of water in the home. Below are the assets explained in the context of the research:

- **Human Capital**: This will consider the labour available which are both quantitative (number of members in the home) and qualitative (health status by age in terms of energy) status.
- **Social Capital**: This will consider the social networks that exist between households and its external members in the community as well as associations in the communities that aid in the access of water.
- **Physical Capital**: This will consider the various modes of transport that are available to the home in accessing water and the availability of other infrastructures such as water supply systems in the community.
- **Financial Capital**: This will consider the economic strength of the household (in terms of its purchasing power) and the percentage set aside for accessing and managing water in the home.
- **Natural Capital**: This will consider the various available natural water resources which can help in the minimization of challenges in accessing water for household consumption.

In Figure 6, the external environment is in four segments which include the vulnerability context. The vulnerability context which consists of

seasonality, shocks and trends will consider seasonality in terms of climatic changes which may affect the quality and quantity of water accessed. It will also consider the price of the water accessed. The shocks on the other hand will discuss issues on conflicts which may arise as a result of competition for the access of potable water. Challenges such as distance, time and convenience and quality of water will also be considered using the population trend and development.

On the other hand, the policies, institutions and processes segment will consider the role the government, private and non-governmental sectors play in making water available and accessible to all in the community. This will also consider the role the traditional customs play to protect water resources. Livelihood strategies will encompass the management processes and practices adapted by the household such as the domestic use of water, choice of water source, access mechanisms and its allocation (Cleaver & Franks, 2005). The livelihood outcomes will consider some of the results such as water security, reduced vulnerability and well being in the context of health.



HK: Human Capital **NK:** Natural Capital

PK: Physical Capital **FK:** Financial Capital

SK: Social Capital

Figure 6: Sustainable Livelihood framework

Source: Adapted from the Department For International Development Sustainable Livelihood Framework.

CHAPTER FOUR

STUDY AREA AND METHODOLOGICAL ISSUES

Introduction

This chapter outlines the study area as well as delineates the sampling techniques and procedures used in collecting information from the field. Issues on ethical concerns are also discussed so are the field challenges and strategies used to address them.

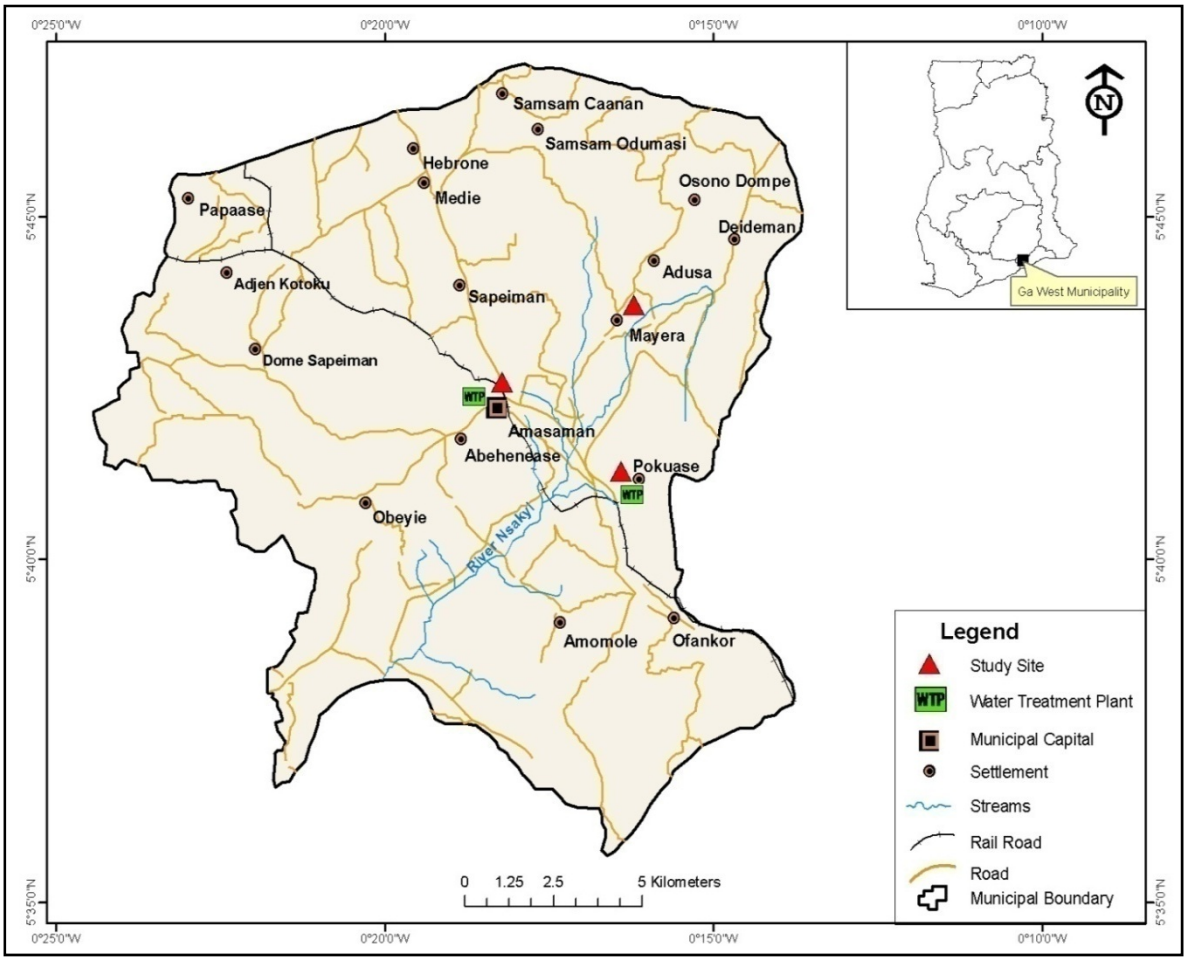


Figure 7: Map of Ga West Municipality with selected communities involved In the research

Source: GaWest District Assembly, 2009

Characteristics of the study area

The Ga West Municipality is currently one of the seven districts in the Greater Accra Region with its capital being Amasaman. Ofankor, Medie, Adjen Kotoku and Pokuase are some of the major towns found in the municipality. The Municipality lies within latitude 50^{o} 48^{1} North, 5^{o} 29^{1} North and longitude 0^{o} 8^{1} west and 0^{o} 30^{1} West respectively and occupies a land area of 284.01sq km. It has been however, zoned into six zonal councils. These are Pokuase, Mayera, Ofankor, Ayikai Doblo, Kotoku and Amasaman zonal councils for effective administration.

The population of the Municipality was projected to be 243,724 in 2007 (Ghana Statistical Service, 2002) but as at the year 2008, the population of the area was 183,000 (Ga West Municipal Health Management Team, 2008). The Municipality remains predominantly peri- urban and urban with a population growth rate of 3.4percent in the year 2000. The reason given was the proximity of the area to the capital city. The population is mainly concentrated along the peri-urban areas of the municipality particularly on the border with the Accra Metropolitan Assembly and Ga East District Assembly. The 2000 population figure also showed a density which was much higher than the national density though lower than that of Greater Accra Region (with 895.5 persons per sq. km). This implies great pressure on resources including water.

Characterized by a large proportion of children, the population of the area has a small portion made up of elderly persons who are sixty years and above. The proportion of the population under 15 years in the year 2000 was 34.8 percent which was an indication of high fertility. Made up of about 50.2

percent males and 49.8 percent females, the sex ratio is rated at 99.1 females to a 100 males (Ga West District Assembly, 2006).

Topography and Drainage

The municipality is made up of a land area consisting of gentle slopes which are spread together with plains in most of its parts. Much of the land is generally undulating and less than 76m (250ft) above sea level except for those areas around the Akwapem and Weija hills creating valleys. Some of these slopes in the area are mostly formed over the clay soils of the Dahomeyan gneiss. The soils found in this municipality are rich in sandstone and limestone which are also a good source of materials for the construction industry. This explains why there are illegal sand winning activities in these areas.

The major rivers that flow through this municipality are the Densu, and Nsakyi rivers. Densu, which is the largest of them drains down from the Eastern Region through the western portions of the district to Ga South Municipality where it enters the sea. It is also the major supply of water to most of the people in the municipality and its neighbouring communities and serves as a natural boundary between Ga West and Ga South municipalities.

Vegetation and Climate

The municipality lies within the coastal savannah agro-ecological zone and has a bi-modal rainfall pattern with an annual mean ranging from 790mm on the coast to 1270mm to the extreme north. The annual temperature ranges from 25ºC in August to 28ºC in February and March- a condition that allows

for farming activities and some rearing of animals (Ga West District Assembly, 2006). The bi-modal rainfall pattern enables some households in the municipality to depend on rainwater as their main source of water for the home. This reduces cost and time in accessing water for the household use.

Economic activities

Because of the age structure of the population of the municipality which has more people dependant on the few work force, there is less economic development. Few members in the communities in the municipality are farmers and petty traders. Farmers in this municipality take advantage of the head quarters of the Plant Protection and Regulatory Directorate sited in Pokuase which is a town close to the municipal capital for assistance in the use of agrochemicals and what to cultivate. However, quite a number of the populations are also involved in the formal sector such as teaching and administrative work.

Agriculture has not developed over the past two decades of the municipality's existence. Though there have been government initiatives such as the Presidents Special Initiative, it has not brought any improvement into this sector. This has been due to loss of farmlands to other sectors considered to be more lucrative such as sand winning and private housing projects. Though opportunities for the development of poultry and the rearing of animals exist, much has not been achieved yet in this district (Ga West District Assembly, 2006). Sand winning and housing projects sometimes end up polluting the surface waters thereby reducing the quality of water from surface sources. Some of the housing projects however, are undertaken near

waterways which either destroy the surface water or affect its natural cycle. This has reduced the number of wetlands in the municipality is affecting the quantity of water in some of the streams and rivers in the municipality.

Health facilities

The municipality has been able to create some health facilities over the past few years in order to cater for the increasing population. There have also been various fora and educational programmes held to educate people on specifically nutritional issues. This was used as a measure to reduce the incidence of malnutrition and increase nutrition rehabilitation. This helped to reduce for instance the incidence of 'Kwashiokor' from thirty five percent in the year 2000 to about nine percent in the year 2005, and the incidence of stunted growth from two percent in 2002 to a zero percent in the year 2005.

Malaria and other skin diseases remain at the top of the top ten diseases in the municipality. Among the most endemic diseases in the municipality are schistomiasis, tuberculosis and buruli ulcer with the highest reported cases in 2004 being Buruli Ulcer, though it has reduced since 1999. According to the 2008 annual report of the Ga West District Assembly, there is the high prevalence of Buruli ulcer, Yaws and schistomiasis making it a major concern which are a result of inadequate potable water in the municipality.

The major health facilities in this municipality are the Amasaman and Oduman health centres located in the Amasaman community which according to estimation covers one hundred and fifty two settlements. However, the health facility located in the Mayera community covers the smallest number of settlements, less than thirteen. Though these are being expanded to cover more

areas, it is still inadequate (Ga West District Assembly, 2006). According to the Ga West Municipal Health Management Team (Annual report, 2008) most of these health centres reported an increase in the incidence of water related disease such as bilharzia and diahorrea which are as a result of the inadequate potable water in the municipality. Therefore, more than three-quarters of people in the municipality are at risk of water related diseases because of the inadequate potable water supply to the municipality. Though more health centres are being built to treat these reported cases, the best strategy is to concentrate on how to put measures in place in order to supply adequate potable water to people in the municipality. This will help reduce the number of people who seek medical attention for water related diseases.

Cultural and Social Issues

Though the land area should be mainly occupied by the Ga ethnic group, the census conducted in the year 2000 showed that the predominant group was the Akans who made up 44.3 percent of the population, followed by the Ewes (25 percent) and the Ga-Dangme (19.1 percent), (Ghana Statistical Service, 2002).

Because much of the land in this municipality was originally owned by the Ga tribe, the Homowo festival which is a traditional festival of the Gas is celebrated in the mid of every year by all resident Gas. Other traditional customs of the Gas in this area is to allow the goddess of the water bodies to rest on Saturdays. This helps to check the use of water from such rivers and as well help protect the environment around water resources. Though this custom

has become outmoded, it was previously a way of protecting the environment by the early settlers of the land.

Research design

The research was a survey which employed both quantitative and qualitative methods. It sourced data from both primary and secondary data. Primary data was collected using three data collection instruments; observation guide, interview guide, and questionnaires. Triangulation was employed in the research so as to use the strength of each method to overcome the deficiencies of the other and also to overcome the deficiency of the single-method studies (Sarantakos, 1998). Secondary data were derived from published journals on the internet, National Population and Housing Census Report (2002) and the Ghana Poverty Reduction Strategy Annual Progress Report, (2008). In addition, unpublished theses, policy conference papers on water, proceedings, books and records from the Community Water and Sanitation Agency were also used. Information from researches conducted by an NGO in the municipality known as the Water Health International under Safe Water Network was also used. The map of the study area as well as the district's water and sanitation plan for the year 2007-2010 were taken from the Ga West District Assembly.

Target population

Since the research was centred on access and management of potable water in the Ga West Municipality, it covered respondents from various categories which basically involved households (both male and female

headed), traditional authorities and water supplier agencies. The water supplier agencies included the individual or private and non-governmental organisations such as the Water Health International in collaboration with Safe Water Network. The water supplier agencies under the government organisation included the Ghana Water Company Limited (Aqua Vitens Rand Water Limited), Community Water Supply and Sanitation Agency and the Water and Sanitation Committee in each community.

Sample Size

The sample size was calculated using a formula by Fisher, Laing, Stoeckel, & Townsend, (1998) for sample size estimation. The formula for calculating the sample size for a population greater than 10000 people was used in calculating the total number of households to be involved in the research. The total population for the three selected communities was 15,630 (Ghana Statistical Service, 2002). The process employed in calculating the sample size is as follows;

$$n = \frac{z^2 \, p \, q}{d^2}$$

Where:

n = sample size

z = the standard score 95 per cent confidence level which is usually set at 1.96

p = the proportion in the target population estimated to have particular characteristics was assumed to be 80percent

q = 1.0-p

d = degree of accuracy desired, usually set at 0.05

Using the above calculations, the total number of households involved in the research was arrived at:

$$n = \frac{(1.96)^2 (0.80) (0.20)}{0.05^2} = 245.76$$

Therefore, a total of 245.76 which was approximated to 246 respondents from 246 households were involved in the research. This number was then divided proportionally allocated to the three communities selected for the study. After using the simple random sampling technique to select the households to be involved in the research, the purposive sampling technique was then used to select of the one in charge of the access and management of water in the home. Table 3 shows how this number was distributed proportionally among the selected communities.

Table 3: Population characteristics of selected communities and the sample size

Selected Communities	Total Popn	No. of Houses	No. of H/d	Avg Size	Proportion (percent)	Sample size
Pokuase	10,858	1,366	2,338	4.6	60.0	148
Amasaman	3,959	626	984	4.2	34.6	83
Mayera	813	177	238	3.4	6.0	15
Total	15,630	2,169	3,560	12.2	100	246

Source: Ghana Statistical Service, 2002

In addition to the above, the cluster and purposive sampling techniques were used to select a number of respondents who were interviewed. The cluster sampling technique was used to select respondents from the water supplier agencies. This was done by dividing each community into three zones depending on the source of water they supplied (i.e. those who supplied river water, ground water and imported water). Purposive sampling technique was used to select key informants and some opinion leaders. Twelve respondents from the water supplier organizations which included the water tankers, sachet water producers, and local truck pushers were interviewed. Also seven caretakers of water supply systems which considered point sources including wells and boreholes constructed by the government and non-governmental organisations were interviewed from each community. The main objective for these interviews was to identify the demand preferences, supply priorities and also policies in place in order to not only supply adequate potable water but also to protect the environment and promote ecological interests.

The one in charge of the selected water supply system was selected purposively and interviewed. This sampling procedure was used because it was assumed that the one in charge of the system had more information and experience than those working under him. Respondents were selected from each mentioned category based on the source of water they supplied. Respondents were selected from borehole water supply point, those who operate at the riverside, and those workers who supplied imported tap water. Table 4 shows the number of selected respondents from the water supplier agencies based on the source of water supplied.

Table 4: Number of respondents according to the type of water supplied

Community	Source of water supplied	Number of respondent(s)
Pokuase	River water	2
	Well water	1
	Borehole water	2
	Imported tap water	1
	Sachet/bottled water	1
	Treated river water	1
Amasaman	River water	1
	Well water	1
	Borehole water	1
	Imported tap water	1
	Sachet/bottled water	1
	Treated river water	1
Mayera	River water	1
	Well water	1
	Borehole water	1
	Imported tap water	1
	Sachet/bottled water	1
Total		19

Source: Fieldwork, 2009

Six opinion leaders were also interviewed. These were the three chiefs of the three selected communities with their assemblymen and the secretary of the well known association in the selected communities such as the Pokuase Development Association and the Stadium Neighbourhood Association in Amasaman.

Three respondents were also selected from the Water and Sanitation Committee and interviewed for each selected community and two respondents from the Ghana Water Company Limited and Community Water and Sanitation Agency were also interviewed. This was done in order to know the various proposed policies in place to help solve the water situation in the municipality. Therefore, in all twenty-nine respondents were interviewed.

Community Entry and Ethical Issues

The chief and the Assembly man were the first people the researcher contacted on arrival in a selected community. This was done to seek permission before the research was undertaken. The objectives of the research were explained to them. A letter from the Head of Department (i.e. the Department of Geography and Regional Planning) was shown to the authorities where necessary.

Consent was sought from opinion leaders and water supplier agencies before selecting respondents to be interviewed. Also, informed consent was sought from the head of the household in case the one in charge of access and management of potable water in the home was a minor. All respondents were assured of confidentiality in the entire research.

Sampling Procedures

Since the municipality is made up of six zonal councils, three zonal councils were involved in the research. Three communities were selected using both the probability and non probability sampling procedures. Two of the councils were randomly selected while the one with the district capital was

purposively selected. A community was selected from each zonal council. These were Amasaman, Pokuase and Mayera. The non probability sampling technique was employed to select the communities in the selected zonal councils where the seat of administration was located. Pokuase and Mayera communities were selected from the Pokuase and Mayera zonal councils. This was arrived at using a sampling frame that involved the various zones in the Ga West Municipality that did not have any major town water supply system such as tap water that supplied homes with potable water. Amasaman, which has always been the district capital since 1988, was, however, selected using purposive sampling technique because it was the seat of administration for the municipality and for the Amasaman zonal council. All selected communities were among the fastest developing communities in the Municipality (Ga District Assembly, 2006).

Since households were used as the unit of analysis, a number of households in the three communities were selected using the probability sampling method. Using the simple random sampling technique, information on the number of households, according to the National Health Insurance Scheme, was obtained. A layout map was obtained from the Assembly and used in locating houses from the selected communities. Every house that had the chance of being selected was involved in the process.

Data Collection Instruments

Primary data were obtained from the field using the following data collection instruments; field observation (non participant observation) questionnaires and interview guide.

The questionnaire design employed both the close ended and the open ended questions. In the case of closed ended questions, options were given from which respondents had alternatives to choose the one that best suited their answers. The open ended questions were an avenue created for the respondents to write down their answers and express themselves without being limited. The questionnaires were also sub-divided into five modules using the objectives for the research and to make it easier for the respondents to understand and answer. The modules were;

- Access to potable water in the area which sought to collect information on available water supply systems which were accessed by the household;
- Challenges faced in accessing potable water which was also designed to gain knowledge on the mode of accessing water and some of the obstructions one came across while accessing water;
- Management strategies including the use and allocation of water, the methods used in purifying water in the home and opportunities available to the households in making water potable;
- Possible suggestions to help reduce the inadequate potable water supply situation in the Municipality; and
- Demographic information on the respondents.

Field observation as a data collection technique was used to inform the researcher on the various sources of water from which the communities accessed potable water and the level of accessibility of the various water sources during the dry and wet seasons. The month of July was selected to

observe the level of accessibility to water in the rainy season while January was selected to observe accessibility in the dry season. It is assumed that the seasonal changes may have influence on the level of accessibility. This also helped to observe how community members helped in the protection of water resources and its environment. Their level of accessibility was meant to inform the researcher on their perception of the water quality from these sources.

An interview guide was employed in collecting data from opinion leaders (traditional authorities) which included the chiefs of the selected towns, the assembly men and officials from the water supply agencies and companies. Two different interview guides were designed to collect data. One was designed for the water supplier agencies (made up of both governmental and non-governmental/private organisations) and another one for the opinion leaders. Though the interview guides were designed separately, they were similar in nature and had five sections each.

The first section sought data on the water situation in each community while the second section sought to gain knowledge on methods of improving the situation using his/her office and position. The third section focused on the management strategies adopted by these leaders to help solve or minimize the situation in their communities. The fourth part gathered information on possible solutions to the water situation in the community in particular and the municipality as a whole. The final part gathered information on the demographic characteristics of the participants.

Pre-Testing

Ten of the designed questionnaires were pre-tested in Sarpeiman community in the Ga West Municipality to allow the researcher identify how effective they will be in the field as an instrument for data collection. Also, a number of interviews were conducted using the interview guide.

The pre-testing was conducted in order to help the researcher assess the feasibility of the data collection instruments. It also helped in making of the necessary changes before the main collection of data from the field was undertaken.

Response Rate

The actual response rate from the research was very high compared with the assumed response rate for the research. Ninety-five percent of all interviews were conducted. Field observation employing the non-participant observation technique was undertaken with little limitation. Though some of the questionnaires were not completed while others were not answered because the respondents opted out of the research, a total of two hundred and thirty- eight questionnaires were fully and partially completed by respondents constituting over ninety-six percent. The Mayera community had a hundred percent response rate. Pokuase had a total of over ninety-seven percent response rate while Amasaman had over ninety-six percent (96.4percent) response rate as shown in Table 5.

Table 5: Number of respondents involved in the administration of the questionnaires

Town	Proposed Questionnaires	Percentage (percent)	Completed questionnaires	Percentage (percent)
Mayera	15	6.0	15	100
Pokuase	147	60.0	143	97.2
Amasaman	83	34.0	80	96.4
Total	246	100.0	238	96.7

Source: Fieldwork, 2009

Problems Encountered on the Field

The data collection was conducted from the 30th March to 25th May, 2009. The researcher encountered some problems in the field. One of these was that some of the scheduled interviews could not be undertaken because some of the respondents opted out due to some level of suspicion. This was because the data collection was done two months after elections. However, the purpose of the research which was only for academic was explained to them. The majority (constituting 90 percent) were convinced and gave consent to participate in the research. The chief of the Amasaman community could not be interviewed because we were told he had travelled. Though some of the private water supplier agencies did not want to be interviewed because they thought we were officials coming to inspect their work, a majority were convinced after reading the cover letter from the Head of Department (Geography and Regional Planning), and participated in the research.

Some of the questionnaires were not completed because the respondents could not read nor write. This problem was however, minimised by making sure that both the researcher and field assistants were fluent in at

least four languages (English Language, Akan, Ewe and Ga) which were the most common languages to the indigenes and recent settlers.

Another limitation was that some community members voluntarily offered to participate in the research though they were not selected as respondents. This was because they saw the research as a platform to bring out their ordeals in accessing potable water in their communities. Although this seemed as an easier way to collect data from the field, the researcher excluded all those not scientifically selected to avoid bias and to aid the objectivity of the information collected from the field.

Non-participant field observation was undertaken with little limitation. Because people from both communities did not fetch water from the various sources at all time, the peak period for water collection from these sources were noted which were the early hours of the morning (i.e. from 5:00am to 7:00am) and in the evening (i.e. from 4:00pm to 6:00pm). Therefore, the observation was conducted within these time frames. The field observation was conducted for each community for fourteen days for each of the seasons. These were the dry season (i.e. the month of January, 2009.) and wet season (i.e. the month of July, 2008). Three days in the wet seasons meant for the field observation were interrupted due to continuous heavy down pour in the Pokuase and Mayera communities.

Data processing and analysis

Questionnaires administered from the field were analyzed using the Statistical Package and Service Solutions (SPSS) version 16. This involved the coding of the questionnaires and creating templates using the SPSS software.

Using the descriptive statistics, bar graphs, frequencies and cross tabulations were created for analysis. The interview data were transcribed, categorised and discussed. The non participant observation also allowed for the taking of pictures which also helped to further explain the access and management of water in the study area. Hypothesis for the research were tested using the Chi-square statistic.

CHAPTER FIVE

RESULTS AND DISCUSSION

Introduction

Chapter four discussed the methodology for data collection and issues from the field. This chapter focuses on various methods of allocation and use of water in the home to ensure its efficient use. Access to potable water in the home including the preferred source of water, mode of accessing water and the challenges faced while accessing water as well as water management processes and practises are covered. Hypotheses for the research are tested in this chapter.

Socio-Demographic information of respondents in the Ga West Municipality

Since the research sought to collect information from those in charge of the access and management of water in the home, those involved in the research were mainly those from the adult age group from eighteen years and above. About 41 percent of the respondents who were in charge of water collection and its management in the home were between the ages of 19 and 30 years. Looking at the intra communities within the study area, it was observed that people from Pokuase New town had more respondents within the ages of 19-30 years compared to Jamin, which adds up to a total of 67.7 percent for the Pokuase community . Toman and Fise communities within the same group had 19.8 percent and 7.3 percent making a total of 27.1 percent

within the Amasaman community. Those respondents who were 18 years and below had the lowest percentage of the total population sampled. Pokuase had the highest number of respondents aged below 18 (i.e. 62.5 percent for both Pokuase and Jaman communities). Toman and Fise in Amasaman however, had 12.5 percent each. Among respondents who were 60 years and above, Amasaman had the highest percentage with 50.0 percent of them in Fise and 25.0 percent in Toman. Mayera community however, had no respondent within that age group.

Table 6: Place of Residence by age of respondents

Place of residence	Intra-Communities	Below 18 years	19-30 years	31-59 years	60 years and above	N
Pokuase	New Town	37.5	52.1	36.5	25.0	100
	Jaman	25.0	15.6	19.0	0.0	41
Amasaman	Fise	12.5	19.8	19.8	50.0	47
	Toman	12.5	7.3	17.5	25.0	31
Mayera	Quarters	0.0	3.1	5.6	0.0	10
	Faase	12.5	2.1	1.6	0.0	5
	Total	100.0	100.0	100.0	100.0	234

Source: Fieldwork, 2009

Gender of respondents

Women were known for a long time to be the collectors and managers of water for the home (Tenkorang, 2002). From several researches, it has been confirmed that women in the home were practically those responsible for the

collection and transportation of water from the source to the home. They were also responsible for the use and management of water. They have actually been branded as the 'domestic managers' of water (WaterAid, 2006). Managing water included women deciding on where to collect water, for which purpose in the home and how much water should be collected for use in the home at a point in time. This is done based on the time spent on accessing water, the energy used, the reliability of the water source and more importantly the quality and quantity of water accessed.

Though the sampling technique involved the probability sampling technique, the data collected showed that females were the main people involved in the collection, allocation and management of potable water in the home forming more than 60 percent of all respondents. They were mostly the ones in charge of the use of water in the home. From the total women respondents, Pokuase had 61.8 percent, while Amasaman had 31.3 percent, and Mayera had the least of 6.9 percent as shown in Table 7. The number of males who formed less than 40.0 percent of the total respondents had Pokuase constituting 56.5 percent, Amasaman with 38.1 percent and Mayera having 5.4 percent.

Table 7: Sex and place of residence

Place of residence	Male	Female	N
Pokuase	56.5	61.8	142
Amasaman	38.1	31.3	81
Mayera	5.4	6.9	15
Total	100	100	238

Source: Fieldwork, 2009

Selected communities in the Ga West Municipality showed the consistence of the continued role of women as collectors, managers and users of water in the home. Information from the field showed that more males are helping in water management at home. This situation was believed to be influenced by factors such as the changing modes of transporting water from the source to the home. One of the modes through which water was transported from the source to the home was by the use of a locally made wooden trolley. This allowed for the transport of a large quantity of water (from four hundred litres and above) at a time often by a minimum of two people. Though some people used this as a means of livelihood, this job was mainly carried out by males and this saved women the stress of transporting water from the source to the home by head porterage.

However, the issue was different considering the respondents who were interviewed from the water supplier agencies. More than 90 percent of all respondents involved in the interviews were males. This was explained by the fact that water supplier agencies had more than half of their staff members as males. This included those supplying water by water tankers and local trolleys.

One reason given by respondents was that it was considered as a difficult job to be handled by females; therefore, virtually all water supplier agencies were male dominated.

Occupation and income

Though the Ga West Municipality was said to be predominantly peri urban and urban (Ga West District Assembly, 2006) most of its communities remained below the poverty line. The data collected from the field showed that most of the people in the municipality were self employed and engaged in petty trading as their main source of income though some supplemented this with other activities such as cultivation of crops and rearing of animals. Agriculture was not done on a large scale by private individuals. However, the Animal Research Institute within the area reared animals on a large scale and helped in the employment of people in this sector. The number of respondents who were unemployed constituted 15.2 percent of all respondents. Those who had jobs were made up of 68.4 percent self employed residents involved in activities such as trading and farming and 10 percent worked in the formal sector as extension officers and teachers in their communities. The rest who constituted 2.5percent were not employed but worked on short term contracts when they were made available.

The data was influenced by the trend of the sex of respondents. More males constituting almost 60 percent were employed in the formal sectors as veterinary, extension officers, and technical officers as compared to 48 percent females employed in the formal as teachers and nurses. The informal sector also had 61.4 percent of women compared to the 38.6 percent of males as

shown in Table 8. The same trend can be seen in the case of the unemployed in the selected communities. More than 71 percent of respondents who were not employed were females as against 28.9 percent males.

Table 8: Occupation by Sex of respondents in the selected communities

Sex	Unemployed	Formal	Informal/self employed	Other	N
Male	28.9	52.0	38.6	50.0	91
Female	71.1	48.0	61.4	50.0	144
Total	100	100	100	100	235

Source: Fieldwork, 2009

Most of the respondents who were employed in the informal sector or self employed were petty traders managing their businesses. As a result, most respondents were unable to really give accurate information on how much they earned at the end of the month. Most of them clarified this by stating that the money was spent before it was even accounted for at the end of the month or sale of a product. One of the respondents explained further that:

> *The money I earn from this business is small. I mostly spend it before even accounting for it. It is more of "from hand to mouth" thing. Therefore, I can't really tell how much I earn at the end of the month (Ama).*

Those in the formal sector were however able to quickly state the range of their monthly income though some respondents were unwilling to state their exact monthly income. Table 9 shows information on income by the occupation of the respondents.

Table 9: Occupation by monthly income of respondents

	Income				
Form of occupation	<50.00 GHC	GHC 60.00-100	GHC 110-150	160 +	Total
Formal	10	5	1	5	21
S/employed	73	31	27	12	143
Other	3	1	2	0	6
Total	86	37	30	17	170

Source: Fieldwork, 2009

Religious affiliations

The municipality was dominated by the Christian religion. A total of 83 percent of all respondents involved in the research were Christians, followed by the Islamic religion (15.7 percent) and the traditional religion forming less than two percent (1.3 percent). Pokuase had the highest number of Christians (60.7 percent) and Mayera having the lowest of 6.6 percent of Christians as indicated in Table 10.

The high percentage of Christians in all communities was predicted to have some effects on the efficiency on the use of traditional customs as a tool to help protect water resources and the environment. Though traditional customs were meant to fulfill spiritual purposes, they also helped to protect and preserve the cultural heritage of the people and through this the environment is also protected from pollution and degradation. With the introduction of orthodox religion, people have tended not to abide by the customs and traditions of their communities because they consider them to be a ‘satanic practice’. This results in the reduction of the use of customs and traditions as tools in protecting water resources and the environment.

Table 10: Religious affiliation in the selected communities

Place of residence	Christian	Islam	Traditional	N
Pokuase	60.7	59.5	0.0	141
Amasaman	32.7	35.1	100	80
Mayera	6.6	5.4	0.0	15
Total	100.0	100.0	100.0	236

Source: Fieldwork, 2009

Level of education in the municipality

Data collected from the field points out to the fact that quite a number of the respondents had had some form of education ranging from primary to the Junior and Senior High school. A few had had some form of tertiary education with very little percentage (forming about 7.3 percent of all respondents) having had no formal education in their lifetime. Most of those with no formal education had some form of vocation which they learnt informally. As compared to the other selected communities in the municipality, Amasaman had the highest percentage (45 percent) of people with no formal education while Mayera which was considered to be more rural had the least percentage (15 percent) as shown in Table 11. Though very few of the respondents had tertiary and higher education, Pokuase had the highest percentage of 61 percent compared to Amasaman which had 34.1 percent. Mayera however, had the least percentage of 4.9 percent.

Table 11: Place of residence by level of education of respondents

Place of residence	No education	Primary education	J H S	SHS/O/A Level	Tertiary education	N
Pokuase	40	54.8	61.3	75.0	61.0	137
Amasaman	45	38.4	32.0	25.0	34.1	81
Mayera	15	6.8	6.7	0.0	4.9	15
Total	100	100	100	100	100	233

Source: Fieldwork, 2009

On the other hand, data collected through the interview schedule showed that respondents from the water supplier category and the opinion leaders had more than half of them having higher levels of education compared to those involved in the administration of water in the home. It was assumed that this might have been influenced by the sex composition of this category of respondents since almost a 75 percent of the water supplier agencies were males. Traditionally, it was believed that males had better chances of acquiring formal education as compared to their female counterparts.

Education as a tool helps to mould one's way of thinking and solving problems. Therefore, with more women involved in managing water in the home, it is predicted that the level of education will influence the management strategy they adapt to provide water on a sustainable bases to the home.

Sources of water in the selected communities

About 86.8 percent of the respondents in the selected communities accessed water from different sources for household use. Confirmed by Engel et al (2005, cited in Eguavoen, 2008), many households in the various regions

in Ghana are faced with having to decide on which source of water is more potable for household consumption because they have to access water from different sources. This makes water user groups dynamic giving household options to choose from, bearing in mind the minimization of risks especially during the dry season. The choice of water source, for instance, involves the need for reasoned decision based on ones own criteria of access, time, effort, water quality, quantity and reliability (Tenkorang, 2002).

The study showed that members in the selected communities made use of the water available to them. This included water from rivers and streams (24.6 percent), groundwater (37.3 percent) harnessed through hand dug wells and boreholes, harvested rainwater (3.0 percent) and imported treated water (popularly known as ‘pipe’) and sachet water (35.2 percent). This was further confirmed by the water supplier organizations in the selected communities who were interviewed. Two out of the three water tanker agencies interviewed admitted that the source of water they supplied were from river sources. Only one organization said their main source of water was from a borehole. Though all these respondents said that water was supplied based on demand and preference, they supplied more water from these sources than treated water (popularly known as ‘pipe’) from outside the community.

The main reason was that imported tap water was more expensive when compared to the river sources. River water was also preferred by community members because they believed that water from rivers made their chores at home easier when compared to water from boreholes and wells which had high mineral content and high level of salinity making them hard water. Because some of the sources were assumed to be unwholesome by

some community members, some have adopted to using some form of technology to improve upon the quality of water accessed. The Mayera community had the least number of respondents accessing water from rivers and streams. One of the main rivers that run through this municipality, known as the Nsakyi River passes through Pokuase. It was therefore apparent that most residents of the community made use of water from this river.

Over 51 percent of those respondents who accessed water from rivers and streams were from Pokuase (Table 12). Right about the same percentage of respondents who accessed water from taps or treated water from outside are in the Pokuase community. Imported treated water and sachet water were more expensive comparing them to the available river water from the community. Despite the fact that few people harvested rain water for use over a period of time, it was supplemented with other sources such as water from boreholes and wells. Both Mayera and Amasaman had the same percentage (14.3 percent) of people who accessed their water from harvested rainfall. Table 12 shows the various sources of water for the household use in the selected communities while Plate 1 shows people accessing water from the Nsakyi River.

Table 12: Place of resident by Sources of water for the home in the selected communities (percent)

Place of residence	Rivers & Streams	Tap/Sachet water	Rain water	BH/wells	N
Pokuase	51.7	51.8	71.4	70.5	140
Amasaman	41.4	39.8	14.3	26.1	81
Mayera	6.9	8.4	14.3	3.4	15
Total	100	100	100	100	236

Source: Fieldwork, 2009

Plate 1: People accessing water from the Nsakyi River

Source: Fieldwork, 2009

Mode of transporting water from source to the home

There were various modes of transporting water from the sources to the home. These modes were identified as by head porterage (73.5 percent), by a private vehicle or water tanker (7.3 percent), by using a wheelbarrow (8.5 percent) and by a locally made trolley (10.7 percent) (Table 13). The locally made trolleys and the use of wheel barrow in transporting water helped to reduce the stress involved where the head porterage method was used. However, through observation from the field, it was noticed that these modes of transportation were only possible if more men were involved in accessing and transporting the water from source to the home. This was because these machines needed a lot of manual energy to push since a large amount of water transported carried a time.

Table 13: Modes of water transportation

Response	Number	Percent
Head porterage	172	73.5
Wheel barrow	20	8.5
Vehicle	17	7.3
Local trolleys	25	10.7
Total	234	100

Source: Fieldwork, 2009

Also through field observation, it was noticed that due to the cost involved in maintenance and purchase of such machineries, very few people could afford to own them. Vehicles such as water tankers and pick up trucks were mainly used by the water supplier agencies. These modes were therefore,

very expensive for the individual households to employ to supply the home with water on a sustainable basis. Nonetheless, a hand full of some rich community members employed this mode to supply their homes with water throughout the year.

Aside this issue, head porterage was the commonest mode of transporting water from the source to the home. It has been the traditional way of transporting water and data collected showed that this tradition was still practiced. In most cases however, it was the containers used in accessing water from the source that determined the mode of transportation. Containers carried were usually big in order for people to carry as much water as possible at a time. This needed a lot of energy and therefore added to the stress involved in accessing water. According to a research conducted by WaterAids International in 2004, women usually carry very big pans or containers in order to carry a large amount of water at a time. These big pans and containers are usually carried on their heads over long distances which later on affect their level of productivity.

Confirmed by Roda (1991) cited in Doyal, (1995), more than a quarter of the energy gained from food daily by women was depleted during the access of water for the home.

Duration for accessing water

Some of the concerns raised about the access to water is the time spent, which was highly influenced by the distance from the home to the source. This is the total time spent by an individual in making round trips in accessing water for the home. The time spent in accessing water had a direct effect on

the quantity accessed, convenience and mode of transportation. Therefore, no matter how close the source of water was to the home, mode of transporting it from the source to the home which was mostly by head porterage, affected the quantity of water accessed thereby necessitating several round trips to arrive at the quantity needed for household use at a time.

According to the UNICEF/WHO Joint Monitoring Programme (2006), round trips in accessing water which are longer than thirty minutes are considered unimproved sources. They also included the fact that any improved water supply system should be accessed from a household connection or public standpipe which is protected. Harvested rainwater, borehole, protected dug wells were defined only as being improved sources for community use when they were located within a kilometer of the user's home.

An issue noticed from the field was that the perception of water quality did not really influence the choice of source of water accessed by respondents. This confirmed the research done by Eguavoen (2008) who found out that people were actually not bothered about the quality of the water they accessed as a major factor in their choice though they may have their own perceptions about the quality of water. This was because they were likely to access their water from sources which were of poor quality because they were closer to their places of residence; hence the issue of proximity does have a great impact on the decisions of people. Verified by Nyong and Kanaroglou (1999) most households preferred using water irrespective of its quality as long as they were found in areas closer to their homes to cut off the extra time spent at sources with good quality but located far away.

Data collected from the field however showed that a number of respondents spent more than an hour in making a round trip in accessing water for household use. This implied that there was the likelihood that most respondents accessed water from both improved and unimproved water sources. About 50.7 percent of the respondents did not collect water from boreholes or wells because they had some level of salinity in them as confirmed from the researches conducted by the District Water and Sanitation Team (2007). These sources were close by and protected because they had caretakers who were responsible for the sanitary conditions of the place.

The category of respondents who used more than thirty minutes to access their water were assumed to have accessed their water from outside their communities contributing to the extra time spent in making a round trip. For instance, someone from Mayera who decides to access potable water from the water supply system of the Water Health International located in Pokuase would have to spend at least an hour in making a round trip since these communities were far apart and linked with un-motorable roads. Respondents who made a round trip within twenty minutes mainly accessed water from sources such a harvested rainwater and water from boreholes and wells.

This implied that people's perception did not totally affect their choice of source of water. As defined by Abane (2005), access also included ones convenience in reaching that facility to enhance ones living condition. Convenience includes the facility being within ones physical reach in order to make it easier for one to access water. This explains the reason why people were forced to depend on the sources available to them in their communities. From Table 14, one can notice that the majority of the respondents

(constituting 69.9percent) within respondents who used twenty minutes or less were from Pokuase while that of Mayera had the least of 5.4 percent. Though a few respondents used more than an hour in making a round trip, Pokuase still took the greater proportion and Mayera again taking the least. This was because people within the Pokuase had access to both river water and the water supplied by the Water Health International. In addition to this, four boreholes were available to supply groundwater to the community.

Table 14: Place of residence by time spent in accessing water

Place of residence	less than 20 mins	21-30 mins	31-60 mins	Above 60mins	N
Pokuase	69.9	63.4	67.6	37.3.0	140
Amasaman	29.7	29.3	27.9	52.8	81
Mayera	5.4	7.3	4.4	9.4	15
Total	100	100	100	100	236

Source: Fieldwork, 2009

Cost of water

Water was sold at prices ranging from five Ghana Pesewas to thirty Ghana pesewas within the studied communities in the municipality. The price was however, dependent on the source of water. Ground water harnessed from hand dug wells and boreholes had little or high level of salinity limiting its functions. Therefore, water from ground water sources was sold mostly at five Ghana Pesewas and where the salinity was low, it was sold for ten Ghana Pesewas per bucket.

On the other hand, imported tap water was sold between ten and thirty pesewas per bucket. Interviews with individual and private water vendors

showed that a bucket of water which had a measuring standard of eighteen to twenty liters was sold for twenty pesewas or more. This made it quite expensive for the average household to provide water from this source on a sustainable basis. Other reports show that water vendors tend to make more profit by selling water five to ten times its actual price (Maxwell, Levin, Armar-Klemesu, Morris, & Ahiadeke, 2000). Though the Water Health International sold a twenty liter bucket of water for ten pesewas in Pokuase and Amasaman it was considered to be expensive by the people in these communities. This reduced the demand of water from this source by community members.

Quite a number of respondents made use of sachet water especially for drinking. This was mainly supplied in bags by vehicles on demand. A bag containing about thirty-three sachet of water with each sachet weighing about five hundred milligrams was sold on the average at seventy Ghana Pesewas from the distribution trucks. Though this was expensive, it was assumed that sachet water was safer to consume as drinking water as compared to the available sources of water in the municipality. This also contributed to the high number of respondents who said they did nothing to the water they accessed because they assumed it was already safe to drink. The few who had to depend on other sources, tried to use various methods to improve the quality of water they accessed before consuming.

In Table 15, people in Mayera had 2.9 percent of the respondents who bought a bucket of water for less than ten Ghana Pesewas with Pokuase having the highest of over 65 percent. Pokuase also had more than 88percent of the total number of respondents who bought a bucket of water for more than

GH5p. Based upon interviews with water supplier agencies and observation, it was noticed that buckets of water were not sold as high as GH50p. Therefore, those who bought it at that price bought it as bags of sachet water and not as in buckets of water. Other respondents on the other hand, did state clearly that they hardly bought water for household use. This was explained by their reliance on social capital or networks available to them. Some of these respondents were tenants of compound houses which had hand dug wells owned by their landlords. Therefore, in order to always have access to this water, they maintain good human relations with their landlords. Most often, this source is supplemented with harvested rainwater. Therefore, they spend at times nothing on water for household use.

Table 15: Place of residence by cost of a bucket of water

Place of residence	< GH 10p	GH 20-30p	GH 40-50p	GH 50p above	N
Pokuase	65.7	56.1	53.3	88.9	120
Amasaman	31.4	36.4	33.3	11.1	62
Mayera	2.9	7.6	13.3	0.0	10
Total	100	100	100	100	192

Source: Fieldwork, 2009

Perception of potable water

Water that is clean, safe and does not present any form of health implications to humans is said to be potable (Drinking Water Review Panel, 2002). This implies that the physical (i.e. the colour), biological (presence of biotic life), and chemical (presence of metals such as mercury, lead) are absent

or in very minimal levels that may not pose any threat to human health (California Water Plan Update, 2005). According to the 17 water supply agents interviewed, potable water was water that was clean and safe enough and does not pose any health hazards to the consumer. The data from the three communities showed that people had similar perception of potable water. However, because most of the ground water accessed were saline limiting their level of productivity, some respondents were particular about the taste of the water they accessed. The major parameters used by respondents in defining potable water were based on the source of water, the taste, the colour and whether it had been treated or not.

In an interview with the General Manager of Water Health International, an NGO, based in the community which was a water supplier agency, she stated that researches made by the organization showed taste as a preference by community members in their choice of source of water. Therefore, they preferred to treat water from the Nsakyi River for supply in the community. Samples of water from groundwater analyzed by the Water Research Institute (Accra, 2009) further verified that water from selected boreholes and wells were hard water. This confirmed the assertion made by Gleick (2003) that users of water may be more likely to value the taste of water available to them and the convenience associated with it, than opt for other alternatives. According to Nyarko et al (2006), though there are several alternatives of water sources throughout the year which is available to people in a community, households seemed to have preferences for water from particular sources using their perception of potabilty.

The perception of the respondents was influenced by their experience and their environment. For instance, due to the nature of ground water in the communities, most people (66.4 percent) defined potable water as water that was less saline and was tasty. However, about 10 percent of respondents thought that water from ground water was more potable. Though this was verified by Cunningham and Cunningham, (2004), VanCalcar (2006) also stated that water quality prior to water collection, transportation and storage may change due to handling and unhygienic conditions surrounding it.

Water that was clean and free from both physical and abiotic life was potable. However, only about 30 percent of the respondents who thought water was potable only when it was clean and safe enough to drink were from Pokuase but Amasaman had the highest percentage (53.8 percent) in this category. Considering the fact that it had the lowest population of respondents with no formal education, Amasaman was considered to have a lower percentage for those who defined potable water using the right parameter (i.e. clean and safe from disease causing agents). This was explained by the fact that many of the researches done in this particular community were centered on water.

This was so because of the outbreak of the buruli ulcer disease in the community which was believed to have been caused by inadequate potable water supplies in the late 1990s. Therefore, members from the Amasaman community, admitted to the fact that fora and other workshops were held in order to sensitize members through education on the need and importance of potable water as a preventive mechanism against the disease. For a community like Mayera considered to be rural it also attracted similar researches through

which the community was educated in the process. As explained by UNICEF (1999) and CIDA (1998), it is through the use of simple methods such as education that will help provide efficient domestic utilization of any water resource.

Those who defined potable water by colour, were assumed to be concerned about the colour of the River Nsakyi which was located in the Pokuase town and used by most of the people. The colour of the water from the river was mostly light brown. However, it was considered potable because some people believed the colour was created by herbs found in the river which made it medicinal on the contrary. Pokuase therefore, had the highest percentage (75 percent) of respondents who defined potable water by its colour and Amasaman had about 24.6 percent as shown in Table 16.

Table 16: **Place of residence by perception of potable water**

Place of residence	Clear water	Tasty/less saline water	Treated water	Clean/safe water	N
Pokuase	75.4	67.2	66.0	30.8	135
Amasaman	24.6	32.8	24.0	53.8	80
Mayera	0.0	0.0	10.0	15.4	15
Total	100	100	100	100	230

Source: Fieldwork, 2009

Access to potable water in the Ga West Municipality

According to WHO (2004), over 80 percent of all human diseases are caused by the inadequacy of potable water. Therefore, making potable water available in substantial quantities and accessible in terms of distance and

quantity would help improve upon the health status of the human race and as well contribute immensely to the development of a nation.

Available literature showed that Amasaman, the district capital, had an increased case of water related diseases such as cholera, malaria and diarrhea. Buruli ulcer remained at the top of the list of endemic diseases (Ga West District Assembly, 2006). This implied that people still relied on unimproved water sources which were mainly water from the Nsakyi River, streams and the various river catchments in the municipality. These were highly polluted due to development such as sand winning, building projects and farming along river banks. According to Johannesson and Olsson (2009), polluted river with sewerage and faecal matter is unsuitable for drinking without prior treatment.

Though there existed a small town water supply system which supplied parts of the municipality with water, it had broken down due to mismanagement and theft. The Water Health Ghana, however, had built a new water supply system to treat the river water for the communities of Pokuase and Amasaman. However, it was only concentrated at the core, leaving those in the peripheries. The boreholes constructed by the WATSAN Committee and some churches in the communities were not highly patronized due to the level of salinity in them. Low patronage coupled with inadequate maintenance has led to the breakdown of some of these boreholes and wells. According to an interview with the one in charge of the town water supply system which also broke down over a decade ago, water from the former water treatment plant was highly patronized by community members. However, as a result of inadequate maintenance and frequent robbery cases due to inadequate security,

the system broke down leaving those members of the community to turn to other unwholesome sources, especially the Nsakyi River.

Over 90 percent of the respondents complained about the monetary cost in accessing water from outside, but the data collected showed that the majority (constituting 70 percent) of respondents in the selected communities used tap water imported from outside their communities but in smaller quantities due to the cost involved in accessing it. Though they could easily order for a water tanker to bring in treated tap water, it was considered quite expensive. Therefore, a few households which were able to generate enough income always brought in treated water.

Two of the water venders who soled imported treated water to the communities in which they lived stated that using this source of water solely for all purposes in the home was quite expensive. They admitted that the water they imported was actually for the use of their homes, but in order to cut down cost, they had to sell some of it to generate part of the money needed to cover for the cost in accessing water from this source.

People have to manage the use of water especially that from imported tap water in order to minimize cost and maintain its supply for household use on a sustainable basis. According to a research conducted in the Greater Accra Region, people who sold tap water, soled it at prices which were ten times higher than they pay for it (Maxwell et al, 2000). The data collected showed that people bought a bucket (which was usually made up of eighteen liters) of water between five and thirty Ghana pesewas in the three communities.

Comparing the current sources of water in the municipality with the sources listed by the Ghana Poverty Reduction Strategy (Ghana Statistical

Service, 2003) as indicated in Table 2 and 11 (in chapter 2 and chapter four), it was also noticed that people from the municipality accessed water from such similar sources. However, the only difference was the availability of treated tap water in all selected communities regardless of whether it was an urban area or a rural area. Both the urban and rural areas had to import treated water though the natural sources of water such as rivers and streams were present and were accessed by people in the municipality. Sources of water for the municipality included piped water which is mostly imported and natural sources such as rivers/streams and ground water. 34.0 percent of respondents accessed water from treated water sources (called 'pipe') and 36.1percent accessed water from ground water sources harnessed through wells and boreholes according to the data gathered from the field. Comparing this to the sources of water at the country level, demand for water from these source were almost the same (i.e. 41.6percent for treated water sources and 33.9 percent for those who accessed water from groundwater sources as indicated in Table 2 and 11 (in chapter 2 and chapter four).

Challenges faced in accessing potable water

Potable water supply in the Ga West Municipality was found to be generally inadequate. This posed a lot of challenges to most communities in the municipality. Though most people claimed to access their water within an average time of thirty minutes or more, the data showed that the water they accessed was not what they perceived as potable. One of the challenges faced by people in the municipality was the time they spent in travelling long distances to access water from sources they considered potable. The average

minutes spent in accessing water from these sources were different because of disparities in its availability at a point in time. In the Greater Accra region, it is estimated that people took an average time of twenty four minutes to access water. The issue was different in the Ga West Municipality (Ghana Statistical Service, 2000). It was expected that people within this municipality also spent close to the same average minutes to access water. However, the situation was different as the average time spent in accessing water was thirty minutes and above.

As a management strategy, most households reduced the time spent in accessing water by making use of what was available and nearer to them. In most instances, however, the time spent in collecting water for household use can be diverted into doing other livelihood activities which may be more productive to the home (Norström, 2007). Therefore, sources of water which was closer to people such as the river water and groundwater were accessed in order to save time for other productive activities in the home. Since people had used water from this source over a long period of time as the most available source, they became used to its poor nature.

Another challenge was the burden of carrying water from the source to the home. The survey showed that more than a half of all respondents used the head porterage method to transport water to the home. Through observation during the survey, it was noted that majority of people carried big pans on their heads in order to transport as much water at a time. This needed a lot of energy to do even if it was for a shorter distance.

The other challenge was how one could try to improve upon the quality of water to make them wholesome for the purpose it was intended for such as

cooking or drinking. The survey showed that very few people were aware of simple ways of improving upon water quality. On the other hand, some people did know about some methods such as boiling and filtering, but said they did not use such methods because it was time wasting and consumes a lot of energy, making the whole process at the end very expensive to do on a continuous basis.

When respondents were asked to assess the inadequate potable water situation in their various communities, about 61 percent said that the situation in their respective communities was bad. This answer was given based on their understanding of potable water. The remaining 39 percent of the respondents said that the inadequate water situation in the municipality was better compared to some few years ago. This was because, currently, some organisations such as NGOs, church and community associations have been able to raise some funds to construct hand dug wells and boreholes with fitted hand pumps to supply groundwater to the people. Though the survey revealed that few people patronize the water from this source, it was also considered as an available and most accessible source of water in most parts of the municipality.

Another observation made from the field revealed that more people relied on the sachet water regardless of its source and treatment information as a source of drinking water. The community members, who relied on this as their source of drinking water, believed that water from this source was well treated and therefore the level of potability was high.

Water management processes and practices in the home

Water allocation and use in the home were based on the source and perception of water quality accessed. As stated by Sarpong (2004), many localities in the Greater Accra Region rely on rivers, streams and sometimes canals for their source of water supply.

River or stream water was allocated differently from imported tap/sachet water. Mostly, the allocation was done to assist effective use of water in the home by using the purpose of a particular source of water as the basis. Most of the respondents from the three communities allocated water differently because they accessed water from different sources. A few also had a single source of water, mainly imported tap water which could be used in the home for all purposes. However, respondents admitted that they sometimes minimized the cost of accessing this water by supplementing it with other sources.

Other households however, were limited to a single source of water. A few of the households who could afford imported tap water from outside their communities used it for all purposes-from drinking to cleaning and washing. About ten households said that they depended solely on the Nsakyi River. In this case, the part allocated for drinking was filtered before storage using the locally made ceramic filter. The portion allocated for cooking was not filtered, because respondents believed the element of heating through cooking will destroy present bacteria. As indicated in Table 16, 38.2 percent of those who used water filter accessed water from groundwater through wells and boreholes. Through observation it was also noticed that water from wells and boreholes within the selected communities were actually clear with little or no

suspended particles in them because they had been already sand filtered naturally in the ground. However, this percentage of the respondents said that they needed to filter water from this source because it helps to reduce the 'salt' content in it.

Other methods used in improving upon the quality of the water they accessed were by adding chemicals bought from the markets such as alum to remove dirt from untreated water. Over 15 percent of those who accessed water from rivers and streams used it untreated while 48.1 percent said they added alum to it in order for it to coagulate so that they can remove some of the dirt or suspended particles and bacteria from it. Bacteria in water attaches itself to suspended particles in water, therefore, through coagulation, the level of bacteria infestation can be reduced but not eliminated totally (Sobsey, 2007). Forty-two percent of all respondents who were accessing water from imported tap water and sachet water consumed it without any prior treatment because they believed with the treatment given it; it was safe enough to drink.

A small percentage of respondents said they adopted boiling to improve upon the quality of water they accessed. The highest percent (48.0 percent) of the users of this method were those who used river and stream water. This method was not highly patronised by respondents because they said it was time consuming and needed energy and other resources to complete. VanCalcar (2006) stated that this method of improving upon the quality of water had its own disadvantage. Boiled water was easily re-attacked by bacteria and therefore needed to be consumed within a few days making this method a less reliable strategy of improving upon water quality. Other respondents who used this method however, explained that water from this

source (i.e. rivers and streams) was also used in cooking and washing, therefore in cooking for instance, the added heat in the process is believed to improve the quality of water.

Quite a number of respondents were however, convinced of the quality of the water; therefore, they consumed water from the source without prior treatment. These mostly included those who accessed their water from imported tap water or sachet water. Table 17 shows how water is made potable in the home by their sources while Plate 2 shows a ceramic filter which was used by a respondent to filter water in the home for drinking.

Table 17: Source of water by how water is made potable in the home

Source of water	Using filter	Consuming it raw	Boiling	Adding alum	N
Rivers and Streams	26.5	15.5	48.0	48.1	57
Tape/sachet water	29.4	42.6	20.0	14.8	82
Harvested rainwater	5.9	2.0	8.0	0.0	7
Groundwater (borehole/well)	38.2	39.9	24.0	37.0	88
Total	100	100	100	100	234

source: Fieldwork, 2009

Plate 2: A ceramic filter

Source**:** Fieldwork, 2009.

It was assumed that since most respondents said potable water was inadequate in their communities, some of them may be more likely to reuse waste water by recycling it using traditional methods to make the use of water in the home effective and efficient. However, the data collected showed that only 47.5 percent reused waste water for other purposes in the home mainly for scrubbing and cleaning the floor and washrooms. This management strategy was adopted by some households to help save cost and energy in accessing fresh water for the proposed purpose. Mostly, this situation was found in cases where a round trip for accessing water was more than thirty minutes. This was further confirmed by Gleick (1996) that people tend to reduce their per capita water use from five to ten litres per day in order to reduce cost and to sustain the continuous supply of water for household use.

The study also showed that all respondents who reused waste water did not use any method to recycle it.

The remaining 52.5 percent did not reuse waste water because they said they did not find use for it. This was explained by the issue of the unavailability of washrooms in most homes. Those who used waste water used this in scrubbing their washrooms and cleaning other surfaces. Some of the respondents who could not find use for their waste water did not own washrooms in their homes and had to use public washrooms. Figure 8 shows the information on the proportion of respondents who reused waste water and for which purpose as a strategy to improve upon the efficiency and use of water in the home.

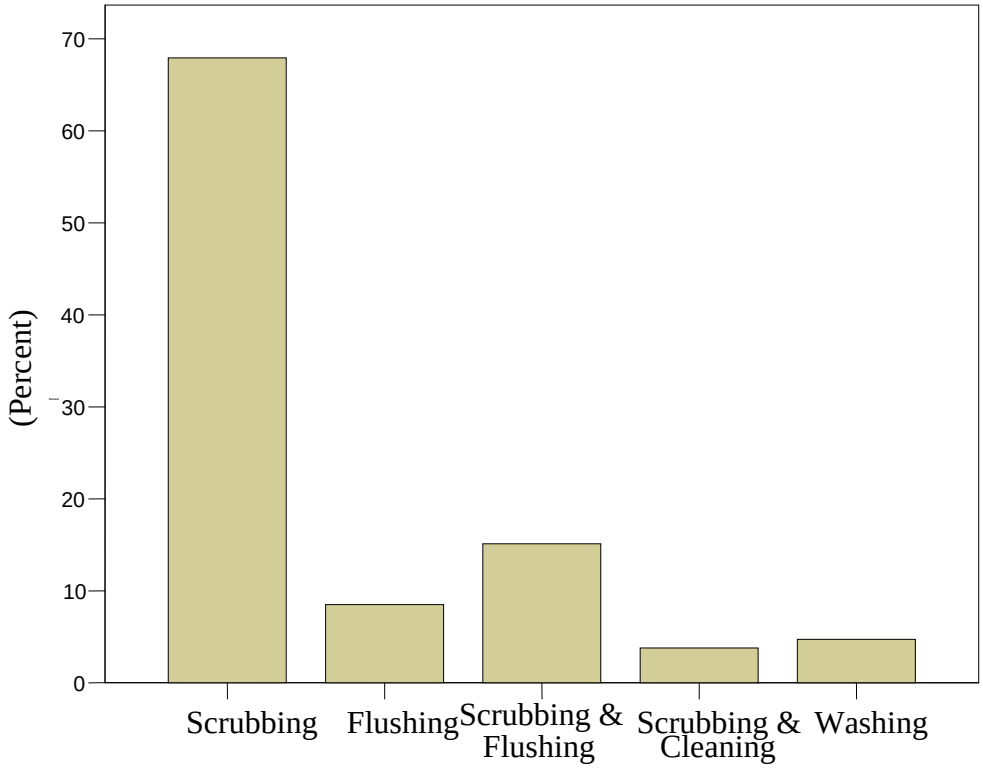


Figure 8: **Purpose of waste water**

Source: Fieldwork, 2009

Exploring available opportunities in household water management

When people live within an environment for a long time, they tend to adapt to strategies that will help them survive in their environment (Hofrichter, 2000). These strategies are meant to assist in the reduction of the challenges they face while accessing facilities in order to improve upon their conditions of living.

Data showed that though there were new opportunities available to households in the municipality they were not totally explored by community members. Through observation this was predicted to be the result of inadequate education on and the unwillingness of household to explore new technologies. More than three-quarters of respondents interviewed, admitted not having knowledge of new but simple ways of improving upon the quality of water in the home.

The various methods known to them were the use of alum and boiling to improve upon the quality of water in the home. Though the use of UV light was an available opportunity to be explored in the municipality to improve upon the quality of water in the home, many did not know about it. The 10 percent who knew about it thought it was time wasting because it could only be done on a small scale at a time. Some community members explored traditional methods known to them to enhance the quality of water which came from ground water sources. Some people who individually owned wells added charcoal or salt to reduce the salinity level of the water. However, this method was not used to a larger extent by people. Though these were opportunities to be explored because they were simple, effective and

inexpensive, it was not widely used because very few of the community members knew about it.

The situation was also influenced by the influx of the sachet water which was popularly known as ‘pure water’. Many people believed that it was treated and therefore was safe enough to consume without any other prior treatment by individual households. More than three quarters of respondents used this source as their main source of drinking water and they did not really find any necessity for the need to employ ways of improving the quality of the water they drink in the home.

Upon an interview with a respondent, he claimed that water from the river has been the source of water to his family from generation to generations and nothing has happened. He said:

> *I was christened with water from the river, and that has been used in cooking, drinking, washing and what have you.. everything...anything. Nothing has really happened; therefore I think water from this source is alright (Odjuku).*

When people experience challenges that create inconvenience to their livelihood they might be inclined to establishing new ideas and methods to overcome the challenges they face while accessing facilities. These ideas and methods are meant to put various mechanisms in place to balance and predict the existing and prospective requirements for the use of that resource as being done by majority of community members in the management of the sources of water they accessed for domestic use.

Seasonality and the quantity of water accessed

Though most of the respondents admitted having been affected by seasonal changes and the quantity of water accessed, they also agreed that they never run out of water. Those who mostly accessed water from wells stated that though the water in the wells runs out occasionally, they were able to get water from other sources. Other respondents on the other hand, said they waited for the ground water to recharge in the morning. More than half of them admitted that water from one of the main rivers in the municipality, which is the Nsakyi River, has never in the history of their existence dried up. This however reduced the preparedness of respondents to make available other measures such as storing water in larger quantities to ensure its continuous access for a longer period. Only 7.8 percent of the respondents had hand dug wells to supplement other sources of water for household use while about 50percent had tanks to store water harvested from the rain and imported tap water as shown in Table 18.

Responses from the interviews from the water supply agents showed that seasonality did not really affect the quantity of water from the source of water they supplied. However, more sales were made during the dry seasons to people who had large tanks at home to store water bought from them. The issue was with the quantity demanded during the dry and wet season since that affected their business because most people depended on harvested rain water during the wet seasons. In an interview with other water supply agents especially those who supplied the sachet water to the communities, they did agree to the fact that they were sometimes forced to reduce the price of the

sachet water they sold in order to be able to sell the expected average number of bags during the wet season.

Table 18: Investment made by respondents

Investment made	Frequency	Percent
Dug a well	19	8.1
Harvest rainwater	54	23.0
Import tap water	68	28.9
Done nothing	94	40.0
Total	235	100

Source: Fieldwork, 2009

Age and perception of potable water in the municipality

The chi-square statistic was used to analyze the relationship between age and the perception of water quality in the selected communities. It was assumed that with the advancement in age, people may gain better understanding of their environment through their experience that result from the various challenges they encounter everyday (Doyal, 1995). For instance, it was assumed that people who had lived in the municipality may have their perception of potable influenced by their daily encounters in their quest to access potable water for household use. This was due to the reason that they might have had the opportunity to access less polluted surface water. Developments especially around water bodies and diversion of sewerage into the rivers in these communities have reduced the quality of water from these sources. This however, limits available alternative sources of fresh water

thereby reducing the ability of people to sustain the continuous supply of potable water to the home.

The Chi square statistic gave a result of 0.039, which was lower compared to the p. value of 0.05 indicating there was a significant relationship between one's age and his/her perception of potable water. Therefore, we reject the null hypothesis. This situation was further explained by the nature of water from the different sources available in the municipality. It was easier to access groundwater because they were made available at points which were accessible to most community members by NGOs and the WATSAN. Water from this source was also subsidized therefore it made it cheaper. Water from this source is mostly saline, but people were forced to use water from this source irrespective of their perception of potable water. This resulted in people accessing water that was not perceived as potable water.

As indicated in Table 19, respondents within the age group of 19-31 years constituted higher percentages within all categories of definitions given for potable water in the municipality. The same age group constituted over 60 percent of those who defined potable water as water that was tasty and less saline. It was therefore, imperative to note that this group of people might have over the years experienced certain challenges which had influenced and shaped their views on how they perceived potable water.

The number of years lived in a community was presumed to have affected one's perception of potable water. The data also showed that people who had lived longer in a community tended to define water quality based on the taste and colour. On the other hand, younger people were more concerned

about the colour of the water as they used that to tell whether water was potable or not.

Table 19: Age by perception of potable water

Age (years)	Clear water	Tasty/less saline	Treated water	Clean/safe water	N
<18	3.6	1.7	8.0	1.6	8
19-30	46.4	29.3	48.0	44.4	95
31-59	50.0	67.2	44.0	49.2	120
60+	0.0	1.7	0.0	4.8	4
Total	100	100	100	100	227

Source: Fieldwork, 2009

The influence of level of education on the adopted management strategy

In situations where scarcity of a particular resource increases over a period of time and especially when that scarce resource is a necessity of life, prudent measures are taken to manage it. One of the issues noticed from the data collected was that very few people were able to make provision for storing water for future use and as well to sustain the continuous supply of water to the home. This necessitated the access of water on daily basis. Some actually made investments by providing tanks which could store between a thousand to two thousand gallons of water at a time. Tanks were constructed underground or placed on platforms or metallic stands. These tanks were able to constantly supply water to the average household for an average duration of thirty to thirty five days.

As a management strategy, it was expected that every household would store water in large quantities to ensure the continuous supply of water to the home. However, this was not so because some people claimed to always have

access to water no matter how scarce it was at any particular point in time. Water from sources such as river water or ground water reduces in quantity during the dry seasons. This forced people to allocate water from such sources for more purposes in the home which would have not been so in the wet season. This affected the process of storage and usage of water in the home.

People who had lived in the community longer than a decade were expected to have invested into underground tanks or other strategies of storing water for household use based on their experience with the water situation in their communities. However, it turns out that out of those who said they had done nothing to ensure the continuous supply of water to the home, 30percent had lived in the community for more than a decade. This trend was influenced by most respondent's living arrangement in the community. More than half of the households were tenants of a bigger compound house with little or no spaces available to enable them build such tanks or even dig wells to enable them store water for a continuous use in the home. Therefore, the issue was not much on their inability to invest in water facilities but rather on the unavailability of such opportunities in the communities.

Various methods used on household bases to improve upon the quality of water also were not fully exploited by community members. This was due to factors such as lack of public education on the use of such methods and the level of education of the one in charge of the water management in the home. Very few public fora were held to educate the community members on the simple ways to improve upon the quality of water they accessed in the home. Therefore community members were less exposed to simple processes used in improving upon the quality of water in the home. On the other hand however,

less educated people who had lived in the community for a long time, preferred to use the water untreated.

Using the chi square statistic, in determining the relationship between the level of education and adopted management strategy, the result showed that there was a significant relationship (refer to appendix). The level of education did influence the management strategy of water in the home. The method for example, used in improving upon the quality of water in the home was influenced by the level of education (indicated in Table 20). People with a higher level of education did use methods known to them to improve upon the quality of water they accessed for domestic use. Some of these respondents were aware of the poor quality of water they accessed and were aware of how this could affect their health if they should use it untreated. In some cases, water from such sources were used for other purposes such as washing and scrubbing in the home other than drinking which could affect one's health.

The data also showed that people who had lived in the selected communities for quite sometime had adapted better to their environment through the use of multiple sources of water for different purposes in the home to cut down cost. Those respondents who had moved to the community recently (within a two year period) spent much money on access water for the household use because most of them chose to import tap water. This was because of the poor quality nature of river and ground water sources in their communities.

Table 20: Management strategy by level of education (percent)

	Level of education					
Management strategy	None	Primary	JHS	SHS/O/A Level	Tertiary	N
Alum& filter	47.3	18.1	21.6	25	39	60
Raw	47.4	58.3	74.3	70.8	53.7	145
Boiling	5.3	23.6	4.1	4.2	7.3	25
Total	100	100	100	100	100	230

Source: Fieldwork, 2009

Location and time spent in accessing water in the municipality

The time spent in accessing water is affected by the distance one has to travel in order to access water for household use. If one is located far away from a water source, it may influence ones decision in choosing that source. It was predicted that there may be differences in the time spent in accessing water in the different communities under study regardless of the differences in their choice of source of water for household use.

The chi square statistic was used to test the difference between time spent in accessing water and ones location within the municipality. Though the three study communities were located in different zonal councils, it was expected that they would access water from a common source such as ground water and river water. This would bring about little differences in the time spent in accessing potable water for household use.

The result from the chi square statistic was 0.01. This was very high when it was compared to the p. value of 0.05. The result showed that there was a strong difference between ones location (in terms of one's community) and the time spent in accessing water. This was the result of factors such as the

choice of source of water for the home. This was influenced by the available water to one at the time of need. For instance, most people in the Pokuase community relied on the River Nsakyi and imported/sachet water as their major water source of water for the household while very few of them relied on rainwater as their main source of water. Reliance on rainwater was very small in all selected communities for various reasons such as people's un-preparedness to invest in storing water in larger quantities for future use.

Pokuase and Amasaman, the district capital had a small plant put up by an NGO (Water Health International) to help resolve the water issue in the municipality. Though it was expected to ease the stress that goes into accessing water in these communities, data collected showed that few people actually patronized water from this plant. Despite the fact that business is booming for this NGO, it was found out that people who actually patronized water from this plant were people from the periphery and outside the community. The situation was different however for the use of other sources of water. People were prepared to access water from rivers and streams irrespective of the distance and time needed to complete a round trip. This was because of the taste people had already developed for the water from the Nsakyi River. Some of the respondents did employ the services of the locally made trolleys to access water from the river as shown in Plate 3.

Mayera community spent the highest amount of time in accessing water for household use. On the other hand, however, the Pokuase community had the least amount of time spent in accessing water. This was due to the available opportunities to the people in the Pokuase community. The Nsakyi River flowed through the Pokuase Township while the Sunkwah stream also

took its source from one of the mountains in the community. Apart from this, the water treatment plant constructed by the Water Health International in collaboration with Safe Water Network gave more than enough alternatives to community members to choose from. Though the district capital (Amasaman) has almost the same alternatives, it was lacking in terms of having streams and rivers compared to the Pokuase community. However, much time was not spent in accessing water compared to the people in the Mayera community because the district capital was more accessible. Due to this, many respondents from this community (i.e. Amasaman) said they depended on imported water and sachet/bottled water for household consumption. Many of the water supplier agencies could easily supply people in the community with water because they were more accessible.

Mayera however, for the reason that it was a small rural community was less accessible and was less developed and had few people with some education. They therefore, spent the highest amount of time in accessing water for household use. Though some depended on imported tap water, few people in the community benefited from water from groundwater sources. Some of them were forced to also travel long distances in order to access the nearest available water source. These factors accounted for the differences in the time spent in accessing water for household use.

Plate 3: **Using locally made trolleys to transport water from source**

Source: Fieldwork, 2009

Vulnerability and livelihood capitals drawn on to access water for household use

People relied on various capitals available to them to influence the source of water they accessed for household use. Social capital which was also considered as social networks or relationships were drawn upon to ease the challenges one faced to access water for the home. As explained in the conceptual framework, social capital considers the relationships people have with an outside organization or the extended family members to access water from close by. This helped them to reduce the time and distance spent in accessing water. Only 10percent of households owned their houses while more than 50percent were tenants of bigger compound houses. A few of the respondents were tenants whose landlords had already dug a well or sell

imported tap water. Therefore, the community members relied on such social networks (relationships) to make their quest in accessing water a little convenient for them. In most cases however, as complained by some of the respondents, these relationships turned sour and resulted in some conflicts with the other tenants or the landlord himself. This forced some tenants to always keep good human relations with their neighbors and landlords.

The human capital drawn on to access water was done depending on its availability in the home. Over 20 percent of the water managers in the home stated that they were the sole collectors of water for the home. One of the factors was the age of the children in the home. In situations where the children in the home were very young and could not fetch water on their own, water collection was done by the adults in the home. In this case some other respondents preferred to engage the services of door to door water suppliers in the locality, though it was a little expensive. The prices of water from the tanker operators and local trolley pushers to the end users made it very expensive because of the transport cost. Transport alone amounted to about 75 percent of the cost of water from this source (WUP, 2003). Figure 9 shows the various groups and their percentages that were responsible for the collection of water for the home.

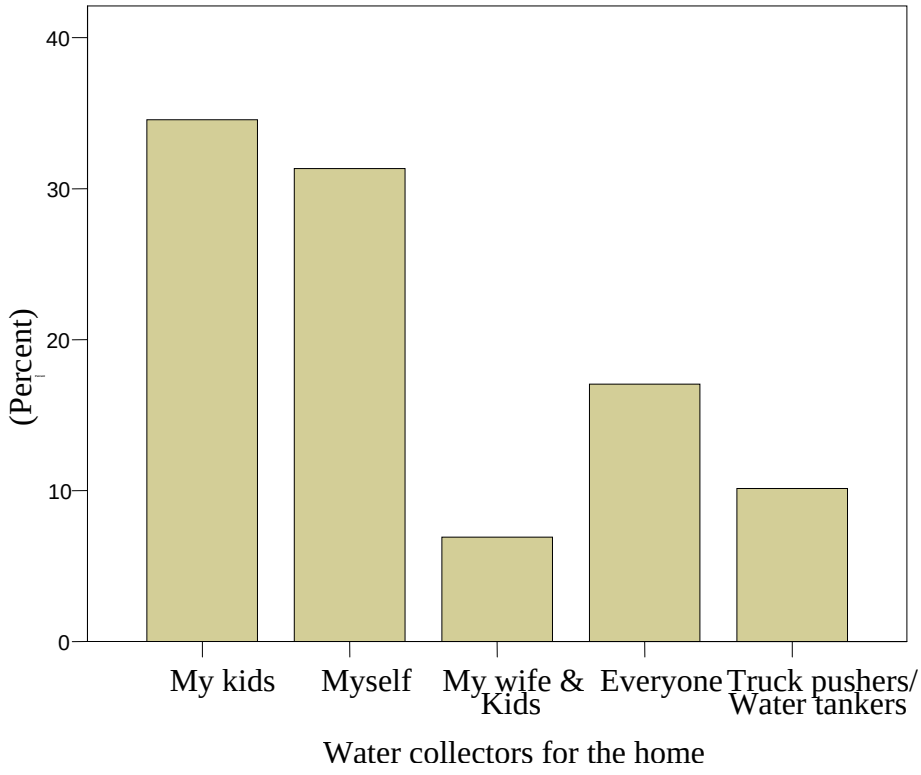


Figure 9: Water collectors for the home

Source: Fieldwork, 2009

In terms of the natural capital, it was apparent that the communities in the municipality made use of resources in their environment. The municipality is endowed with water resources (Ga District Assembly, 2006). The natural capital available to them was grouped into two:

- Ground water which was harnessed through hand dug wells and boreholes; and
- Surface water resources including rivers, streams, dams and harvested rain water.

Through various management strategies, the community members were able to use these sources of water on a sustainable basis. The concern for seasonality and shocks which were experienced during the dry season were well adapted to by accessing water from more than one source. This was always presented in alternative water sources for households, creating water security and reducing the level of vulnerability.

The infrastructure that supplies point source water such as protected hand dug wells (considered as Physical capital) are very few in some communities. For example, in the Pokuase community which had almost eleven thousand people, there were only about six boreholes of which two were individually owned by community members. This made water from this source inadequate. Imported treated water was very expensive not only because it was accessed from outside of the community but also because most of the roads in the communities were in poor state which affected the smooth transportation of water tankers into the community. This increased the monetary cost involved in accessing potable water for household use in the municipality. This also reduced the amount of water accessed from this source (imported tap water) by various households. As a management strategy, a greater reliance on river water which was highly polluted for household purposes was seen as an appropriate measure (Johannesson & Olsson, 2009).

Institutions involved in the supply and management of water in the Municipality

Two institutions were involved in the supply of potable water in the selected communities in the municipality. These were the formal and informal

sectors. The formal involved the governmental organisations which was mainly the Community Water and Sanitation Agency and Ghana Water Company Limited. The informal sectors were made up of the local 'truck pushers' and water tanker organisations.

Those water suppliers from the informal sectors had traditional customs or policies which governed the supply of water to the community though these customs were not so effective. These customs played important roles in the management and protection of water sources in the municipality. During an interview with one of the chiefs in the selected communities, he stated that people were supposed to refrain from swimming in the Nsakyi River. Those who were caught doing so were summoned by the chief and punished. On the other hand, an interview with a water supplier agency which supplied river water on demand spoke about it being a custom not to fetch water on Tuesdays. These customs by traditional bodies (or informal institutions) allowed for the preservation and protection of water bodies within these communities and as well contributed to the provision of fresh water to the community members.

However, these customs were not as effective as was expected since most people considered them to be outmoded practices. Aside this, some of the water supplier agencies such as that of the local trolley pushers (popularly called 'truck pushers') thought that this only reduced their level of productivity. Majority of the individuals from the municipality ignored these customs, making them almost non-existent at the time of the survey. This was because these traditional customs were not reinforced to become more effective for many to know about them by the traditional authorities.

In the formal sector however, some NGOs had to intervene in the supply of water to some of the communities in the municipality. The issue with the Non Governmental Organisations coming to contribute to help protect the environment and as well provide potable water to people in the municipality had raised a lot of questions among community members. As non-profit making organisations, it was expected that they would provide potable water at a cheaper cost to community members. An interview with the general manager of the Water Health International (WHI), and some of the members of the WATSAN in the selected communities revealed low patronage of community members resulting in the reduction of the sale of water. Some of the respondents did state that water from this treatment plant was quite expensive. The WATSAN became partners with WHI on condition that they would help their communities by providing potable water at a cheaper price. On the contrary, water from WHI treatment plant is quit expensive. For this reason, some respondents stated that it makes the NGO a profit making organisation. However, other people in the community think that the impact of the water treatment plant to the selected communities within the municipality has helped reduce the stress in accessing potable water.

At the time of the survey, the Ghana Water Company of Ghana (GWCL) had not yet started supplying water to the selected communities though some other communities within the municipality were periodically supplied with treated water from the Weija water treatment plant. It was expected that since two of the selected communities were considered as urban areas, treated water would be supplied to these areas because it was the policy of GWCL in collaboration with other private sectors to provide treated water

to urban communities in the country. According to an interview with a selected staff member of the Community Water and Sanitation Agency, they wanted to take up this responsibility of supplying water to these communities. However, they were told by GWCL to leave it to them. This was because such areas were considered as urban areas and therefore, it was the responsibility of the GWCL to provide treated water to such areas.

Protection of the environment around water resources

By exploring respondent's knowledge on any form of traditional customs that helped to protect water resources in the municipality, it was observed that though customs existed, people no longer regarded them because of development and change in the way people think and the change in religious beliefs by many people through formal education. Very few (15.6 percent) of the respondents knew of any traditional customs that helped protect the environment and water resources.

Information through observation also showed that building projects in water ways were more prevalent and sand winning worsened the situation. One of the opinion leaders interviewed in Pokuase stated this issue as a concern in the Pokuase community. It did not only affect the ability of traditional authorities to protect water resources but the environment as a whole. This contributed to the pollution of water resources in these communities. Plate 4 shows a vegetable farm and buildings constructed very close to the Nsakyi River bank.

Plate 4: **A vegetable farm and buildings around the Nsakyi River**

Source: Fieldwork, 2009

According to the water supplier operators, the environment around the sources of water they supplied was kept clean. Though some of them were aware of some traditional customs which they did not obey, they kept their surroundings clean to increase the number of customers. Public fora have also been held on several occasions to educate the communities especially to keep water resources and its environments clean. But this, according to some opinion leaders, had not had any impact on the attitude of community members towards the use of water from River Nsakyi for instance.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter summarises the major findings of the thesis. It also concludes the study and suggests recommendations to ease the burden of access to potable water in the Ga West Municipality and other equally important areas where further researches can be conducted.

Summary

The main objective of the study was to assess the mode of obtaining potable water and how the system of accessing it is managed in the Ga West Municipality. It was also to know some of the challenges people face in accessing potable water and to uncover some of the management strategies put in place by various households to cope with the problem. Twenty-seven respondents made up of key informants and opinion leaders were interviewed and 238 questionnaires were administered to households. In all 274 respondents were involved in the research.

The major findings are as follows:

- The main water resources in the Municipality were not potable. Water from the Nsakyi River was polluted while much of the ground water was saline. About, 95 percent of the respondents in the selected communities in the Ga West Municipality accessed water from these

sources for domestic purposes though some were aware of the health implications.

- Water from a single source in the municipality presented its own quality defects (such as groundwater being saline) which made it unsuitable for all household purposes. About 95 percent of respondents accessed water from at least two sources.
- About 66.4 percent of the respondents defined water as that which was less saline and tasty because of the nature of the available water resources they accessed.
- The main mode of transporting water from the source to the home was by head porterage (74 percent).
- The average time used in completing a round trip to access water was about twenty five minutes. This forced almost 50 percent of the respondents to reuse waste water as a management strategy to minimise cost (i.e. time and monetary cost).
- Social capital (i.e. social networks such as relationships with well owners and borehole owners) and human capital (i.e. available labour to the household) were highly depended on by households in order to access water for domestic use.
- More than 60 percent of the respondents who collected and managed water in households were women.
- Access to potable water in the Municipality was found to be more of an individual responsibility than a collective decision. This is because there was no formal body which was known to supply potable water to

people in the comfort of their homes. People had to make individual decisions on where and how to access potable water.

- Cost of treated water was quite high and this led to the reduction of the quantity accessed for use at the household level.
- Efforts were not made to store water in larger quantities because water from the various sources did not reduce significantly in quantity even during the dry season.
- Rainwater harvesting was underexploited though it was an easier and a cheaper way of accessing water.

Policy implications

Some parts of the Greater Accra Region that hosts the capital city of the country still lack adequate supply of potable water. It is imperative that adequate potable water supply to more than half of the population in the country be achieved by the year 2015 (MDG, 2000). It is also the first goal of the Ga West Municipality to make potable water available to the majority of the people. This goal can only be achieved if more stakeholders are involved in the water business.

Apart from the WATSAN including the DWST and NGOs, informal associations may be involved to help achieve the municipality's goal of making potable water available and accessible to all. Instead of the DWST and WATSAN waiting for GWCL to provide potable water to people, this can be changed. Though already, more boreholes and wells are being dug to ensure that majority of the people in the municipality will have access to water, the situation has not improved because of this. The six existing zonal councils

within the municipality can be subdivided into smaller zones depending on the population of a zone. These zones should be small enough to be able to involve members of the community as much as possible. This way NGOs may come in to support financially in the treatment of the available water resource in that zone before distributing it through piping systems directly to homes for a fee. If treated water is made accessible to the homes, many people would not access the polluted water around them.

Therefore, the policy of the GWCL in collaboration with some private institutions being given the mandate to supply potable water to urban areas should be amended to encourage communities without water to make their own efforts in the supply of potable water to everyone as well as manage it the distribution of the water.

Conclusions

The study helped to unearth some of the challenges many households face in their quest to access potable water for their homes in the Ga West Municipality. Use of triangulation in the study allowed for the expected data to be collected from different categories of respondents. Therefore, the desired objectives for the survey were achieved.

Particular sources of water (which were ground, river and rainwater) were opted for by households for various purposes in the home because of some key variables (the nature of water from these sources, time spent, distance and cost involved in accessing water) which influenced the management of water in the home. Management of water from different

sources was central because it warranted the sufficient and continuous supply of water to the home.

Recommendations

The District Assembly, Community Water and Sanitation Team and Non-Governmental Organisations (NGOs) should help communities within the municipality to raise funds to improve upon the water treatment plants built in Pokuase and Amasaman by the Water Health International. This will help increase the quantity and quality of water they supply to cover more communities within the municipality.

It is also recommended to the District Water and Sanitation Team to help develop the informal water supply institutions to manage water, collect and disseminate information about the water quality to community members while maintaining the social and cultural perspective of the community to ensure equitable access to potable water.

The District Assembly should also embark upon public education to help change behaviour towards the use of natural water resources in the communities. This is specifically to reduce practices such as damping of refuse and other sewage into water bodies. This will help in the prudent use of the available water resources on a sustainable basis.

Suggestions for further research

Studies could be conducted to know how the quality of groundwater can be improved upon using simple but cost effective methods since groundwater is an easier way to access potable water for household use.

Some countries such as the Bermuda Islands and parts of Australia in the south depend on harvested rainwater for domestic use. This source is seen as an easier and a cheaper way of accessing potable water for domestic and some industrial use. Feasibility studies could be conducted to know how this method can facilitate an easier and a cheaper access to potable water in the municipality.

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APPENDICES

Appendix 1

Chi square test for location and time

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.209(a)	2	.001
Likelihood Ratio	13.031	2	.001
Linear-by-Linear Association	11.004	1	.001
N of Valid Cases	236		

1 cells (16.7percent) have expected count less than 5. The minimum expected count is 3.37.

Chi square test for Age and Perception

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.466(a)	2	.039
Likelihood Ratio	6.621	2	.037
Linear-by-Linear Association	.255	1	.613
N of Valid Cases	227		

0 cells (.0percent) have expected count less than 5. The minimum expected count is 25.41

Chi square test for level of education and the adopted management strategy

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.741(a)	4	.008
Likelihood Ratio	13.027	4	.011
Linear-by-Linear Association	1.234	1	.267
N of Valid Cases	230		

0 cells (.0percent) have expected count less than 5. The minimum expected count is 25.0

APPENDIX 2

QUESTIONNAIRE FOR HOUSEHOLDS

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

UNIVERSITY OF CAPE COAST, CAPE COAST

RESEARCH TOPIC: *ACCESS TO AND MANAGEMENT OF POTABLE WATER IN THE GA WEST MUNICIPALITY*

Note: *Respondents are to note that all information provided are for the purpose of the above mentioned research only and will be treated with required confidentiality. Please read and tick the option that best describes your answer and fill in the gap where necessary.*

Household Questionnaire

Access to potable water

1. Since you lived here, has there been a water supply system (e.g. a waterworks, a

Borehole etc) that supplied your home with potable water (i.e. tap water/ pipe water)?

Yes **[ ]** No **[ ]**

2. If yes, which type of supply system was it?

a. Treated water from a water supply system nearby **[ ]**

b. Water from a bore hole that supplied homes with mineral water **[ ]**

c. Other, please mention……

3. Which organization has been responsible for the provision of potable water? to your home?

a. The Community Water and Sanitation Commission in the town [ ]

b. A Non- Governmental Organization, [ ] please mention

……

c. A private agency, [ ] please mention…….

d. Other, [ ] please mention…….

4. How long has the above organization (avenue) provided your home with potable water?

a. Less than 2 years [ ] b. between 3-5 years [ ]

c. between 6- 10years [ ] d. 11 years and above [ ]

5. Currently, what is the source of water for your home?

a. Rivers and streams [ ] b. Imported tap/sachet water [ ]

c. Harvested rainwater [ ] d. Groundwater (wells, boreholes etc.) [ ]

6. Please rank the following according to your perception of potability. (i. e. From 1 to 4).

a. Rivers and streams [ ] b. Imported tap/sachet water [ ]

c. Harvested rainwater [ ] d. Groundwater [ ]

7. In your own opinion, what do you consider as potable drinking water?

……

……

8. How often do you have access to this potable water within a week?

a. none in a week [ ] b. Once in a week [ ]

c. Twice in a week **[ ]** d. Everyday of the week **[ ]**

Challenges faced in accessing potable water

9. Averagely, how many minutes does it take to access potable drinking water for your household (i.e. a round trip)?

a. Less than 20 minutes **[ ]** b. 21-30 minutes **[ ]**

c. between 31 minutes to one hour **[ ]** d. An hour and above **[ ]**

10. Who is responsible for the fetching of water for household use, please mention? ……

11. How reliable is your source of potable water within a week?

a. Very reliable **[ ]** c. Sometimes not reliable **[ ]**

d. Not reliable at all **[ ]**

12. Is the source of potable water influenced by seasonal changes (i.e. the dry and wet seasons)?

Yes **[ ]** No **[ ]**

13. If yes, what measures have you put in place in order to make potable water available for household use on a sustainable basis?

…….

…….

…….

14. What containers do you use in accessing the water?

a. basins and buckets **[ ]** b. gallons and Jeri cans **[ ]**

c. Pots and urns **[ ]** d. other, **[ ]**please mention,…….

15. What mode do you employ in transporting the water from the source to the

home?

a. by carrying it on our heads [ ] b. using the wheel barrel [ ]

c. using a vehicle [ ] d. using the local truck by pushing it [ ]

16. On the average, how many buckets of water is needed for the following in the household in a day?

a. For bathing …… …. buckets b. For cooking ……buckets

c. For washing…….buckets d. For drinking ……....buckets

e. Lavatory ……..buckets

17. How much does a bucket of water cost?

a. Less than GHp 10.00 [ ] b. GHp 20.00 - GHp 30.00 [ ]

c. GHp 40.00 - GHp 50.00 [ ] d. GHp 50.00 and above [ ]

18. Do you sometimes use waste water?

Yes [ ] No [ ]

19. If yes, what do you use it for?

…….

…….

20. On the average, how much money do you spend on accessing potable water for the Household within a week?

a. less than GH¢5. 00 [ ] b. GH¢6.00 to GH¢10.00 [ ]

c. GH¢11.00 to GH¢15.00 [ ] d. GH¢16 and above. [ ]

21. How will you assess the water situation (i.e. bad, good, very good or excellent) in your community and why?

……..

…….

22. How has the water situation in your community impacted on your economic and social lives (i.e. in terms of quality of life)?

……..

……

23. In case you have any problem(s) concerning the access and quality of Water you use in your community, who do you contact? Please mention…… ……..

Management of potable drinking water

24. Mention the various sources of water for each of the following chores in the home?

a. For cooking……

b. For drinking……....

c. For washing …… d. For cleaning ……

e. For the lavatory……..

25. Is the decision for the allocation of water dependent on the source from which the water is accessed?

Yes **[ ]** No **[ ]**

26. How do you make water safe for household use/consumption?

a. By using water filter to filter it before consumption **[ ]**

b. By consuming the raw tap water available to my household **[ ]**

c. By boiling it before consumption **[ ]**

d. Other, **[ ]** please mention……

27. Has this method you have adopted in making water potable been successful for you since you started using it?

Yes **[ ]** No **[ ]**

Possible solutions

28. What investments have you made in order to make potable water available for household use on a sustainable basis?

a. I have dug a well in my house **[ ]**

b. I always buy tap water from outside my community **[ ]**

c. I have a tank that stores harvested rain water **[ ]**

d. other, **[ ]** please mention, ……

29. What would you suggest as a solution to minimize the challenges you face while accessing potable water for household use?

……

……

Demographic Information

30. Age.

a. Below 18years **[ ]** b. 19-30 **[ ]** c. 31- 59years **[ ]** d. 60 years and above **[ ]**

31. Sex. a. Male **[ ]** b. Female **[ ]**

32. Marital status. a. Married **[ ]** b. Single **[ ]**

33. Level of education attained.

a. None **[ ]** b. Primary Education **[ ]** c. JHS **[ ]**

d. SHS/O/A Level **[ ]** e. Tertiary Education **[ ]**

34. Place of Residence.

a. Pokuase **[ ]** b. Amasaman **[ ]** c. Mayera **[ ]** .

35. How many are you in your home? ……

36. Occupation?

a. Unemployed **[ ]** b. Formal **[ ]** c. Self employed **[ ]**

d. other, **[ ]** please mention……

37. Religious affiliation

a. Christian **[ ]** b. Islamic **[ ]** c. Traditional **[ ]**

d. Other, **[ ]** please mention …….

38. The range of your monthly income is

a. Less than GH₵ 50.00 **[ ]** GH¢ 60.00 to 100.00 **[ ]**

c. GH¢ 110.00 to GH¢200.00 **[ ]** GH¢210.00 and above **[ ]**

39. How long have you lived in this town?

a. Less than 2 years **[ ]** b. 3-5 years **[ ]** c. 6-10 years **[ ]**

d. 11 years and above **[ ]**

APPENDIX 3

INTERVIEW GUIDE FOR WATER SUPPLIERS

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

RESEARCH TOPIC: ACCESS TO AND MANAGEMENT OF POTABLE WATER IN THE GA WEST MUNICIPALITY

Dear Sir/Madam,

The above research is being conducted as part of the fulfillment in obtaining a Masters degree in Geography in the department of Geography and Regional planning.

I wish to have a little chat with you on the water situation in your community and how people are using various management strategies to cope with the situation in the community.

If you give your consent to be involved in this research, please sign below.

I agree to be involved in the research conducted on the access to and management of potable water in the Ga west municipality.

Sign……

Date ……..

Interview Guide for Water suppliers

1. How long have you been operating your business in this community?
2. What is your role in the business? (find out which section the works in the company)
3. What is the source of the water you supply?
4. Do you treat the water before you supply or supply straight from the source?
5. In your opinion, what do you consider as potable water? (find out the parameters used in defining potable water)
6. On the average, how many gallons or tankers (or sachet) of water is demanded?
7. How much do you make from a trip?
8. How is the market for the demand of water from your company? (find out whether the demand influences the price of water sold from that company)
9. Do you pay any municipal bills? (find out to whom is it paid and how often it is paid, i.e. quarterly, annually, etc)
10. Is the quantity of water supplied affected by seasonal changes?
11. If it does, does it affect your sales?
12. What investments have you made to minimize this?
13. Does the demand of water from your company necessitate expansion? (find out whether there are enough funds to ensure expansion)
14. How do you assess the water situation in the community? (the economic and social impact).

15. What do you think can be done to help solve the water problem in the community?
16. Do you know of any customs in place to ensure that water resources and its environment are protected?
17. What measures have you put in place to help maintain sanitation around the water sources to protect its environment?

APPENDIX 4

INTERVIEW GUIDE FOR OPINION LEADERS

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

RESEARCH TOPIC: ACCESS TO AND MANAGEMENT OF POTABLE WATER IN THE GA WEST MUNICIPALITY

Dear Sir/Madam,

The above research is being conducted as part of the fulfillment in obtaining a Masters degree in Geography in the department of Geography and Regional planning.

I wish to have a little chat with you on the water situation in your community and how people are using various management strategies to cope with the situation in the community

.

If you give your consent to be involved in this research, please sign below.

I agree to be involved in the research conducted on the access to and management of potable water in the Ga west municipality.

Sign……

Date ……..

Interview guide for opinion leaders

1. As one of the leaders in this community, what are some of your roles? (take note of those roles that may relate to the management of water in the community).
2. In your opinion, what is potable water? (make sure the definition given are noted with parameters on perception)
3. How will you assess the water situation in your community? (find out some of the impacts of inadequate potable water supply on the economic and social activities of the community)
4. How have you adapted to this? (find out some of the locally adapted management strategies in accessing and using potable water in the community)
5. What are you doing to help minimize this? (find out some of the efforts made by respondent using his or her position to influence and speed up the implementation some policies that may help improve upon the water situation in the community)
6. What suggestions do you have to help minimize this problem? (find out some of the long term and short term solutions to the current problem)
7. What are some of the policies in place to help promote the access to potable water for the community members? (find out some of the policies that are locally implemented and those that are from the government sector to help improve the situation).
8. Are there any policies to help protect water resources? (find out those that are both traditional and governmental policies)

9. Are there any customs in place to ensure that water resources and its environs are protected from over exploitation?

APPENDIX 5

OBSERVATION GUIDE

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

RESEARCH TOPIC: ACCESS TO AND MANAGEMENT OF POTABLE WATER IN THE GA WEST MUNICIPALITY

- Look out for the type of containers used in accessing the water from the source to the home (try to note down the quantity of water the containers could carry at a time, also notice how the water is accessed by the people whether by using a smaller container to fetch it or using other means).
- Study the various modes of transporting the water to the home (whether it is by head porterage or by vehicle).
- Watch the level of accessibility (frequency of accessing the water using the differences in seasonality).
- Study how the water collectors pay attention to sanitary conditions around the water resource.
- Find out whether community members pay attention to any of the traditional customs of the area.