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WATER SUPPLY AND UTILIZATION IN SMALL TOWNS IN GHANA. A CASE STUDY OF SABOBA DISTRICT.

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SEPTEMBER, 2012.

DECLARATION

I hereby declare that this thesis is the result of my own research and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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DEDICATION

This thesis is dedicated to the family of Chief Alfred Opel Tibun Kotin. Thank you the entire family for all your pieces of advice, encouragement, prayers and financial support.

God richly bless you.

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ABSTRACT

The study was conducted on Socio-economic effects of water access and utilization in the Saboba District of Ghana. The main objective of the study was to examine the problems of water supply and use in Saboba town and its immediate communities. In all, ten communities were studied including Saboba town. A total sample of 321 respondents took part in the study using the simple random sampling and purposive sampling techniques. The data collection tools used included questionnaires, interviews, Focus Group Discussion and field observation. The study shows that anthropogenic, natural and institutional factors affect water access and use in the study area. These compel households to travel distances for water and thus use water from unsafe sources that are further challenged with pollution and sanitation problems. These partly contribute to the occurrence of water related diseases such as typhoid and diarrhoea among the people of Saboba. A test of water from the most used sources for domestic purposes (river, dam and well) confirmed high levels of contamination from faecal coliform, E. coli and total ethetrophic bacteria (THB) that are potential causes of water related diseases. The above affect the quality of life of the people for school children stay for the most part out of the classroom in search of water. Households' limited access to water affect their productivity and income. Though, the government, District Assembly, World Vision Ghana, Local of Churches, Ghana Health Service and Ghana Education Service intervened, these have not solved the water supply problems adequately. For adequate and reliable water supply in the study area, the pipe water system in the district should be changed to an urban water system, borehole mechanics trained to maintain broken boreholes and the dam as well as wells dredged and reconstructed to ensure an all year water supply in the district. These would affect health, education and productive activities

of the people positively and therefore, improve the standard of living and quality of life of the people of Saboba District.

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ABBREVIATIONS

BH	Borehole
BGN	Buagbeln
BKN	Buakoli
CIDA	Canadian International Development Agency

LIST OF

COM	Community Ownership and Management
CSIR	Center for Scientific and Industrial Research
CHAG	Christian Health Association of Ghana
CONIWAS	Ghana Coalition of NGOs in the Water and Sanitation Sector
CWSA	Community Water and Sanitation Agency
DCN	Dicheeni
CFU	Colony-Forming Unit
Ct	Product of Disinfectant Concentration and Contact Time
DDT.	Dichlorodiphenyltrichloroethane
DISCAP	District Capacity Building Project
DWST	District Water and Sanitation Team
	Evangelical Presbyterian
E.P.C	E.P. SHS Community
FAO	——FOõŒäñðAgriculture Organization
GWCLG	Ghana Water Company Limited
GHS	Ghana Health Service
GES	Ghana Education Service
GSS	Ghana Statistical Service
GTz•	Germany Technical Co-operation
	Human Immunodeficiency Virus
HDO	Hand Dugout
IDA	World Bank International Development Association
JMP	Joint Monitoring Programme for Water Supply and Sanitation
KTG	Kitieg

MDG	Millennium Development Goal
NCWSP	National Community Water and Sanitation Programme
NORWASH	Northern Region Water and Sanitation Project
NRCWSA	Northern Regional Community Water and Sanitation Agency
NGO	Non-governmental Organization
NWP	National Water Policy
NGN	Nalongni
NKD	Nankpando
NDK	New Dokondo
SD	Saboba District
SDA	Saboba District Assembly
SCWSDB	Saboba Community Water and Sanitation Development Board
SPSS.	Statistical Products and Services Solutions
STPS SAB	Small Town Pipe System ~~Saboba~~
TOM	Toma
TSS	Total Suspended Solids
UNICEF	United Nations Children's Fund
	United Nations
UNDP	United Nations Development Population Fund
WATSAN	Water and Sanitation Committee

WSDBS	Water and Sanitation Development Boards
WSMP	Water and Sanitation Sector Monitoring Platform
wsscc	Water Supply and Sanitation Collaborative Council
WHO	World Health Organization
WW1)	World Water Day

OPERATIONAL DEFINITIONS

Faecal Coliform: Bacteria found in the intestinal tracts of mammals and therefore in faecal matter. Their presence in water is an indicator of pollution and possible contamination by pathogens.

Household: A person or group of persons who live together in the same house or compound, sharing the same house-keeping arrangements and are catered for as one unit. Household head: The person responsible for the upkeep of the household and recognized by other household members as the head.

Refuse: Solid waste that is thrown away and considered as being of no value or use.

Sewage: Human and domestic waste matter from houses that is carried away through sewers.

Surface sources: Those sources of water in which the water flows over the surface of the earth, and is available for water supplies

Turbidity: The amount of solid particles that are suspended in water and that cause light rays shining through water to scatter.

Water-borne diseases: Diseases that are transmitted through the ingestion or direct skin contact with polluted river water. They include diarrhoea, cholera, typhoid, skin infection, eye infection.

Water-related insect vector disease: A disease transmitted through the bite of an insect vector. An example is malaria which is caused by plasmodium. The vector is the female anopheles mosquito.

Water quality: The physical, chemical and bacteriological condition of water with respect to the amount of impurities in it.

CHAPTER ONE

GENERAL INTRODUCTION

1.1. BACKGROUND

Water is crucial for sustainable development. No living being on this planet earth can survive without water (UN International Decade for Action- Water for Life, 2005-2015). Limited access to clean and safe water affect hygiene and sanitation at household level. This further widens poverty gap, gender inequalities and prevalence of water-borne diseases (Gender and Water Alliance, 2006). Limited access to clean and safe water has contributed to about 3.7% of the total global disease burden and 2.2 million deaths each year, with women and children in developing countries being most affected (WHO/UNICEF, 2008).

Globally, about 1.2 billion people live in areas of physical scarcity of water and 500 million people are approaching this situation. Another 1.6 billion people face economic water shortage, and most countries lack the necessary infrastructure to take water from rivers and aquifers (UN- Water and FAO, 2007). About 884 million people worldwide do not have access to potable water, most of them living in Africa (UNESCO, 2010) and nearly two-in ten people in the world do not have source of quality drinking water (UN Decade for Action- ater for Life, 2005-2015). Access is lowest in Sub-Saharan Africa ——with about 42% using unimproved water sources (WHO/UNICEF, 2008).

In Africa, insufficient skilled personnel and effective institutions, water scarcity, pollution and limited financial resources are factors that militate against the continent's water delivery abilities (Efam, 2007).

In 2005, an approximate of 10.3 million (51%) of the population of Ghana had access to improve water supply and about 8.4 million people residing in the country's urban centres

with 61% of them having access to improve water and 40% of these urban residents are served by the Ghana Water Company Limited (Wateraid, 2005). In 2006, 47.20% of small towns lacked access to potable water and the national coverage without access to water supply in both rural communities and small towns is estimated at 42.96% at the end of 2008

(CWSA, 2009). In 2000, 39.9% of the population had access to improve sources of water and this increased to 46.5% in 2010 (Ghana Statistical Service, 2013).

In the northern region of Ghana, access to potable water is even more serious due to the long dry seasons which do not support perennial rivers hence, most rivers and streams dry up. The lack of access to water accounts for the high incidence of guinea worm diseases in several districts in northern region (Debrah, 2002). The region is among the first three regions that accounted for 3, 622 cases of guinea worm disease in Ghana in 2002 (Tay, 2005). The Northern region has water supply coverage of 60.11% and that of Saboba district is 60.65% (NRCWSA, 2010).

Ghana Water Company Limited (GWCL) is the institution responsible for urban water supply while the Community Water and Sanitation Agency (CWSA) facilitates and coordinates provision of water to rural communities and small towns. (CWSA Corporate Brochure, no date).

Almost 1.5 million children die every year from water-borne diseases (UNESCO, 2010). United Nations (2005) also asserts that the problem of unavailability of safe water

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has led to the death of 3,900 children as a result of diseases transmitted through water or human excrement every day worldwide. Inadequate water and sanitation rob children of schooling and educational opportunities and water scarcity, poor water quality and sanitation negatively affeCt food security, livelihood choices and educational opportunities for poor families across the world.

Despite the United Nations Millennium Development Goals (MDG) by world leaders in 2000, Ghana is still lagging in achieving goal seven by the estimated time frame because, the national population having access to water by the end of 2009 was 58.97% while Ghana has a MDG target of 76% by 2015 (NRCWSA, 2010). In 2010, the percentage having access to improved water was 46.5% (GSS 2013) of the about 24, 658,823 people. This implies Ghana has 17.3% deficit in 2009 and 29.5% in 2010 to meet her MDG target and thus about one fourth of the Ghanaian population still depend on unimproved sources

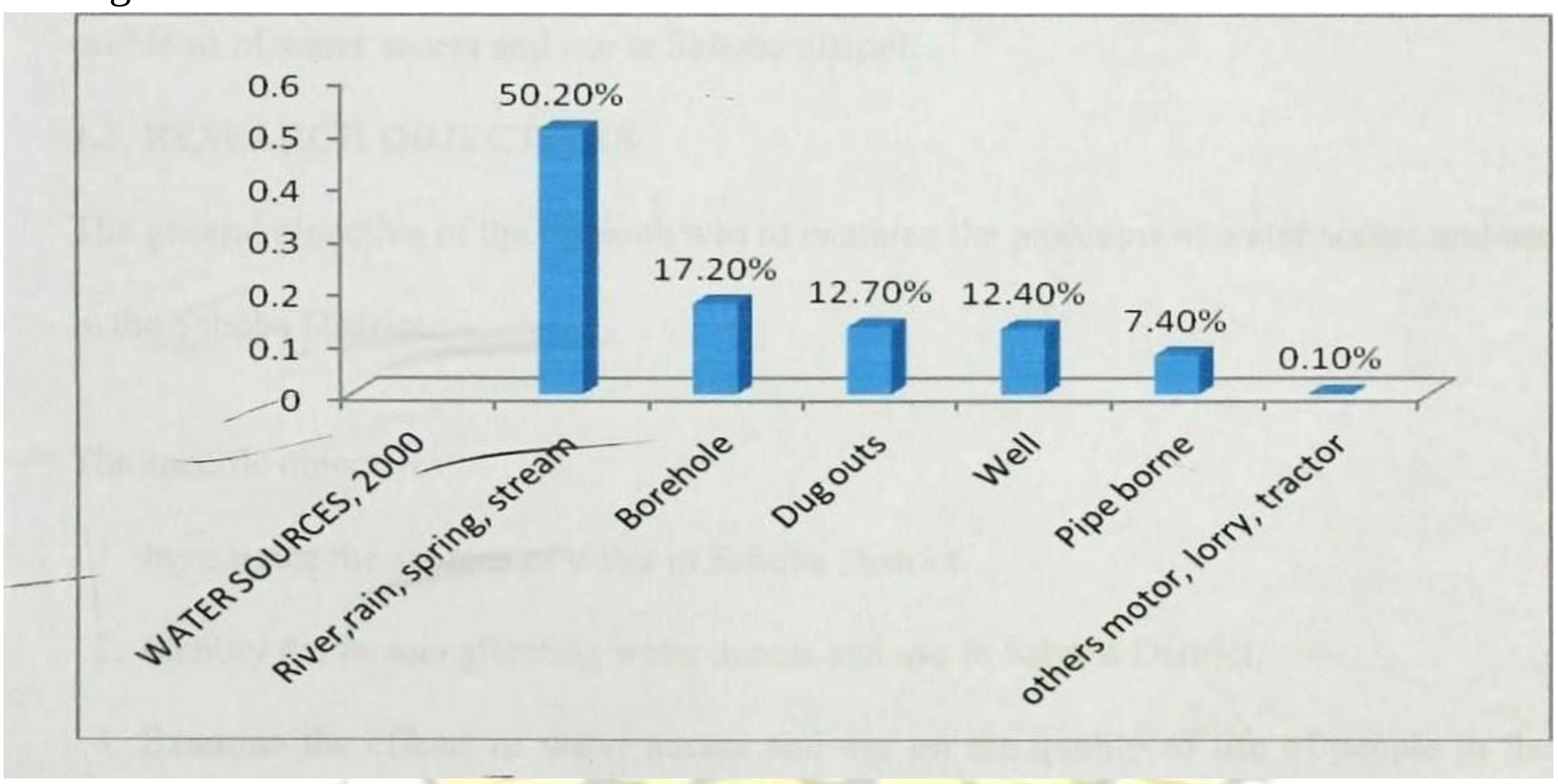
of water and hence susceptible to water related diseases.

1.2. STATEMENT OF PROBLEM

Saboba was one of the newly created districts in Northern region in 2008 from the then, Saboba-Chereponi District,

Ghana Statistical Service (2000) in its Population and Housing Census report indicates that Saboba District have numerous sources of water as shown in Figure I I ,

Figure 1.1: Sources of Water in Saboba District in 2000.



Source: Ghana Statistical Service, 2000.

This implies only 24.6% of these sources are improved sources (pipe-borne and borehole) and the rest of the sources constituting 75,4% are unimproved, exposing households to unsafe water sources hence water related diseases which have dire consequences on the quality of life of the people.

It is worth knowing that during the dry season, some of these sources dry up, hence an increase in the search for and use of water (Saboba District Assembly Medium Term Development Plan, 2010). The district has a total wáter coverage of 60.65% which is even above the Northern regional coverage of 60.11 (Northern Regional Community Water and Sanitation Agency, 2010). Despite the above stated natural and artificial sources of water and the efforts by the District assembly, SCWSDB and NGOs at making water accessible

for use, Saboba district is still constrained with inadequate water supply. Based on the problem water access, the study aims to investigate the sources of water and the implications of the use of water from these sources on the quality of life of households in the study communities in Saboba with emphasis on health, education and productivity. Again, the study aims to identify the institutional interventions to water supply in the district. These findings would help inform policy makers at the district level to solving the problems of water access and use in Saboba district.

1.3. RESEARCH OBJECTIVES

The general objective of the research was to examine the problems of water access and use in the Saboba District.

The specific objectives:

1. Investigate the sources of water in Saboba District.
2. Identity the factors affecting water access and use in Saboba District.
3. Examine the effects of water access and use on the quality of life of people in the study area particularly on health, education and productivity.
4. Identify institutional interventions aimed at enhancing water access and use in Saboba District.

1.4. PROPOSITIONS

1. Incidence of water related diseases is a function of inadequate water supply in Saboba District.
2. Inadequate supply of water in educational institutions distracts teaching and learning.
3. Limited access to water supply leads to low productivity in Saboba District.
4. The effectiveness of Water Supply Institutions is adversely affected by the behaviour of the people in the study area.

1.5. METHODOLOGY

1.5.1. Types ofData

Both qualitative and quantitative data were used for the purpose of this study. The qualitative data is based on Saboba Community Water and Sanitation Development Board (SCWSDB) activities specifically on source of water to the water system, water treatment, quantity and quality of water supplied, challenges of the water system, renovation of the water system and interventions from external sources.

The quantitative data collected on the study include: household size, main sources of water, levels of access to water, level of satisfaction with quantity and quality of water collected by households, pollution and sanitation conditions around water sources, quantity of water households collect, time spent on water fetching and queuing daily, payment of water bills, common water relat diseases, various economic activities, time spent on economic activities and time spent in search of water daily. Data were also collected on the effects of water unavailability on education, problems of water supply institutions, microbiological and physio - chemical properties of water.

1.5.2. Sources ofData

The data for this study were collected through a combination of primary and secondary data sources and used. Both qualitative and quantitative methods were employed in pnmary data collection and this include structured interview for household heads (male/female). One Focus Group Discussion (FGD) was held for sampled members of SCWSDB members.

Secondary data sources included content analysis of documents relating to water access and utilization in general with particular reference to annual reports, journals, books and Ather relevant documented sources. The primary source was used to obtain detailed data from respondents based on their experiences on the topic under study while the secondary sources were depended on for literature review to find the lapses in available data for further studies. It was also used to confirm or refute the findings in the study area.

1.5.3. Data Collection Method

Mixed methods of data collection were employed for this study. Structured interviews were particularly adapted for the main respondents (household heads). This was to enable the researcher meet the varied needs of the sample population and also help explain some of the questions for appropriate responses since majority of respondents were illiterates. Questionnaires were administered to key informants such as the District Water and Sanitátion Team (DWST), Ghana Health Service personnel (GHS), Heads of educational institutions in the district, and Key District Assembly Staff (DA) since these categories of people could read and write. Both closed ended and opened ended questions were designed and subsequently dministered. A Focus Group Discussion was held for some members of the Saboba Community Water and Sanitation Development Board (SCWSDB) is composed of both educated and non educated members Out of 18 members composed of 13 men and five women, Il board members were chosen made of eight men and three women that formed only one group. They were all invited formally but only I I members turned up. These data were recorded and transcribed. Finally, field observation was also cotxiucted on the various water sources by taking plates in the study communities based on a customized list of water sources in the study area based on GSS (2000) data on water sources.

1.5.4,Sampling Design

In all, 284 households were selected from a total of 982 households from the study communities using simple random sampling technique by Saunder et al., (2007) as shown in appendix 3. Quota sampling technique was used to select the number of households in

the various communities to be interviewed. This was guided by not selecting less than 5% of the population of each community. A household refers to a person or group of persons who live together in the same house or compound, sharing the same house-keeping arrangements and are catered for as one unit. The household head (male/female) was eligible to be interviewed. Household heads were eligible because they control and supervise all the activities of their households and therefore will be in the right position to respohd to issues on water access and use in the household. Both male and female heads were used in other for the researcher to be gender sensitive because everyone uses water irrespective of one's gender. The number of respondents from each community are: Buakuli 29, Buagbeln 24, Dicheeni 21, Kiteg 29, Nankpando 31, Nalongni 34, Saboba 43 (excluding five pito brewers and five food venders) giving Saboba a total of 53 respondents, Toma 33, E.P Senior High Community 25 and New Dokondo 5 respondents.

The proúbility sampling technique was used because each household in the study communities had equal chances of taking part in the study. Simple random sampling was used to select the sample population of households in the study area. In each community, the researcher used the 2010 Population Census House listing and the fish bowl method was used to draw the various community population samples. Numbered cards were prepared based on the number of houses listed in each community. These cards were placed in a bowl and randomly selected according to the number of households to be interviewed in each community. The same process was repeated for the rest of the study communities.

The non probability sampling technique was used to enable the researcher contact key informants from different organizations and departments. Thirty three (33) key personalities from departments/organizations who work in the water supply sector in Saboba District also took part in the study. They were selected using purposive sampling technique. The details are shown in appendix 1 (Al) and Appendix 2 (A2).

One FGD was held for eleven 11(8 males and 3 females) selected members of the Saboba Community Water and Sanitation Development Board out of 18 members for them to express their opinions on water supply on the pipe water system that they manage. This was aimed at getting first hand collective data on the real situation of activities of the board in managing the small town pipe water system in the district.

1.5.5. Data Analysis

Data gathered from structured interviews were coded and analyzed using Statistical Products and Service Solutions (SPSS version 16.0) software. The results are displayed in bar charts, pie charts and tables. The research' made use of frequencies and cross tabulation. The specific tool used to find relationship in the data collected through interviews is Spearman correlation. The qualitative data• was tape-recorded and transcribed. Using the technique for content analysis, the transcribed interviews were arranged in identified themes. Field notes were also used to provide contextual information about the data. Some of the results are presented in the text as direct quotations.

A water test was carried out on the three most used sources of water for domestic purposes (river, dam and well) by respondents in the study area at the Centre for Scientific and Industrial Research Institute's (CSIR) Water Quality Laboratory at Tamale to find the microbiological and physio-chemical properties based on WHO/Ghana standards/guidelines and the implication of the test results on the health of the people of Saboba district.

1.6: CONCEPTUAL FRAMEWORK FOR THE STUDY.

Cusworth et al., 1993 model on Project Operations and Maintenance is used for project operations and maintenance in general especially, for large scale projects. For the purpose of this study, the model has been adopted and modified for the operation and management of water facilities (sources) in the study area which are much on a small scale. The interplay of the various variables in the model's framework would lead to sustainable water supply in

Saboba district. The new model borrowed two key ideas (project operation and maintenance system) from the original model. The adoption of the key ideas would serve as the basis through which the people in the study area can have access to sustainable water supply and use.

The key operational terms - operation and maintenance are explained as follows.

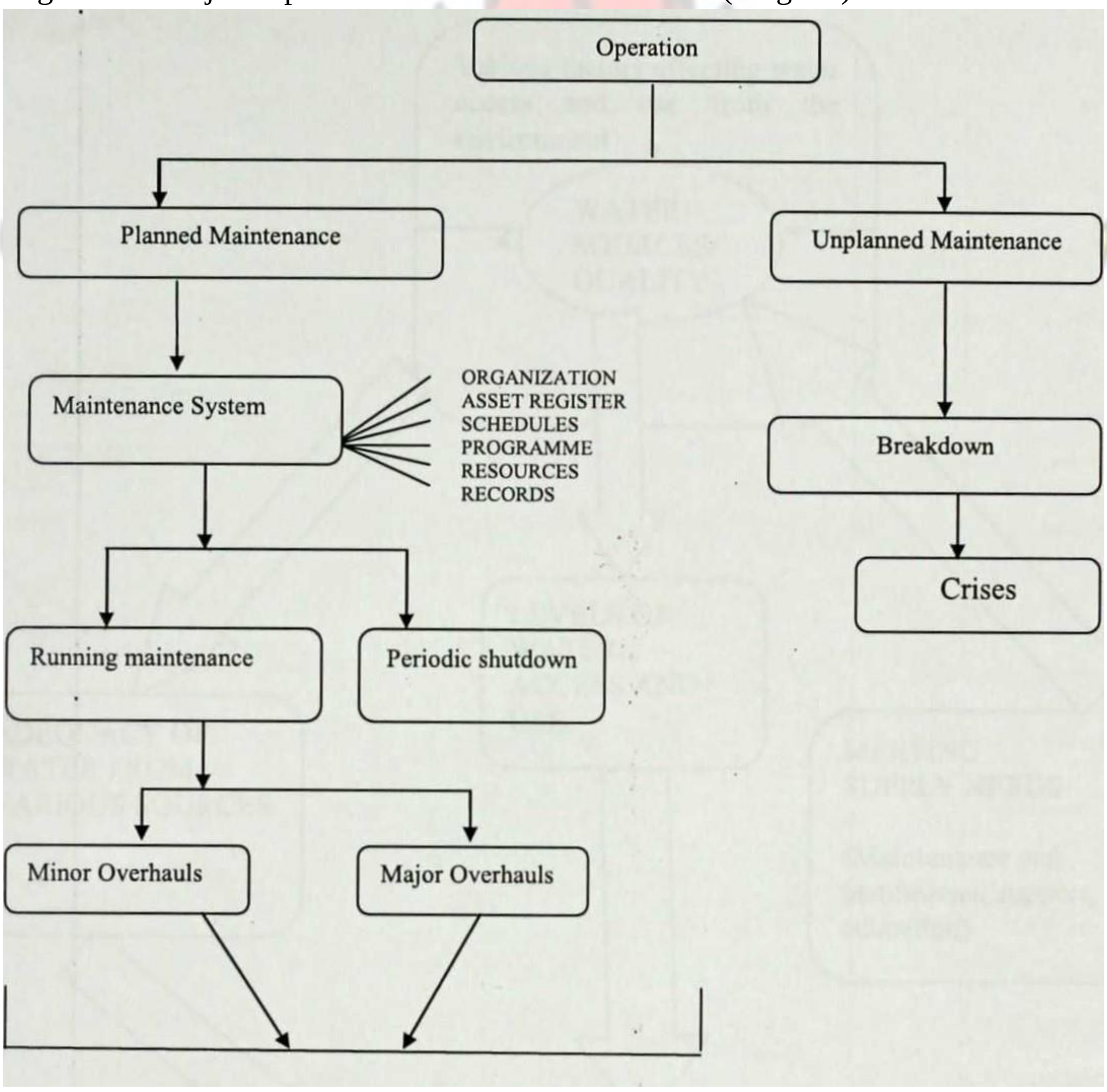
OPERATION: This refers to the use of available water sources in the study communities both natural and artificial sources aimed at supplying water for use.

MAINTENANCE: This refers to all activities that take place on a water facility/source (pipe water system, borehole, well, dam, river etc) during the use of the facility to ensure households have access to water. Maintenance has two forms — Planned and unplanned. Maintenance can be effective only when it is planned. Lack of maintenance plans for water sources whilst ira use until they can no longer produce the desired water before attempts are made to maintain them (pipe, dam, borehole, wells) is termed unplanned maintenance. Each of these two main components (planned and unplanned) follow systematic patterns that lead to access / no access to water as shown in the original model in Figure 1.2.

In the new model, the use (operation) of various water sources in an environment (Saboba district) is influenced by several factors from the environment - natural and artificial factors (Distance, climate, anthropogenic factors and institutional challenges). These factors affect water adequacy from various sources for various uses that also affect the quality of life of the people positively/ negatively (Health, education and productivity). To facilitate water adequacy and use, there is the need for interventions in the water supply sector thus meeting water supply needs of the people. This can be achieved through maintenance of water sources and institutional support to water management bodies in the district including health, educational and productive institutions. This would come from water users, the DA, the government and donor organizations. The impact would lead to quality water and access at the various levels for use and subsequently affect the quality of life of people in the study area. Education and training (capacity building) would enable

households take care of other water sources such as the wells, dam, dug outs, boreholes etc. This interplay of various variables in the model on water access and utilization is shown in Figure 1.3.

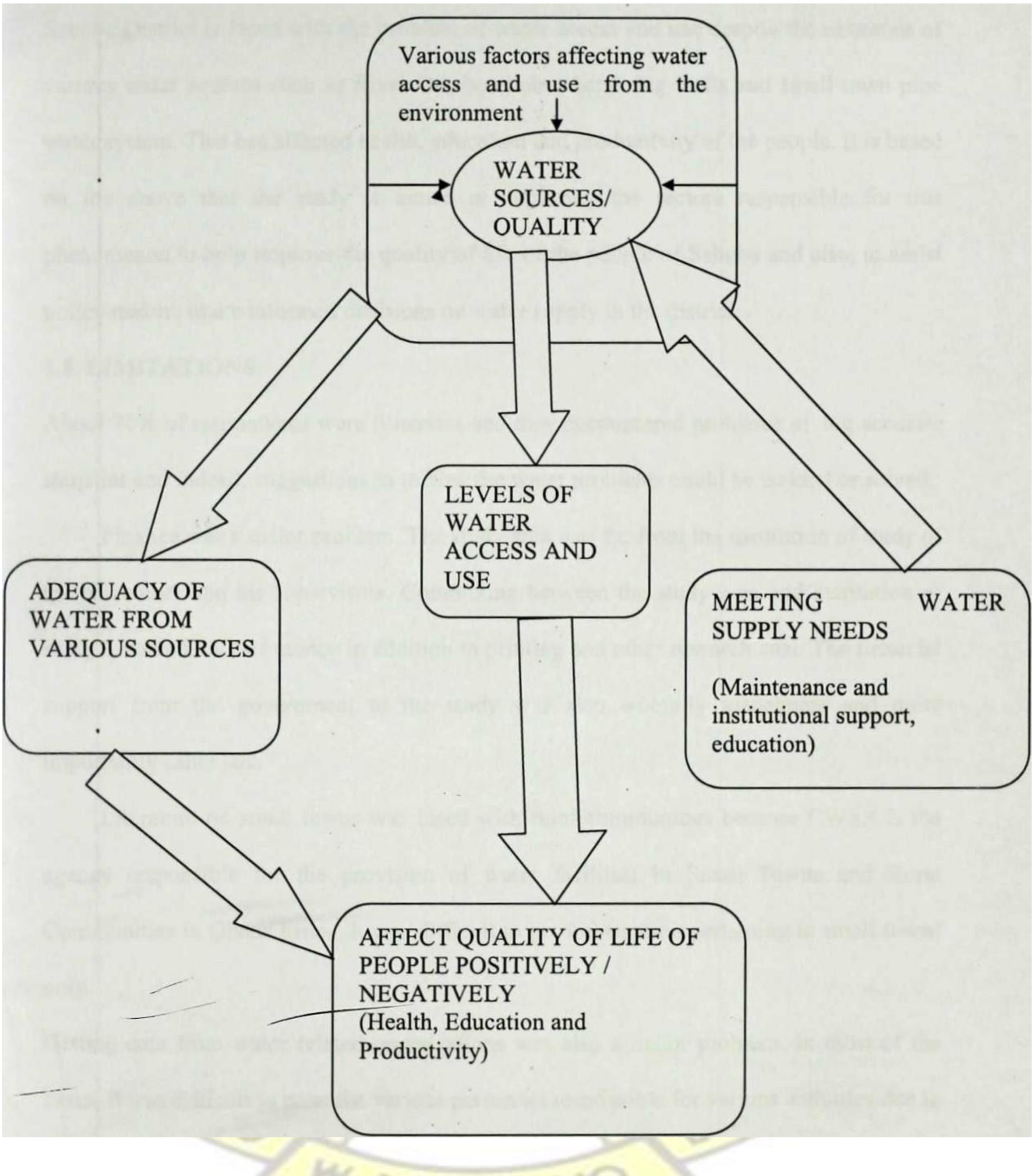
Figure 1.2: Project Operation and Maintenance Model (Original).



REGULATED FLOW OF BENEFITS —Þ SUSTAINABLE WATER SUPPLY.

Source: Project operations and maintenance model by Cusworth et al., 1993.

Figure 1.3: Water Access and Utilization Model.



Source: Adopted from Cusworth et al., 1993.

1.7. JUSTIFICATION OF THE STUDY

Saboba District is faced with the problem of water access and use despite the existence of various water sources such as River Oti, boreholes, hand dug wells and small town pipe

water system. This has affected health, education and productivity of the people. It is based on the above that the study is aimed at exploring the factors responsible for this phenomenon to help improve the quality of life of the people of Saboba and also, to assist policy makers make informed decisions on water supply in the district.

1.8. LIMITATIONS

About 70% of respondents were illiterates and they encountered problems giving accurate statistics and indeed, suggestions as to how the water problems could be tackled or solved.

Finance was a major problem. The study area was far from the institution of study of the researcher and his supervisors. Commuting between the study area and institution of study involved a lot of money in addition to printing and other research cost. The financial support from the government to the study was • also woefully inadequate and more importantly came late.

Literature on small towns was fused with rural communities because CWSA is the agency responsible for the provision of water facilities in Small Towns and Rural Communities in Ghana hence, it was difficult to get information pertaining to small towns only.

Getting data from water related organizations was also a major problem. In most of the cases, it was difficult to meet the various personnel responsible for various activities due to their busy schedules.

In addition, Saboba is a newly created district and lacked much data hence much information was based on Saboba-Chereponi District statistics.

Also, due to the numerous students' researches especially, by students of University for Development Studies on various community issues, the failure of these researches to solving their problems made some of the respondents not willing to take part in any research work again, they consider it waste oftheir time.

To be able to cope with the problems, a reconnaissance survey was conducted in the study area to acquaint the researcher with the real situation in the study area and the

necessary arrangements and mechanisms were put in place such as collection of contacts of formal groups, provision of a motor bike for easy movement, collection of data from relevant offices, organization of financial resources for the successful completion of the study and the giving of vivid explanation on the purpose of the study that motivated respondents take part in the study.

1.9. ORGANIZATION OF THE STUDY

The project is organized into six chapters. Chapter one focuses on the introduction, problëm statement, objectives, propositions, methodology of the research, justification and the limitation(s) to the study. Chapter two presents a review of relevant literature on water issues. Chapter three contains the profile of the study area. Chapter four contains data analysis and discussions on the sources of water, factors affecting water access and use and its effects on health, education and productivity. Chapter five is a continuation of data analysis and discusses institutional interventions to water supply problems and use in the study area. Chapter six is focused on the summary of findings, conclusion and recommendations to the study.

CHAPTER TWO

REVIEW OF RELEVANT LITERATURE

2.0. INTRODUCTION

This chapter presents review of relevant literature on water in general by highlighting on water access and use as well as its quantity and quality for domestic purposes. It further looks at factors that affect water access and use, and the linkages between water access and the quality of life of people with particular emphasis on health, education and productivity. Lastly, the chapter discusses institutional interventions (both local and foreign) in the water sector in Ghana.

2.1. WATER ACCESS AND USE

This looks at the sources of water people depend on and the various uses of the water. It further look at the various levels of access to water and the quantity obtained at each level, the minimum amount of water each person requires in a day at various locations and the WHO guidelines on the quality of water for domestic uses.

2.1.1. Water Sources

Generally, there are two main sources of water and these are surface and underground water (Roseemma et al., 2007). Gyau-Boakye (2001) of Water Research Institute of Ghana indicates that, rural areas depend on surface water sources (dug wells, ponds, dug outs, dams and streams), groundwat (hand dug wells with or without hand pumps, boreholes fitted with hand pumps and springs) and on rain harvesting from the roof of buildings. However, he failed to indicate the sources of water for urban areas in Ghana. Santosh (1996 cited in Eantuo et al., (2009) similarly also identified two main sources of water namely; surface sources (ponds, lakes, streams, rivers, storage reservouirs and oceans) and underground water (spring, infiltration galleries, infiltration wells and well and tube wells). Santosh defined surface sources as those sources in which the water flows over the surface of the earth, and is available for water supplies. He further categorized surface water sources into three sub-classifications. These are natural ponds and lakes, streams and rivers and impounding reservouirs. Based on the above review on water sources, water sources in Ghana can be classified to include surface water (river), boreholes, streams, springs, hand dug wells, dams, ponds, pipe and rain harvesting of water from the roofs of buildings. However, the Ghana national water policy (2008) adds lake as a source of water and that Lake Bosumtwi was the only natural lake that had fresh water in Ghana. But all these authors did not indicate whether water from tanker services and pure water were also sources of water or not. This is contrary to the WHO (2008) classification of water sources into improved and unimproved source. WHO defined the improved sources to include: household connection, public standpipe, borehole, protected well, protected spring and rain

collection. However, they explained that bottled water was considered an 'improved' source only when the primary source was considered as improved. Unprotected well, unprotected spring, vendor provided water, tanker trucks provision of water, surface water from stream, river, dam, lake, pond, canals and irrigation channels are defined as unimproved sources. WHO's reason for the above classification of these sources as unimproved was informed by the potential quantity of water supplied and not the quality.

21.2. Water Use

In its Guidelines for Drinkin -Water Quality, WHO defines domestic water as 'water used for all usual domestic purposes including consumption, bathing and food preparation' (WHO, 1993; 2002 cited in WHO, 2003). Water has various uses. In Ghana, these uses have been categorized into three main forms. These include domestic uses (cooking, bathing, washing and drinking), agricultural purposes (irrigation and food processing) and industrial uses (hydro-power generation, transport services and tourism). Among the uses, agriculture takes the greatest proportion followed by industrial and water for domestic purposes uses the least water in Ghana (Ghana National Water Policy, 2008).

Gadgil (1998) recommends that it is not only water meant for drinking that should be potable but also, the amounts used for cooking, bathing and washing should be minimally polluted. He again advised that all the four uses of water: drinking, cooking, bathing and washing should be included as part of potable water definition and defined 'potable water as having acceptable quality in terms of its physical,' chemical and bacteriological parametres so that it can safely be used for drinking and cooking'.

2.1.3. Water Quantity

Water is an important and a life-sustaining drink to humans and is essential for the survival of all organisms. Water occupies 70% of the human body and is a crucial component of metabolic processes and serves as a solvent for many bodily solutes. Health authorities have

historically suggested at least eight glasses, eight fluid ounces each (168 ml) of water per day (64 fluid ounces, or 1.89 litres), and the British Dietetic Association recommends 1.8 litres. The United States Environmental Protection Agency recommends an average of 2.0 litres per day for American adults (WHO, 1987).

The quantity of water used per capita depends on the climate and work load. The human body needs about 3-10 litres of water per day for the normal functioning of the body. The quantity of water for food preparation and cooking is constant, but the quantity used for other purposes varies widely and it is greatly influenced by the type and availability of water supply. Some of the factors that influence the quantity of water use are; whether the water is charged for, standard of living of the person and the quality of the water available.

WHO (1987) however, emphasized that the quantity of water used or consumed is frequently expressed in litres per capita (head) per day. This criterion neglects the fact that in households, water use is shared by all members of a family for cooking, drinking, cleaning, waste disposal, and many other uses. But the per capita daily water usage data are necessary and useful to help make estimates of a community's water demand. Previously, this was expressed in gallons per day. However, WHO failed to indicate the quantity of water required by sex per day and also that for maternal mothers.

In terms of educational institutions, WHO (1987) recommends day schools would consume between 15-30 litres/day/per pupil and boarding schools would consume between 90-140 litres/day/per pupil and hospitals with laundry facilities would use between 220300 litres/day/per bed but fell short to indicate whether this refers to schools with the water source on school compound or when students bring water for drinking from home (levels of access).

The above is reiterated by WHO (2008) guidelines for drinking water quality that, the quantity of water used by households affects their health as the human body requires water to maintain adequate hydration and additional requirement for food preparation and to support hygiene. Estimates of the volume of water needed for health purposes vary widely

and according to WHO's guideline values, it is assumed that the daily per capita consumption of drinking water is approximately 2 litres for adults, although actual consumption varies according to climate, activity level • and diet. Based on currently available data, a minimum volume of 7.5 litres per capita per day will provide sufficient water for hydration and incorporation into food for most people under most conditions. In addition, adequate domestic water is needed for food preparation, laundry and personal and domestic hygiene, which are also important for health. Water may also be important in income generation and amenity uses. The quantities of water collected and used by households are primarily a function of the distance to the water supply or total collection time required. This broadly equates to the level of service. Four levels of service can be defined, as shown in Table 2.1. Service level is a useful and easily measured indicator that provides a valid surrogate for the quantity of water collected by households and is the preferred indicator for surveillance. Available evidence indicates that health gains accrue from improving service level in two key stages: the delivery of water within 1 km or 30 minutes total collection time; and when supplied to a yard level of service. Further health gains are likely to occur once water is supplied through multiple taps, as this would increase water availability for diverse hygiene practices. The volume of water collected may also depend on the reliability and cost of water (Howard and Bar-tram, 2003 cited in WHO, 2003). Table 2.1 shows the correlation between distance and quantity of water collected for use.

Table 2.1: Service level and quantity of water collected

Service Level	Distance/Time	Likely Volumes of Water Collected in Litres	Public Health Risk from Poor Hygiene
No Access	More than Ikm/more than 30m round-trip	Very low - 5 litres per capita per day	Very high. Hygiene practice compromised and Basic consumption may be compromised too

Basic Access	Within 1 km/within 30m round trip	Average. Approximately 20 litres per capita per day	High. Hygiene may be compromised and laundry may occur off/plot
Intermediate Access	Water provided on- plot through at least one tap (yard level)	Average. Approximately 50 litres per capita per day	Low. Hygiene should not be compromised, laundry likely to occur on-plot
Optimal Access	Supply of water through multiple taps within the house	Average. 100-200 litres per capita per day	Very low. Hygiene should not be compromised Laundry will occur on-plot

Source: Howard and Bar-tram (2003 cited in WHO, 2003).

21.4. Water Quality

Water quality is basically a determination of the organisms, and the mineral and organic compounds contained in water. The basic requirement for drinking water is that, it should be free from pathogenic (disease causing) organisms, contain no compounds that have an adverse effect on human health. The water should be fairly clear, not saline, contain no compounds that cause an offensive taste or smell and the water should not cause corrosion or encrustation of the water supply system, nor stain clothes washed with it (WHO, 1987). As an indicator organism for microbial contamination in drinking water, WHO (2006) cited in Wikke (2009) recommends E. coli form not to be present in drinking water. The guideline value stated by the WHO (2006) for all water intended for drinking is that the indicator organisms must not be detectable in any 100-ml sample of water. Dijk (2008) cited in Wikke (2009) indicates that, there are three types of waterborne pathogens of concern in water treatment - bacteria, viruses and protozoa.

WHO (1987) identified two parameters for drinking water quality: chemical / physical and microbiological. Chemical/physical parameters include heavy metals, traces of organic compounds, Total Suspended Solids (TSS), and turbidity. Microbiological parameters include Coli form bacteria, E. coli (bacterium in intestinal tract) and specific

pathogenic species of bacteria (such as cholera-causing Vibrio Cholerae), viruses, and protozoan-párasites. Chemical parameters tend to pose more of a chronic health risk through build-up. Physical parameters affect the aesthetics and taste of the drinking water and may complicate the removal of microbial pathogens. Originally, faecal contamination has the presence of coli form bacteria, an indication of contamination by sewage. Microbial pathogenic parameters are typically of greatest concern because of their immediate health risk. Gadgil (1998) indicates that water quality and quantity are affected by faeces from the environment that are washed into rivers and springs, rain causing erosion that over power sedimentation and filtration methods in the communities. He found that during the dry seasons, the decrease in access to potable water affects hygienic practices and drinking water quality and that underground Water is less affected by weather conditions. A study by McGregor et al., (2001) suggests that underground water seems to be the alternative to polluted surface sources.

The consumption of water containing toxic levels of chemicals resulting in diseases specifically, arsenic and fluoride. Fluoride occurs naturally and exposure can lead to mottling of teeth and, in severe cases, crippling skeletal fluorosis. Excess exposure to arsenic in drinking water may result in a significant risk of cancer and skin lesions (WHO, 2006 cited in Wikke, 2009). Fluoride is a significant global problem and WHO (1999) cited in WHO (2003) suggests that over 60 million people are affected by fluorosis in India and China and the total global population affected is about 70 million. Nitrate is also of concern although there remains uncertainty about the scale of adverse health effects from nitrate as few countries include: methemaglobinaemia (an infant born with a bluish colour; usually has a defective heart) as a noticeable disease as indicated by (Saywell, 1999 cited in WAC), 2003). High level of nitrate was identified as a potential public health problem in countries where concentrations in groundwater reach extremely high values (Melian et al., 1997 cited in WHO, 2003).

2.2. FACTORS AFFECTING WATER ACCESS AND USE IN GHANA.

22.1. Factors Affecting Water Access And Use In General

Generally, every continent is confronted with water scarcity and this has been a major problem among countries in the 21st century. Lack of finance to acquire the necessary water infrastructure to draw water from rivers and aquifers have denied about 1.6 billion people access to safe and clean water while water use is growing at more than twice the rate of population increase in the last century, although, there is no global water scarcity (UN-Water and FAO, 2007). The challenges confronting the water sector would increase significantly due to population growth and rising incomes that have led to greater water consumption and waster (UN-Water for Life Decade, 2005-2015).

A study on the Impact and Sustainability of Community Water and Sanitation Programme in developing countries indicates that, there is a gap between water supply and water demand and this was due to the failure of top-down (the provision of water facilities by the central government) provision of water which has necessitated the development of community based systems in India and Ghana (World Bank, 2004). The failure of the topdown approach was due to vast price differences between piped borne water and alternative options available to the poor people.

Nwanza (2003) asserts that 'water becomes more expensive as the poor end up purchasing water in small quantities but at a higher unit cost than those connected especially, in the poor rural areas or in the marginal urban or peri-urban areas where the ability to pay for the services was more limited'. Carter et al., (1999) argues that one of the obstacles of constructing new water facilities was affordability of the new facility by the beneficiaries.

Asiamah (2010) noted that, the problem of lack of potable water was due to the commodification of water in Ghana and the poor investment in the water sector. In his view, government was 'shifting away from the concept of water as a public service', as stated in the 1992 constitution of Ghana in chapter six, Article 35 (3) which states that 'The State shall

promote just and reasonable access by all citizens to public facilities and services in accordance with law'. But today, a substantial percentage of Ghanaians rely on water produced by private/commercial entities. Statistics from Ghana Statistical Service (2008) cited in Asiamah (2010) indicates that 15.2% of urban population and 1.8% of rural population of Ghana resorted to packaged (bottled and sachet) water for drinking alongside other improved sources. But recent statistics (Ghana Statistical Service, 2013) shows that the proportion of the Ghanaian population using sachet/bottled water as sources of drinking water are 2.8% for rural and 13.9 % for urban dwellers. This statistics reflects a decline in urban and an increase in the rural populations respectively using sachet water as source of drinking water. The failure of governments to honour their budgetary allocation to the water sub-sector was also cited as another obstacle. Asiamah used statistics to buttress his claim that between 2004 and 2009, government's budgetary allocation to the water sub-sector was estimated at 2.61% of total discretionary budget. But the financial allocations to the GWCL and the CWSA were not forthcoming, limiting the quantum of capital investments. In a recent joint tracking of their budgets by two institutions GrassRootsAfrica and the Ghana Coalition of NGOs in the Water and Sanitation Sector (CONIWAS), they found that both institutions were able to access only up to 10% of their budgetary allocations for 2009 financial year. CWSA received just GH 3,023,113 (10%) of a total allocation of GH 3,023,113 for the 2009 financial year (Asiamah, 2010). Low tariffs affected service cost leading to inability to meet the economic efficiency of regional average due to lack of funds to maintain and extend water infrastructure. It is clear that the problems of water supply are very linked to financial cost to acquire a water facility or buy water for household use. However, Asiamah failed to indicate how much money water supply institutions generate annually from their internal operations to support the water sector in Ghana.

The recent reforms in the water sector in Ghana have led to a multitude of institutions with overlapping responsibilities constituting another challenge for the water sector.

However, the National Water Policy (NWP) was launched in 2008 to introduce a comprehensive sector policy (CWSA, 2010).

The Ghana National Water Policy estimated that Ghana had a total surface water of 39.4 billion cubic metres. Ghana still has deficits in potable water coverage due to droughts or floods exposing women and children to water and sanitation related diseases. The disposal of faecal and other waste substances at the convenience of people has a high potential for water pollution (Aarne, 1990 cited in Eantuo et al., 2009). Pollution of water sources is aggravated when rain water washes some of the disposed waste into water sources. The lack of means to treat the polluted water, compel people to use untreated water. to the detriment of their health (United Nations Report, 2003 cited in Eantuo et al., 2009). The food processing industry is responsible for 40-54% of organic water pollution, paper industry (10-23%), the textile industry (7-15%), the metal industry (7-10%) and the chemical industry (7-8%) (UNESCO, 2003 cited in Eantuo et al., 2009).

The motivation of the community to maintain and protect their water sources is of critical importance to ensure a sustainable reduction in water borne diseases and also prevent an increase in the incidence of water-related vector-borne diseases, caused by breeding of mosquitoes in stagnant water around the water sources. All water-borne and faecal-disposal-related diseases, and water-based diseases, depend on infecting agents from human excreta and therefore, the provision and hygienic use of adequate sanitation are crucial for their control (WHO, 1987).

Agyemang(2006) _____ reckoned in Performance Audit Report that the main reason for the rarity and inadequacy of public water supplies in developing countries is the widespread belief that water should be free. The people in these countries prefer to rely on rivers and streams as their sources of water. Distance or ones' accessibility to a water source

was found to be one of the factors affecting water availability. The distance between the residential areas of most communities is far from their water sources, hence people have to walk for distance to their water sources and this in the views of Brugger (2002) cited in Eantuo et al., (2009) is one of the problems of water access. and use.

The operation and maintenance of most water facilities provided to beneficiaries was considered by Cairncross (1993) cited in Eantuo et al., (2009) as another problem confronting water supply. He observed that it is usually easier to obtain development finance for the construction of new supplies than funding for the recurrent expenditure of a maintenance programme and that there was not enough money available to cover operating costs and to carry out running repairs, let alone to carry out necessary preventive maintenance.

2.3. LINKAGES BETWEEN WATER ACCESS AND QUALITY OF LIFE

Water is life and before this role is achieved, it must be of a certain quality in order not to affect the quality of life of its consumers. It is based on the above that this section discusses how the use of water affects the quality of health, education and productivity of its users and consumers.

2.3.1. Water Supply And Disease Occurrence

Water related diseases are diseases contracted as a result of consuming contaminated water, use of inadequate water or attack by insects that breed on water bodies. Bradley (1977) cited in WHO (2003) suggests that there are four principal categories of water related diŠeases which are not m ally exclusive: They are:

Water-borne diseases: These diseases are spread by the consumption of water contaminated by human faeces or urine. Cholera, typhoid, guinea worm, infectious hepatitis and bacillary dysentery are examples of water-borne diseases. Outbreaks are characterized by simultaneous illness among a number of people using the same source of water.

Water-washed diseases: These are caused through the use of inadequate volumes of water, for personal hygiene such as washing and examples of water washed diseases are diarrhoea disease, infectious hepatitis, scabies, typhoid, trachoma, and skin and eye infections.

Water-based diseases: They are caused by worms which infest the sufferer and produce eggs which are discharged in faeces or urine. Infection often occurs by penetration of the skin rather than by consumption of the water. Schistosomiasis (bilharzia) and Dracunculuasis (guinea worm) are probably the most important examples.

Water-related insect/vectors diseases: They are diseases that are spread by insects that breed or feed near water sources. Infection with these diseases is in no way connected with human consumption of or contact with the water. Such insects include mosquitoes, which transmit malaria and simulium flies, which transmit onchocerciasis (river blindness) and dengue fever.

Consequently on the global scale, 3.7% of diarrhoeal diseases are attributed to poor water supply, sanitation and water hygiene (WHO, 2003). These have made diarrhoea the 6th on the scale of diseases in the world.

In developing countries more than 2.2 million people die each year from preventable diseases associated with lack of access to safe drinking water, poor water, and inadequate sanitary conditions (WHO/UNICEF/WSSCC, 2000: 5 cited in 2005 UN factsheet on water and sanitation). At anytime, half of the world's hospital beds are occupied by patients suffering from water-borne diseases. Every week, an estimated 42,000 people die from diseases related to low quality dnnking water and lack of sanitation. Over 90 per cent of them occurred to children under the age of 5 years (WHO/UNICEF, 2005: 15 cited in UN factsheet on water and sanitation). Two of the water-related diseases, diarrhoea and malaria were ranked 3rd and 4th places and are responsible for the death of children under

5 years old, accounting for 17% and 8% respectively of all deaths (WHO, 2005 : 106 cited in UN factsheet on water, sanitation and health). This implies that the global position on the occurrences of diarrhoea disease has increased from 6th in 2003 to 3rd position in 2005 and this again asserts the problem of water quality globally. With particular reference to the study area, the first ten causes of Out- Patient Department attendance in Saboba district from 2009 to 2011 are shown in Table 2.2.

Table 2.2: The ten top causes of OPD attendance in Saboba District 2009-2011.

2009			2010			2011		
DISEASE	No OF CASES		DISEASE	NO OF CASES		DISEASE	NO OF CASES	
Malatia	43,216	41.4	Malaria	37,950	50.6	Malaria	32,550	52.0
ARI	23,105	22.2	ARI	14,268	19.0	ARI	9,473	15.1
Typhoid fever	14,970	14.4	Typhoid fever	8,250	11.0	Typhoid fever	5,240	
Diarrhoea	6,626	6.4	Diarrhoea	3,639	4.9	Diarrhoea	3,536	5.6
Anaemia	4,552	4.4	Anaemia	1,637	2.2	Anaemia	623	1.0
Skin Dxs / Ulcer	1,562	1.5	Skin Dxs & Ulcer	1,330	1.8	Skin Dxs & Ulcer	1,516	2.4
Rheumatism & Joint ain	993	1.0	Rheumatism & Joint ains	960	1.3	Rheumatism & Joint ains	881	1.4
H ertension	825	0.8	H ertension	769	1.0	H ertension	693	1.1
Acute Eye infection	617	0.6	Acute Eye Infection	553	0.7	Acute Eye Infection	467	0.7
Acute Ear Infection	569	0.5	Acute Ear Infection	519	0.7	Acute Ear Infection	467	0.7
All Other Diseases	7,247	6.9	All Other Diseases	5,097	6.8	All Other Diseases	6,796	10.8
TOTAL	104,282			74,981			62,603	

Source: District Health Directorate Annual Report, 2011.

Table 2.2 depicts the ten top causes of OPD attendance in the district. Malaria still remains the number one cause ___LOPD—attendance o even though the general trend observed is a reduction in orD attendance which is a reduction in all the ten top causes of OPD attendance.

2.3.2: Water And Education.

Children throughout the world suffer greatly because they do not have access to safe water and sanitation and these affect their health, education and family relationships. In many countries children, particularly girls, are responsible for the fetching of water. Girls as young

as 10 years are responsible for fetching and carrying water for household use. Collecting water is not only physically stressful but extremely time consuming. One of the most serious effects is that girls are often not able to attend school. The children who manage to go to school have very low attendance figures and often drop out. Both boys and girls are needed by poor families to help in doing domestic tasks at home (Wateraid, 2012). This is affirmed by UN Decade for Action (2005-2015) report which indicates that children of school going age (five-fourteen years) especially, girls miss schooling due to; inadequate drinking water and sanitation facilities in their homes, diseases, domestic chores, and lack of separate school latrines for girls and boys, keep school attendance figures low and impair the absent pupils' future chances of escaping from their families' poverty. WHO (2005: 11 cited in UN factsheet) also asserts that poor health resulting from inadequate water and sanitation robs children of schooling.

More than 150 million school-age children are severely affected by water-borne parasites like roundworm, whipworm, and hookworm. These normally result in anemia, stunted growth, and other debilitating conditions. Children who suffer from constant water-related illnesses carry the disadvantages into school. Poor health directly reduces cognitive potential and indirectly undermines schooling through absenteeism, attention deficits, early drop-out. Over half of all schools worldwide lack safe water and

sanitation, jeopardizing the health and education of millions of school children. Most of the 115 million children currently out of school are girls. Many are denied their place in the classroom by lack of access to decent toilets at school, or the daily chore of walking kilometres to collect water(UNICEF, 2005).

In Ghana, children spend about two hours daily on domestic chores such as fetching water (Ghana living standards survey, 2000 cited by Wateraid, 2006). Also, the absence of basic water and sanitation facilities in rural areas is a major disincentive for teachers to accept rural postings. In 1999 for example, out of 262 teachers posted to four districts in

the Upper West Region, only 155 teachers reported at their post. In areas where there was limited access to safe water and sanitation, teachers were exposed to water and sanitation related diseases. Inadequate washing due to water shortages resulted in skin diseases and bad body odour among school children. In a focus group discussion Tay (2005) indicates that teachers in the Eastern Region of Ghana had their interaction with their pupils reduced in thqir classrooms due to bad body odour as a result of lack of water to bath.

However, reasons why water supply has been a problem in educational institutions were not stated in the literature reviewed.

23.3. Water And Productivity

This section deals with the productive uses of water at household level that includes brewing, small-scale food production and household construction in low-income areas. In terms of overall use of water, the economic use of water greatly exceeds that used for domestic supply. The health sector's oversight of water supply, has traditionally not considered productive uses of water as important to control. However, it is increasingly recognised that productive uses of water have particular value for low-income households and cbmmunities and these result in health and well-being benefits (Thompson et al., 2001 cited in WHO 2003). Benefits arise from improvements in household wealth from productive activity. In urban areas, this is often essential for low-income communities to meet their nutritional requirements and may offer additional income from small-scale sales.

Fass (1993) cited in WHO (2003) agrees with Thompson and notes that in families living in 'ultra-poverty' water could form anywhere between 1.5% and 10% of the total production costs in household enterprises. The removal of a water supply or deterioration in the quality of service may lead to further poverty among poor households using this water for small-scale economic activities such as food production. The quality of water used for productive processes needs to be suitable for domestic supply where it is used for processing food for retail or in some circumstances irrigation purposes.

Amenity uses where water is used for lawn-watering and car washing although, in some cases the latter would be more correctly categorised as productive uses of water may be used to provide an income. The principal concern in relation to amenity uses of domestic water supplies is to reduce the consumption of water for these purposes and this may place a significant demand on the water supply such that universal basic access would be compromised (WHO, 2003). Therefore, controlling amenity use of domestic water supplies should be driven to ensure that basic needs are met throughout the population in an equitable manner (Gleick, 1993 cited in WHO, 2003). .

The United Nations Decade for Action (2005-2015) further indicates that, inadequate supply of water and sanitation affects all members of a household, but not equally. For the men, lack of satisfactory drinking water and sanitation means that they are less productive and so earn less, due to illness. Poor health resulting from inadequate water and sanitation rob adults of earning power to work for a livelihood (WHO/UNICEF 2005). Brugger (2002) cited in Eantuo et al., (2009) asserts that impaired health and much time spent in the searclvfor water limit the possibility to do paid work.

2.4. INSTITUTIONAL INTERVENTIONS IN WATER SUPPLY IN GHANA

2.4.1. Government

Government established Ghana Water and Sewerage Corporation in 1965 to provide water to both urban and rural areas and later established the National Community Water and Sanitation Programme (NCWSP) in 1994 to address the problems of water and sanitation in rural communities and small towns (Ghana National Water Policy, 2008). The Community Water and Sanitation Division (CWSD), was established in 1994 within the Ghana Water and Sanitation Corporation (GWSC) to manage the NCWSP and cater solely for rural water and sanitation and this was later transformed into Community Water and Sanitation Agency (CWSA) in 1998 to still perform the same function. In 2008, CWSA facilitated the delivery of 1,784 boreholes, rehabilitated 302 and provided 54 hand dug

wells and (14) small towns' piped water systems were constructed in the country (CWSA, 2009). In Ghana, the demand driven approach is employed by CWSA in providing water to rural areas and small towns. The communities are required to make a contribution of 5% of the capital cost to obtain a water facility (Ghana Small Town Water policy, 2003).

The Government of Ghana released 36 billion cedis within 2002-2005 for guinea worm eradication in the Northern, Brong Ahafo, Upper West, Upper East and Volta Regions.

Table 2.2 shows the national progress up-date on potable water at the end of 2009.

Table 2.3: National water coverage since 2003

YEAR	2003	2004	2005	2006	2007	2008	2009
PER CENT	33.1	39.0	42.0	58.12	59.53	57.97	60.11

Soufce: Northern Regional CWSA Presentation, 2010.

Saboba district has a total of 262 communities with a total population of 73, 042 people.

The entire district has 168 boreholes, 39 hand dug wells, 1 small town water pipe system (STPS). The-population served with potable water is 44, 296 people, with a total coverage of 60.65% (Northern Regional Community Water Sanitation Agency, 2010).

24.2. Organizational /External Support

External Organizations have also contributed greatly to enhance the supply of water in Ghana. Canadian International Development Agency (CIDA) supported the water supply and sanitation sector in Ghana's northern regions through three projects. These include District Capacity Building Project (DISCAP), which was aimed at strengthening local capacities to manage water and sanitation resources, DISCAP began in 2000 and ended in 2008, the Northern Region Water Sanitation Project (NORWASP), also began in 1999 and ended in 2009 (CIDA, 2000).

The World Bank also supported Community Water and Sanitation Program (CWSP) in Ghana. The Second Community Water and Sanitation Program was initiated in 2000 with support from World Bank International Development Association (IDA) with a credit of

US$21.9 million, aimed at increasing access and effective and sustained use of improved community water supply and sanitation services in villages and small towns through a demand-driven approach. As a result of the program, which ended in 2004, nearly 800,000 people were provided with potable water and almost 6,000 households and 440 schools were also provided with latrines.

Small Towns Water Supply and Sanitation Project was approved by the World Bank in 2004 with a loan of US$26 million. In 2007, the World Bank decided to support the project with an additional credit of US$IO million. The German Development Agency (GTZ) contributed US$400,000, while the Government of Ghana provided US$4.6 million. The project ended in 2009 and was aimed at increasing water supply and sanitation access in small towns in six Ghanaian regions, providing about 500,000 people with water supply facilities and about 50,000 people with sanitary facilities (World Bank External Projects, 2004).

In conclusion, the reviewed literature indicates that generally, there are three main sources of water- surface water, ground water and rain harvesting. These have further been classified into improve and unimproved sources by WHO, (2008). Water is used for several activities but has been classified to include domestic, agricultural and industrial purposes. The reviewed literature indicates that there are specific quantities of water for various activities for example, human consumption, food preparation, use of water at school, hospital etc and there is a relationship between distance and quantity of water obtained from various sources with related health implications/benefits. The quality of water for various uses is very important and water for use should be free from pathogenic organisms, contain no compounds that have adverse effects on human health WHO (1987) or result in any of the water related diseases.

Factors such as natural/climatic (Drought, floods, distance) anthropogenic (finance, population growth, commodification of water, food processing etc) and institutional problems (lack of maintenance, overlapping of institutional responsibilities, low tariffs, poor investment in the water sector, failure of policies etc) mostly affect water access and

use in many places and there is a linkage between water access and use and the quality of life of a people. The quality of water consumed also resulted in the occurrence of water related diseases ranging from water borne, water washed, water based and water related insect/vector diseases. These diseases affect the quality of life of millions of people globally (health, education and productivity) with developing countries being the most affected.

Several interventions by governments (GWCL, NCWSP, CWSA) and external donors and organizations (World Bank, Germany, Canada etc) in the Ghana water sector in the form of time bound projects, donations all aimed at making water accessible to both the people of rural and urban Ghana.

This review has shown how the various actors in the water supply chain have been working to ensure sustainable water supply and interrupted service has affected the quality of life and the interventions put in place to address the challenges of water access and use. However, the literature has failed to indicate how community water management organizations have failed to survive after establishment and the policies put in place by the local and central governments to address these problems. 'This review aims to affect this study on how the local government institutions, supporting organizations in the water sector and water consumers/beneficiary communities will work together to ensure sustainable water supply in Ghana and Saboba district in particular. Furthermore, it would help to examine the district's water access and utilization situation and if it conforms to that of other places and if not, what is peculiar of Saboba district.

CHAPTER THREE

PROFILE OF STUDY AREA

3.0. BACKGROUND OF THE STUDY AREA

Saboba District (SD) until 2008 was called Saboba-Chereponi District which was created in 1988. Saboba District is part of the eastern corridor Districts of Northern Ghana. Today, Saboba District is among the twenty Districts and one of the youngest Districts in Northern Region (Saboba District Assembly Medium Term Development Plan, 2010).

3.1. GEOGRAPHICAL (PHYSICAL) BACKGROUND

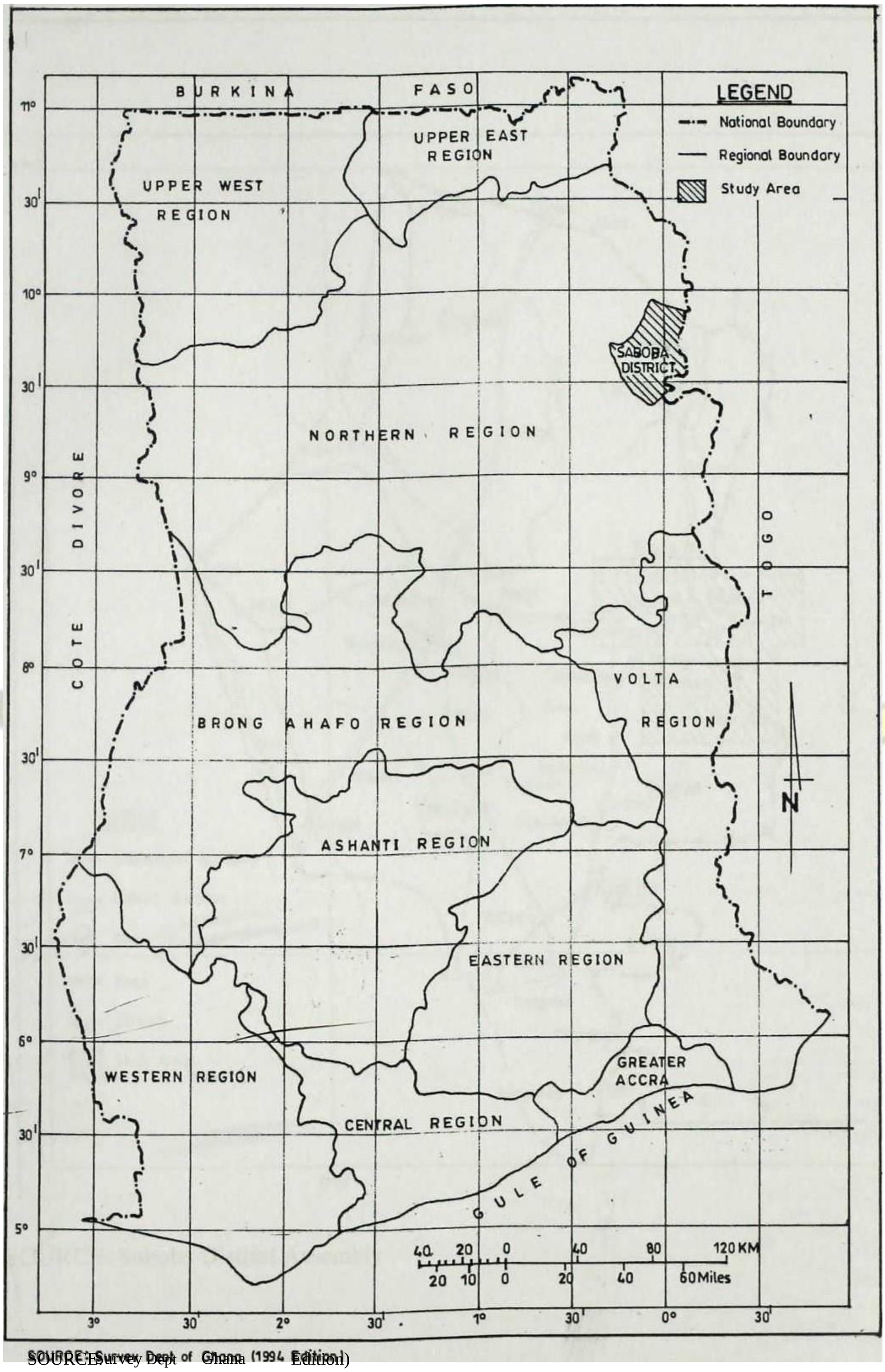
3.1.1. Location And Size

Saboba District is located in the north eastern part of the Northern Region of Ghana. It lies between Latitude 24^0N and 25^0N; Longitude 27^0 E and 13^0 E and covers a land area of approximately 1,100 km^2. The district shares boundaries with Chereponi District to the north, Gushiegu and Karaga Districts to the west, Yendi to the south-west, Zabzugu and Tatale Districts to the south and River Oti to the east.

Politically, the district has one town council and four area councils. It has about 254 settlements, with 95% rural and 5% urban. The district is made up of mostly dispersed settlements and few nucleated settlement (in the town and other large communities) and linear

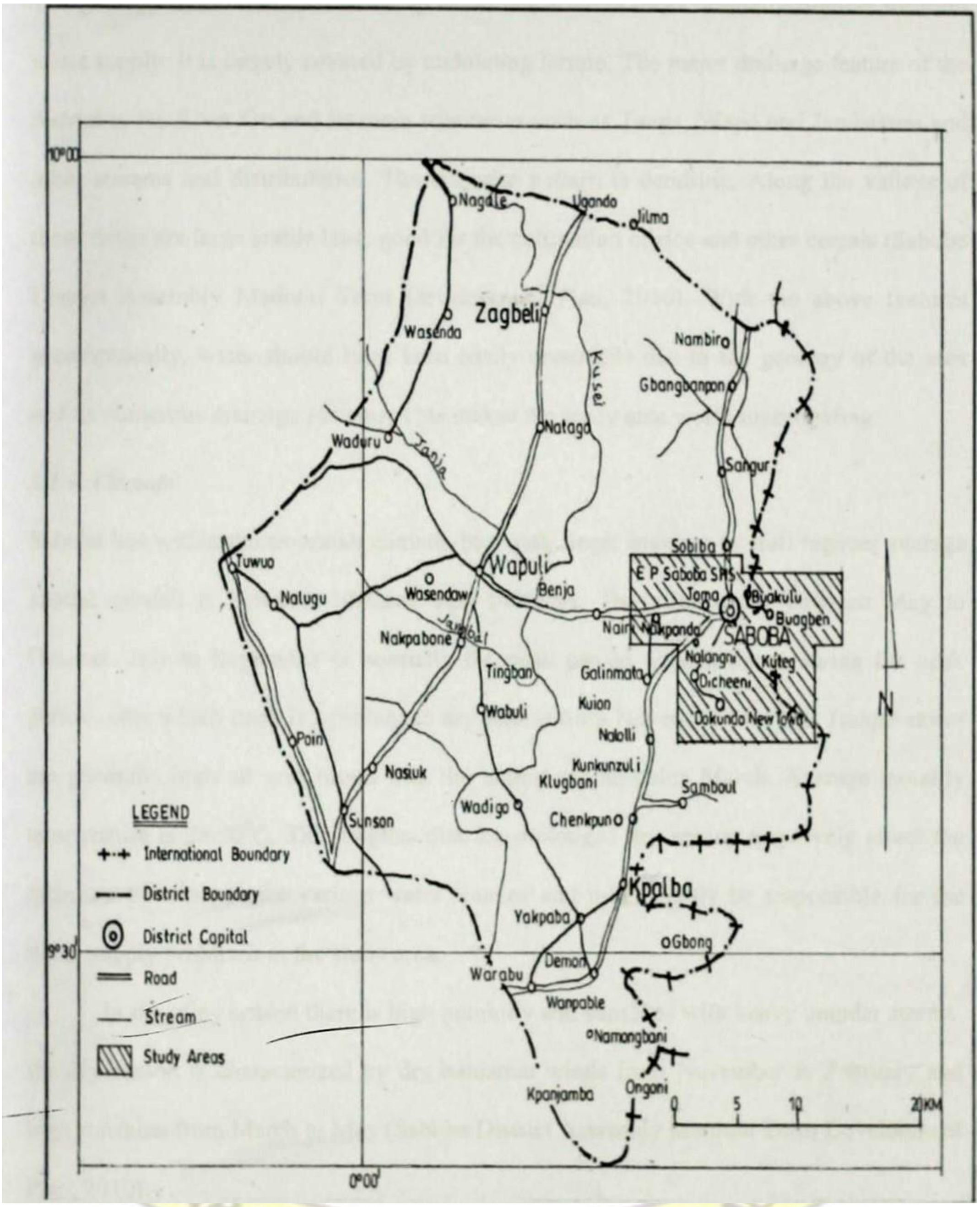
(alorrg-ffiõGGGds) respectively. The District has 25 electoral areas and 38 Assembly Members comprising 25 elected and 13 Government Appointees and 50 unit committee members (Saboba District Assembly Medium Term Development Plan, 2010). Figure 3.1 shows the map of Saboba District in national context and Figure 3.2 shows the map of Saboba district.

Figure 3.1: Map of Ghana showing Saboba District in National context



SOURCE: Survey Dept of Ghana (1994 Edition)

Figure 3.2: Map of Saboba showing study communities



SOURCE: Saboba District Assembly

3.1.2. ReliefAnd Drainage

The geology of the district is made up of Middle Voltain rocks normally suitable for rural water supply. It is largely covered by undulating terrain. The major drainage feature of the district is the River Oti and its main tributaries such as Tanga, Wape and Jambabuni and

other streams and distributaries. The drainage pattern is dendritic. Along the valleys of these rivers are large arable land, good for the cultivation of rice and other cereals (Saboba District Assembly Medium Term Development Plan, 2010).. With the above features geographically, water should have been easily accessible due to the geology of the area and its numerous drainage systems. This makes the study area worth investigating.

3.1.3. Climate

Saboba lies within the savannah climatic belt with single maxima rainfall regime; average annual rainfall is between 1000mm and 1400mm. The rains occur between May to October. July to September is normally the peak period. Floods occur during the peak period, after which there is a prolonged dry season from November to April. Temperatures are generally high all year round with the hottest month being March. Average monthly temperature is 25.50^0C. This implies that the prolonged dry season negatively affect the quantum of water at the various water sources and might partly be responsible for the water supply problems in the study area.

In the rainy season there is high humidity and sunshine with heavy thunder storms, the dry season is characterized by dry hamattan winds from November to February and high sunshine from March to May (Saboba District Assembly Medium Term Development Plan, 2010).

3.1.4. Soil And Vegetation

The major soil types developed under the savannah vegetation are groundwater laterite soil developed under rainfall between 1000mm and 1400mm. The soils are quite good along the valleys. Alluvial valleys are quite extensive around Kpalba which is also suitable for rice production. There is considerable soil erosion in the district due to bad farming practices and rampant burning of the bush.

The trees in this part of the country are short, scattered and wood lock in nature. The major tree species are the Dawadawa, Niim, Acacia, Mahogany, Baobab, Mango among

others. There are naturally grown tall grasses during the rainy season. The major economic trees are Shea and Dawadawa which have gained international recognition (Saboba District Assembly Medium Term Development Plan, 2010).

3.2. SOCIO-ECONOMIC CHARACTERISTICS

3.2.1. Demographic Or Population Features

Saboba has a population of 65,706 people. Out of this total population, 32,320 are males and 33,386 are females (GSS, 2010). Based on the existing facilities and the distance to facilities in the area, the district is predominantly rural (Saboba District Assembly Medium Term Development Plan, 2010).

3.2.2. Education

Education in the district is that of formal and non formal. The district has a total of 63 preschools with a total enrolment of 5,538 pupils, 63 primary schools with a total enrolment of 13,472 pupils, 17 Junior High Schools (JHS) with a total enrolment of 3,067 students and 2 Senior High Schools (SH/T) with a student population of 1,452.

The schools with water facilities in the district are Central primary and JHS, St. Charles Primary and JHS, Galaa Primary and JHS, E.P. Primary School, E.P SHS and St. Joseph's SH/TS. Buakoli primary and JHS are without any water facility due to the lack of pipe water system at Buakoli. This implies, pupils/students in these institutions have to rely on the available sources in the school community hence, exposure to water related diseases (District Education Statistical Unit, 2010).

3.23. Health

The main medical facility in the district are Saboba Medical Centre (SMC) owned by the Christian Health Association of Ghana (CHAG) situated at Saboba, the district capital and a newly established Saboba Town Clinic by Ghana Health Service in 2011. The SMC provides health services to other clinics and health post located in the other sub-districts. These other clinics in the sub-districts are owned by CHAG. These include the Sambuli

Clinic, Kpalba Clinic and Wapuli Clinic. The government (Ghana Health Service) ran health facilities in the district are the Community Health and Planning Services (CHPS zones) in some rural communities such as Kucha, Sanguli, Gmangmapong, Kujooni, Demon and Liful. Out of the 10 health facilities, only Saboba Medical Centre and Sambuli Health Clinic have mechanized boreholes as water facilities. The doctor—population ratio in the district is 1:65,706 (PHC, 2010) people and the nurse-population ratio is 1: 1, 240 people (District Health Directorate annual Report, 2011).

The common water related diseases in the district are typhoid and diarrhoea. A summary of data on outpatient attendance on diseases is presented in the Table 2.2.

3.2.4. Water Supply

Saboba District has an acute water problem though the district is endowed with several natural water bodies. The main water source in Saboba, the district capital is a Small Town Pipe Watersstcm. Other sources are 168 Boreholes, 39 Hand Dug Wells and numerous hand-dug-outs. The rural water supply is mainly through Boreholes and Dug-Outs. Water supply in the district is grossly inadequate (Saboba District Assembly Medium Term Development Plan, 2010).

3.2.5. The Local Economy

Agriculture plays a vital role in the economic development of Ghana. The northern region in general and the Saboba district in particular, cannot under-emphasize the role of agriculture in the local economic growth. The district's economy is purely rural and dominated by agriculture. The other economic activity of importance is commerce.

The farmers produce primarily for household consumption. The main crops produced include millet, sorghum, beans, maize, rice and groundnuts. Other food crops cultivated in the area include cassava, yam and vegetables (okro, tomatoes and pepper). About 70% of the working force is engaged in agriculture. Besides agriculture, fishing and hunting are also practiced.

Most of the female populations are engaged in food processing especially, in groundnut and soya-beans. Others are into sewing and dress making, food stuff trading, pito brewing, and food preparation for sale.

It is a common feature for every farmer to keep animals and poultry in the district. Some of the animals reared are cattle, sheep, goats and pigs. Though reared on subsistence level, they also serve commercial purposes.

Commercial activities are not only restricted to Saboba town only. There are other market centres such as Sanguli, Gmangmapong, Kpalba and Wapuli where people deal in various merchandise goods with traders coming from other adjoining districts and Togo. Cotton is the major industrial crop cultivated in the district, but on a smaller scale. Other industrial crops grown in the study area are groundnuts, and soya-beans. Besides, there is concentration on Shea nut activities in the district of late (Saboba District Assembly Medivm Term Development Plan, 2010).

3.2.6. Transportation And Communication

Saboba District is accessible by road. The district is linked to other towns and districts by third class roads. The total road net work is about 125 km. The major road networks are Yendi to Saboba, through Demon on one side and Yendi-Wapuli-Saboba on the other. During the rainy seasons, the district is normally cut off due to floods as a result of torrential rains. Small routes and foot paths serve to link communities. Private transport owners and Metropolitan Mass Transport Limited provide transport services in the district (Saboba District Assembly Medium Term Development Plan, 2010).

Saboba district is networked by the following telecommunication networks: MTN, Vodafone, and TIGO. Most of these service providers have mounted masts for efficient service delivery. This however, serves as source of revenue to the Saboba District Assembly (Saboba District Assembly Medium Term Development Plan, 2010).

In addition to the above, the district can also boast of two private radio stations that have also aided communication in the district. These are Radio Kitawuln and Radio Gaaki.

Though the geology of the Saboba district is made up of thee voltain rocks that favours rural water supply, the climatic belt in which the district is located and its characteristics such as the single maxima rainfall, prolong dry season coupled with high temperatures (monthly average of 25.50^0 c) and severe hamattan clearly indicate that these conditions affect the district's water supply situation and the quality of life of the 65,706 (GSS, 2013) people of the district This would have untold hardships for the 23,529 pupils/students in schools (basic-secondary) in the district (District Education Office, 2011) and economic activities that use water especially, farmers and food processors. These characteristics of the district are going to help inform findings in the study communities in Saboba district.

CHAPTER FOUR

4.0. SOURCES OF WATER AND PROBLEMS OF WATER ACCESS AND USE IN THE SABOBA DISTRICT.

4.1. INTRODUCTION

This chapter presents results from data collected from the various respondents on the sources of water, the factors that affect water access and use and, its effects on health,

education and productive activities in the study area. In all, 321 respondents took part in the study. This was composed of 284 households who formed the main respondents, made of 35% males and 65% females. The other participants included 33 key informants including six Ghana Health Service Personnel, twelve Heads of educational institutions, three staff of District Assembly (one from District Assembly and two from District Water Sanitation and Team), eleven Saboba Community Water and Sanitation Development Board members and one staff of a water related Non Governmental Organization (World Vision Ghana). The responses provided by these key informants were used to support data provided by households in their fields of responsibility.

The study was carried out in ten communities in the Saboba district mostly located in Saboba town and its immediate environs. The study looked at the following general characteristics ofthe respondents: nder, educational level, household size, occupation, average monthly income, number of respondents from the various study communities and the key informants. A summary of these characteristics of respondents are presented in Table 4.1.

Table 4.1: General characteristics of Respondents

CHARACTERISTICS	DETAILED CHARACTERISTICS	RESPONDENTS	TOTAL
GENDER	Male Female	100 (35%) 184 (65%	284
EDUCATIONAL LEVEL	Tertiary SHS Basic Never schooled	48 (16.9%) 13 (4.6%) 24 (8.5%) 199 70.1%	284
HOUSEHOLD SIZE	1-5 6-10 11-15 16-20	85 (29.9%) 168 (69.2%) 24 (8.5%) 7. (2.5%)	284
OCCUPATION	Farming Teacher Trader Food vendors Pito brewers Health workers	190 (66.9%) 32 (11.3%) 13 (4.6%) 8 (2.8%) 5 (1.8%) 11 (3.9%)	284

	Others	25 8.8%	
AVERAGE MONTHLY INCOME	Below GH 10 GH 10-30 GH 40-60 GH 70-100 GH 110-130 GH 140-160 GH 170-200 GH 200 and above No income	4 (1.4) 185 (65.1) 13 (8.1) 11 (3.9) 4 (1.4) 2(0.7) 4 (1.4) 48 (16.9) 3 1.1	284
STUDY COMMUNITIES	Buagbeln Buakuli Dicheeni E.P.SHS Community Kiteg Nalongni Nankpando New Dokondo Saboba Toma	24 (8.5%) 29 (10.2%) 21 (7.4%) 25 (8.8%) 29 (10.2%) 34 (12%) 31 (10.9%) 5 (1.8%) 53 (18.7%) 33 (11.6%)	284
KEY PERSONALITIES	GES GHS DA Staff(DA and DWST) NGO(WVG) SCWSDB	12 6 3 1 11	33

Source: Field Data, 2011.

4.2. MAIN SOURCES OF WATER TO HOUSEHOLDS IN THE STUDY COMMUNITIES.

Table 4.2: Sources of water in the study communities.

	LOCALITY										Total
Main Sources OfWater	BGN	BKN	DCN	E.P.C	KTG	NGN	NKD	NDK	SAB	TOM	

Borehole											
Dam	0	0	21	3	29	0	5	0			67
Dug out	0	0	0	0	0	0	0	0	25	25	50
Pond	0	1	0	0	0	1	0	1		0	
River		0	0	1	0	0	0	0		0	25
Stream	24										110
Well	0	27	0	15	0	31	25	0	0	3	2
Spring		1		0		0	1			0	13
Tankçr/Lorry/Motor Services											
Pipe Borne											
Total	24	29	21	25	29	34	31		53	33	284

Source: Field Data, 2011.

KEY TO TABLE 4.2.

BGN- Buagbeln

BKN - Buakoli

DCN - Dicheeni

E.P.C - E.P. SHS Community

NGN - Nalongni

NKD - Nankpando

NDK - New Dokondo

SAB - Saboba

TOM - Toma

KTG - Kiteg

Ähe study indicates that the main sources of water households depend on in the study communities are river (38.7%), borehole (23.6%), dam (17.6%), pond (8.8%) and wells (4.6%). But in the dry season, these communities depend on river, borehole and pond and in the rainy season, rain water collection becomes the main water source. On the various community levels, Buakoli, E.P.Community, Nalongni and Nankpando depend on River Oti as their main source of water. Dicheeni and Ketug depend on borehole, Saboba and Toma communities also depend on the Dam. The people of Buagbeln depend on the pond and New Dokondo depend on spring as their main sources of water. Data from Ghana Statistical Service (2000) confirms the existence of these sources except the dam, pond and sachet water identified as other sources of water in the study communities. This confirms the assertion of Asiamah (2010) on bottled/sachet

water as a source of water. Among these various sources, only the pipe and borehole sources are improved sources as classified by Howqrd and Bar-tram, (2003) cited in WHO (2003). The rest of the sources namely dam, dug out, pond, river, stream, well, spring, tanker and vendor services are all unimproved sources. Out of the 284 households, only 25% (70) have improved sources of water located in their communities mainly from the pipe and boreholeas indicated in Table 4.2. The rest of the households 77% (219) have unimproved sources of water located in their communities. Plates 4.1- 4.4 show some main water sources in some study communities.

Plate 4.1: A dam at Saboba at Saboba

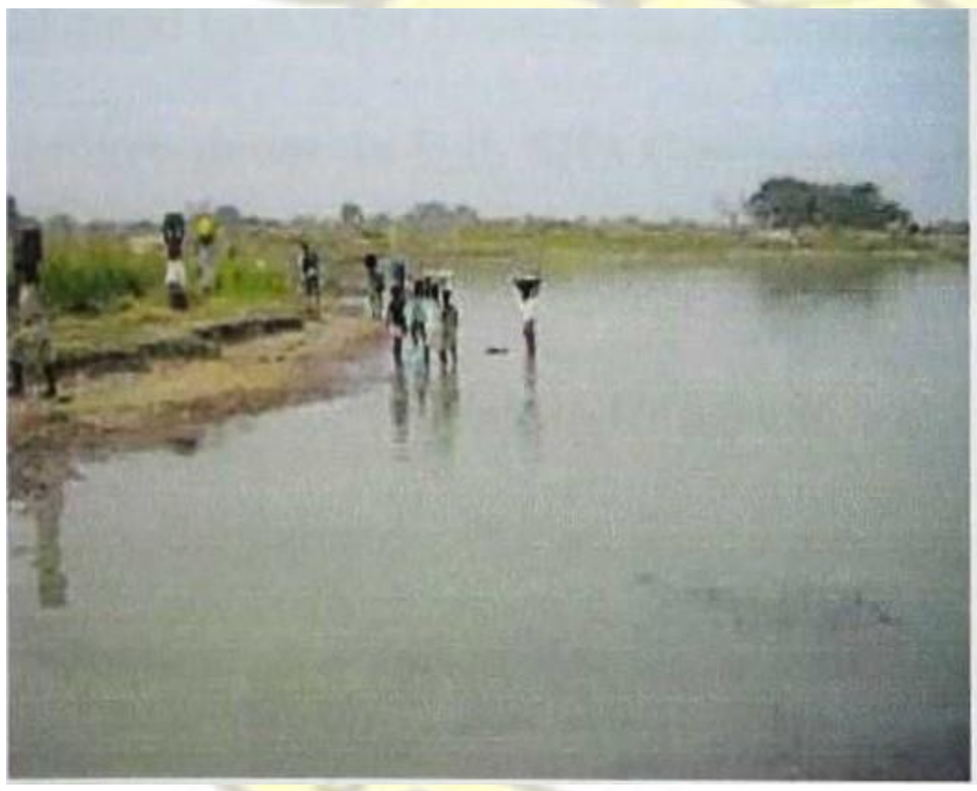


Plate 4.2: A well at Saboba town

Plate 4.3: A dug out at Nalongni

Plate 4.4: A pond at Buagbaln

Source: Field observation, 2011.

On the various sources households use to meet their domestic water needs, the study shows that out of the 284 households, 31 (11%) depend on pipe, 99 (35%) depend on borehole, 124 (44%) depend on river, 11 (4%) depend on well, 11 (4%) depend on sachet/pure water and six (2%) depend on spring. Among these sources, only pipe and borehole are improved sources by WHO (2003; 2008) guidelines, The study indicates that only 130 (46%) households have access to improved sources of water to meet their drinking water needs, This implies that 54% of the households depend on water from unimproved sources.

However, during data collection, field observation reveals that the people of Buagbaln depend on a river because their borehole and the pipe water system in the community have broken down. In E.P. SHS Community and Nankpando, though they have boreholes, they contain high levels of fluoride according to a World Vision Ghana report (who drilled the borehole) and the pipe water system was broken down in the case of E.P. SHS community hence they also depend on river water mostly. Saboba town have multiple sources of water including pipe and boreholes. Field observation revealed that the breakdown of the pipe water system led to pressure on the existing boreholes leading to the breakdown of some of them. These therefore compel people to resort to other sources of water such as the river and wells to meet their domestic water needs, which are unimproved sources according to

WHO (2008) classification. The implication is that the affected households would become susceptible to water related diseases if they depend on these unimproved sources.

4.3. LEVEL OF ACCESS TO WATER

The study shows that none of the households in the study communities have optimum access (multiple taps in house) to water. Out of the 284 households studied, two (0.7%) have a single tap in their compounds from which they fetch water hence, have intermediate access to water. About 60.09% (173) of households have basic access (fetch water within a distance of Ikilomtre) and 38% (109) of households fetch water from a distance of more than one kilometre daily from their main sources of water hence, have no access to water as classified by Howard and Bartram (2003) cited in WHO (2003). This is detailed in Table 4.3.

Table 4.3: Level of access to sources of water by households

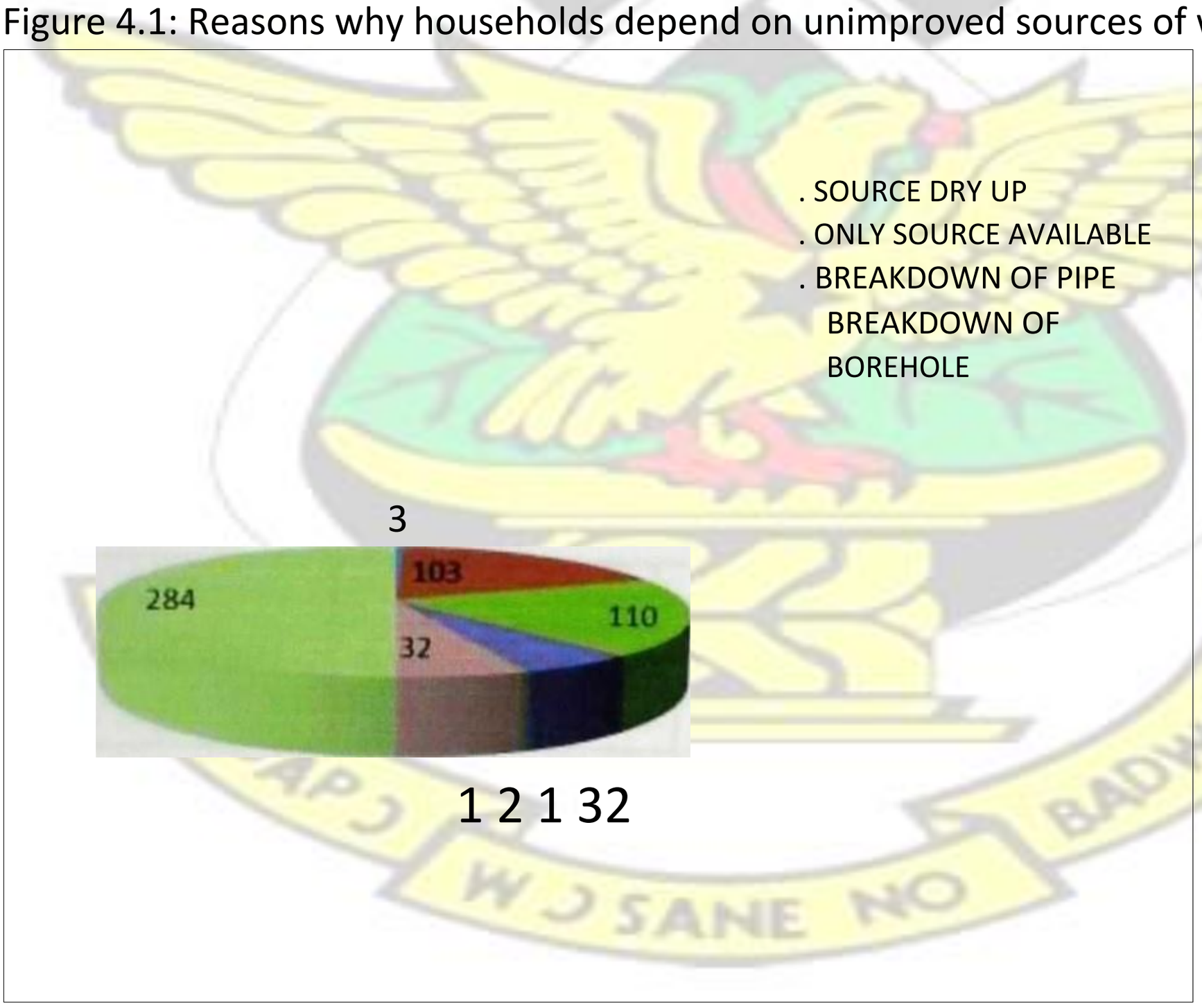
Main Sources of Water	Level of Access to Water in Kilometres								Total
	Optimum Access (Multiple taps in the house). Average Quantity (100-2001itres). Health Risk (Very low)		Intermediate Access (Tap in Yard). Average Quantity (50 litres). Health risk (low).		Basic Access (Within Ikm) Average Quantity (201itres). Health risk (High).		No Access (More than I km), Average Quantity(Below 51itres), Health Risk (Very high)		
Borehole	o	o	o	o	62	21.8	5	1.7	67
Dam				o	40	14.08	10	3.5	50
Dug out	o	o	o	o	7	2.46		0.35	8
Pond	o	o	o	o	25	8.8			25
River	o	o	o	o	24	8.45	86	30.3	110
Stream	o	o	o	o		0.35		0.35	2
Well	o	o	o	o	10	3.52	3	1.1	13
Spring	o	o			4	1.4			4
Lorry/Motor Services	o	o		o	o	o	2	0.7	2
Pipe Borne	o	o	2	0.7				0.35	3
Total	o	o	2	0.7	173	60.09	109	38.4	284

Source: Field Data, 2011

Though the study shows households have access to water from their main sources, only 2 (0.7%) households have intermediate access and they depend on pipe borne water hence use improved source of water. Out of 173 (60.09%) households that have basic access 62 (21.8%) depend on improved sources. Out of a total of 109 households with no access to water, only 6 (2%) of the households depend on improved sources. The implication of this on these households is that—out-orthe total households studied, 70 (25%) have access to improved sources of water according to WHO (2003) classification.

The study shows that the major reasons why households use unimproved sources of water to meet their water needs in the study area are: lack of alternative sources of water available (36.2%), break down of pipe (39%) and breakdown of boreholes (11.2%) as shown in Figure 4.1.

Figure 4.1: Reasons why households depend on unimproved sources of water.



Source: Field observation, 2011.

The study further reveals that, households spend much of their productive time collecting water especially their morning and evening hours from the boreholes, dam, pond, and

river. A total of 200 (70%) households in the study communities do not queue for water at their main sources while 84 (30%) households queue for water at the boreholes, wells, dug outs, spring and pipe. The factors that account for the queues at these sources include population pressure as a result of increase in the population of the study area, proximity to water facility as some households are located far from their water sources and seasonality especially in the dry season when some of the sources do not contain water throughout the day except in-the early hours of the day, Saboba is located within the Savannah climatic

belt that experiences single maxima rainfall (1000mm-1400mm) annually, coupled with high temperatures (monthly average of 25.50^{0}C) and prolong dry season affect the quantity Of water at the various water sources especially, the wells. These characteristics of the belt partly explain why wells have low water quantity and dry up for most part of the year. These factors influence the time households spend in queues to collect water from their sources.

The study reveals that households spend a minimum of 15 minutes and a maximum of 60 minutes and above in queues at the various water sources. Averagely, households spend 37 minutes to fetch 20 litres ofwater from their main sources. This is shown in Table 4.4.

Table 4.4: Time households spend in queues to fetch water at their sources.

Sources of Water	Time spent in Queues for Water per day						
	Within 15 mins.	Within 30 mms.	Within 45 mins.	Within 60 mins.	Above 60 mins.	Do not	Total

Borehole	10	28	23	1	4	1	67
Dam	o	o	1			50	50
Dug Out	1	1	0	o	o	5	8
Pond	0	0		0		25	25
River					o	110	110
Stream						2	2
Well	0	1			2	4	13
Spring	1	3	5	1		o	4
Lorry Services			0	0	1	1	2
Pipe Borne	1	0	0	0		2	3
Total	13	33	0	0	7	200	284
			29	2			

Source: Field observation, 2011.

The average time households spend daily on water collection is shown in Table 4.5.

Table 4.5: The average time Households spend daily to fetch water at their sources.

Source of water	Minimum time in hours	No. of res ondents	Maximum time in hours	No. of res ondents	Average time s ent dail
Borehole	1	32	4	13	1+4= 5/2=2 5
Dam	1	7	5	6	1+5=6/2=3
Pond	1	16	5	1	1+5=6/2=3
River	1		6	6	1+6=7/2=3.5

Source: Field observation, 2011.

The study sort to find the minimum and maximum number of hours households use to collect water at some of their main sources of water and it was found that some households spend a minimum of one hour and a maximum of six hours daily collecting water at their various sources. In finding the average time (minimum hours plus maximum hours spent daily divided by two) spent collecting water at the various sources as indicated in Table 4.4, it was found that households spend averagely between two hours, thirty minutes (2hrs, 30mins) and three hours, thirty minutes (3hrs, 30mins) daily collecting water which is

contrary to the assertion of Ghana Living Standard Survey (2000) that children spend about two hours on water fetching daily for domestic chores.

The study also indicates that not all the water facilities in the study communities have an organized management system or body. The Small Town Pipe System (STPS) is managed by Saboba Community Water and Sanitation Development Board (SCWSDB). Though, some of the boreholes in some of the communities have Water and Sanitation Committees (WATSAN), the study shows that they lack the means to carry out their core functions due to lack of capacity and tools to work. Other water facilities like the wells, spring and river are communally owned and are entrusted in the care of various community elders. Based on these factors, some of the water facilities have not benefited from any form of maintenance or renovation leading to their dry ups in the dry seasons thus further accounting for the lack of water access in the district. This shows that the characteristics of the Savannah climatic belt as stated in the study profile in 3.1.3 within which the study area is located negatively affect the water sources in the study area. The following plates 4.5 - 4.6 depict the condition of some of the deplorable water facilities due to lack of or poor management in the study communities, especially at Saboba town.

Plate 4.5; An aged well at Saboba town

Sources: Field observation, 2011.

Plate 4.6: An abandoned borehole at Saboba town

Sources: Field observation, 2011.

This confirms data collectea-aÉétudy area that only 30 (11%) out of 284 households pay-for the water they use while 254 (89%) of households fetch water free from their sources or refuse to pay for the water they fetch. The study indicates that the households that pay for the water they use are those who fetch water from the pipes/taps.

About 89% of households do not pay for the water they use because they contribute money towards maintenance of the facility annually (boreholes) as stipulated in the guidelines for the acquisition of water facilities from CWSA, In addition, some of the communities especially Buakoli, households do not pay because there is no water facility that requires the payment of water bills. For those households that use water facilities that supply water that is supposed to be paid for like pipe, refuse to pay water bills because they claim they are supplied water inadequately and irregularly. This is contrary to Agyemang (2006) assertion that the rarity and inadequacy of public water supplies in developing countries is the widespread belief that water should be free. The implication of these on water supply is the lack of financial resources to maintain and renovate water sources in the study area such as the pipe, boreholes and wells leading to lack of access to water in the study communities.

On the level of satisfaction (Desired quantity of water) households derive from their water

sources, the study indicates that, 110 (39%) households are satisfied while 174 (61%) are dissatisfied with the quantity of water they fetch from their sources. This is shown in Table 4.6.

Table 4.6: Level of satisfaction on the quantity of water households fetch from some water sources.

Sources	Very Satisfied	%	Satisfied	%	Dissatisfied	%	Very Dissatisfied	%	Total
Pipe Borne	4	1.4	7	2.4	' 14	4.9	6	2.1	31
Borehole	12	4.2	31	10.9	51	18	6	2.1	100
River	6	2.1	39	14	76	27	4	1.4	125
Well	o	o	2	0.7	5	1.8	5	1.8	12
Sachet	2		6	2.1	2	0.2	1	0.3	11
S rin	o	o	1	0.3	4	1.4	o	o	5
Total	24	8.5	86	30.3	152	53,5	22	7.7	284

Source: Field observation, 2011.

For the households who are satisfied, the study shows that they get enough water from their sources. Some of the Youseholds also have containers and reserviours for water storage especially, when pipes flow and some households queue early enough with their containers to collect water for use. Other factors include availability of functioning community boreholes and small family size. These factors enable households to meet their water needs from their sources.

For the households who are dissatisfied with the quantity of water they get from their sources indicated that long queues, pipe water rationing, large family size, uncommunicated time table for water rationing and water leakages from broken pipelines including frequent breakdown of pipe prevent households from meeting their water needs. Other factors include distance to water sources, dry wells, low water table (poor hydrology of study area) of some boreholes and providing water to visitors prevent households from meeting their water needs. These account for why about 61% of households are dissatisfied with the quantity of water they fetch from their sources. This supports Brugger's (2002) cited in

Eantuo et al., (2009) assertion that distance is one of the problems of water access and use and Caircross (1993) cited in Eantuo et al., (2009) assertion that the operation and maintenance of water facilities is a problem that confronts water supply. Thus about 61% of households lack access to water for household use, spend much of their time on water fetching which also affects other work (For example, farming the main occupation of respondents) of the people and high cost of water for sale especially in the town. This buttresses Nwanza (2003) who observed that, water becomes more expensive when bought in small quantities. It can further be argued that these factors especially population pressure compels people to fetch water from River Oti despite its distance and other water sources though unimproved sources. This confirms the assertion býthe Chair of United Nations Secretary General's Advisory Board on World Water Day (2010) at Nairobi that people have no choice but to use unsafe drinking water on daily basis. The implication of this is that, if water becomes expensive and people tend to manage water, hygiene may be compromised as indicated by Howard and Bartram (2003) cited in WHO (2003) in their 4th level of water access (no access). Plates 4.7 and 4.8 show

field observations on some of the problems households go through to access water.

Plate 4.7: A hilly bank of River Oti

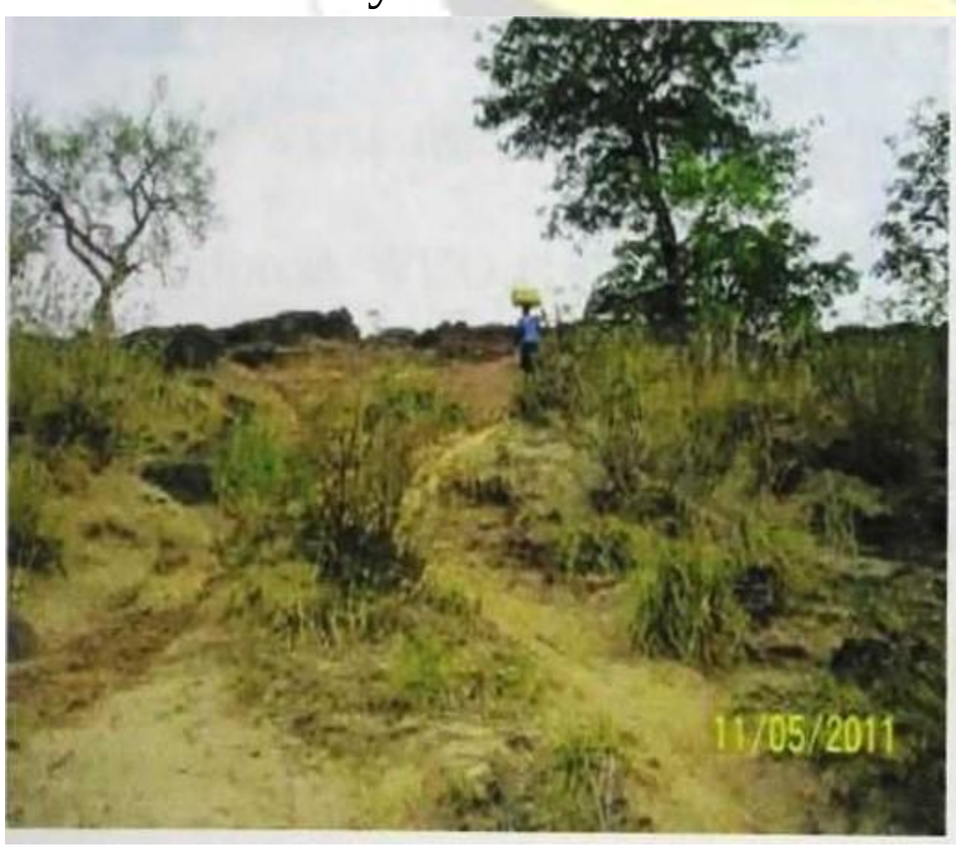


Plate 4. 8: A queue of people at a borehole

Source: Field observation, 2011.

4.4. ANTHROPOGENIC FACTORS AFFECTING WATER ACCESS AND USE

The study further explored the perception of respondents in terms of the factors accounting

for the pollution of water in the study area, The results are presented in Table 4.7.

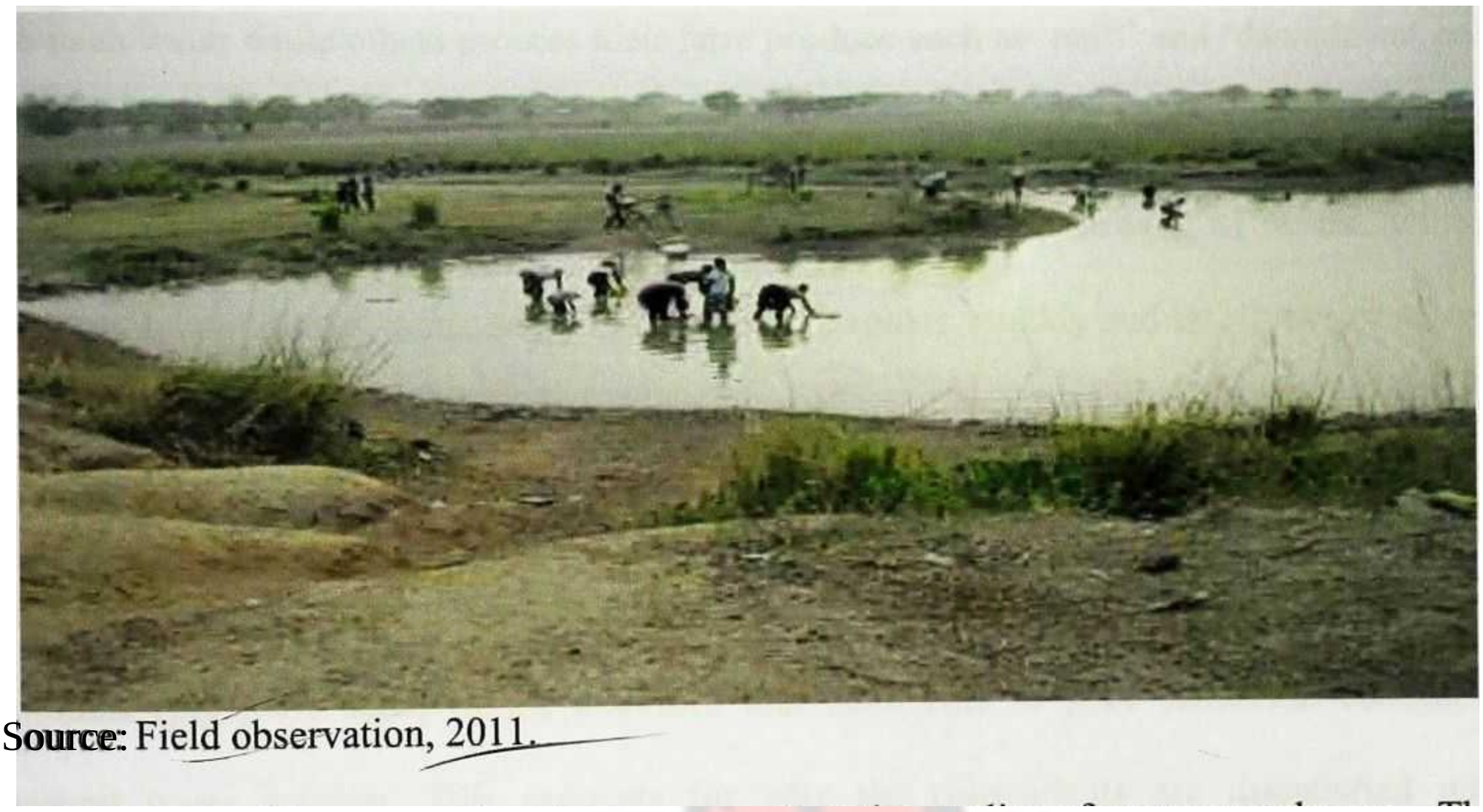
Table 4.7: Respondents perception on the sources of pollution to water sources in their communities.

Source of pollution	Strongly Agree		Agree	%	Disagree	%	Strongly Disagree	%	Idea	o
Sewage/latrine	161	57	67	24	29	10	20			
Refuse dump	109	38	21		67	24	85	30		
Bathroom waste	117	41	62	22	37	13	63	22		
Transport—-through pipeline			27	10	30	11	75	26	22	
Maintenance of water facilities	133	47	30	11	21		77	27	23	
Animals entering	240	85	18				19			
Washing of Clothes	237	83	13				26			
Entering to fetch	243	86	18				19			
Container and Rope	83	29					183	64	5	

Source: Field observation, 2011.

The main sources of pollution of water in the study area are people entering to fetch water, animals, washing of clothes by the banks/into water, sewage/latrine from nearby houses without sanitation facilities were identified as the most serious sources of pollution. The other sources include maintenance of water sources, transportation of water through the pipelines, bath house waste, refuse and rope of containers used in collecting water from wells as indicated in Table 4, 7, Sewage, entering to fetch water by humans, bath house waste and waste from refuse dumps have serious health implications on human health, This reinforces WHO (1987) assertion that, water contaminated by sewage/latrine has the presence of coliform bacteria in the water, a harmful faecal pathogen, the implication of which is detrimental to human health and increases health risk when such water is consumed. Some of these perceptions of the respondents were observed and are presented in Plate 4.9.

Plate 4.9: People entering to fetch water in a dam with bare feet at Saboba



Source: Field observation, 2011.

Sanitation conditions around water sources affect the quality of water people use. The respondents are generally very dissatisfied with the sanitation conditions around their water sources in their communities. Out of 284 households, 5 (2%) households are very satisfied with sanitation conditions, 30 (11%) respondents are satisfied, 169 (60%) respondents are dissatisfied and 80 (28%) respondents are very dissatisfied with the sanitation conditions around their water sources. On the whole, 88% of households agree the sanitation conditions at water sources in their communities are not satisfactory. In some of the communities (Kitieg and E.P. SHS Community) the boreholes have very clean environment except for the outlets where dirty water flows through and collected as stagnant water. This accounts for 5% satisfaction on sanitation conditions by households at their water sources. In some of the communities (Dicheeni and Kitieg), they clean around their boreholes and do not allow people to wash on its concrete floor and that is why respondents are satisfied with sanitation conditions.

The lack of security for boreholes, the dam, wells and river make these sources vulnerable for animals that enter to drink and sometimes defecate into them (rivers and dams) or around these sources. Other factors such as proliferation of organic and plastic wastes (rugs, polythene bags), washing of clothes, cars and motorbikes and people entering to fetch water while others process their farm produce such as 'nairi' and 'dawadawa' pose

sanitation problems around the banks of water sources. Furthermore, encroachment of people to water sources and lack of toilet facilities and the throwing of refuse, worsen sanitation condition at water sources. Moreover, stagnant, muddy and smelly water around some boreholes, the growth of algae around these water sources and children play around the water sources, including sacrifices by traditional leaders. Most of the wells are old and stagnant water seen around them and swimming in the river and dam by people and animals (pigs)--are some of the activities that contribute to poor sanitation conditions around water sources. This accounts for why the respondents are dissatisfied with itation conditions around water sources in their communities. Plate 4.10 shows sanitation conditions at a well at E.P. Senior High School community.

Plate 4.10: Stagnant water around a well at E.P SHS community

Source: Field observation, 2011.

The above supports the assertion by UN Decade for Action 'Water is Life' (2005-2015) that 17% of the un-served world's population has little choice but to carry home water from unsafe sources, It further emphasized that there was the need for communities to maintain and protect their water sources as critically important to ensure a reduction in water borne diseases and prevent an increase in the incidence of water related vector borne diseases, caused by breeding of mosquitoes in stagnant water around the water sources,

4.5. EFFECTS OF WATER ACCESS ON HEALTH.

4.5.1. Daily Quantity of Water Collected per Head by Households

Table 4.8: Quantity of water collected and the levels of access per head daily.

Household Size	Litres	Litres	Litres	230 Litres	345 Litres	460 Litres	Litres+	Total
Section A	Quanti of Water Collected b Households in Litres Dail							
1-5	3	12	36	28	1	2	3	85
6-10			18	101	18	18	12	168
11-15	0		3	7	3	8	3	
16-20	o	o	o	2	O	0	5	7
TOTAL	3	13	57	138	22	28	23	284
Section B	Avera e uanti of Water Collected Dail er Head b Households							
1-5=3	20	30	38.3	76.7	108	153		
6-10=8	7.5	11.3	14.4	28.8	43.1	57.5		
11-15=13	4.6	7.0	8.8	17.7	26.5	35.4		
16-20=18	3.3	5.0	6.4	12.8	19.2	25.5		
SECTION C	Quanti of Water Collected Dail er Headb Households in Saboba							
1-5		C12	C36	B28				A3,B28, C51
6-10		DI	D18	CIOI	C18	B18		B18, 19, D19
11-15				D7				Cll,DIO
16- o				m				m
TOTAL	3	13	57	138	22	28		261

SOURCE: Field Data, 2011.

Formular = Quantity of water collected by a Household / Average of Household — Quantity of water per head.

To determine the quantity of water per head from total quantity of water collected daily per a household the above formular is used. For example, to calculate for the 1-5 household that collects 60 litres of water from their main sources daily, you will find the average number of persons in this household (1+5/2=3). Then divide 60 litres (the quantity of water collected per day) by three (the household average) to get 20 litres (the quantity of water per head per day) 60/3=20. This means the quantity of water the 1-5 household

collects per head per day is 20 litres. Based on Howard and Bartram (2003) cited WHO (2003) classification of quantity of water per day per head under the levels of water access, 20 litres show that this household has basic access to water. According to them, household with Optimum access would use an average of 100-200 litres per day per head, Intermediate access 50 litres per head per day, basic access an approximate average of 20 litres per head per day and no access would use less than five litres per head per day. The quantity of water collected by the various households daily and the quantity per head per day has been calculated and classified according to Howard and Bartram, (2003). These are shown in section C of Table 4.8. In the C part of Table 4.8, 'A' stands for (Optimum access), 'B' (Intermediate access), 'C' (Basic access) and 'D' (No access). Table 4.8 shows that a total of three households have optimum access to water and 46 households have intermediate access to water. 181 households have basic access to water and 31 households have no access to water based on the quantity of water households collect per head daily. By this classification according to Howard and Bartram (2003) using the water quantity component, households are likely to experience the health effects as reinforced under the various levels in Table 2.1.

45.2. Quantity of Water used by Households daily

The study sought to find the actual quantity of water households use daily per head based on the indication that some households meet their daily water requirement as defined by Howard and Bar-tram, (2003). This is because water usage per head daily was higher in some households than the approximate average quantity by Howard and Bar-tram, (2003). The quantity of water households used per head daily is shown in Table 4.9.

Table 4.9: Quantity of water used daily per head in the various Households from their main sources.

Household Size	60 Litres	90 Litres	115 Litres	230 Litres	345 Litres	Litres	460 Litres+	Total
Section A	Quanti of Water Collected b Households in Litres Dail							
1-5	8	23	35	15	2	1	1	85
6-10	o	2	35	86	31	6	8	168

1 1-15		0	3	12	3	5	1	24
16-20		0	0	2		2	3	7
TOTAL	8	25	73	115	36	14	13	284
Section B	Avera e Quanti of Water Collected Dail er Head b Households							
1-5=3	20	30	38.3	76.7	108	153		
6-10=8	7.5	11.3	14.4	28.8	43.1	57.5		
11-15=13	4.6	7.0	8.8	17.7	26.5	35.4		
16-20=18	3.3	5.0	6.4	12.8	19.2	25.5		
Section C	Quanti of Water Used b Household in Stud Communities in Litres							
1-5	8 20	23 30	35 38.8	15 76.	2 108	1 153		
6-10		2 11.3	35 14.4	86 28.8	31 43.1	6 57.5		
11-15			3 8.8	12 17.	3 26.5)	5(35.4)		
16-20				2 12.8		2 25.5		

Source: Field Data, 2011.

Formular = Quantity of water used by a Household / Average of Household = Quantity of water used per head.

From Table 4.9, the average minimum quantity of water used per head in a household in the study communities daily is 8.8 litres and the average maximum is 153 litres daily.

Three households from the (11-15 persons in a household) use 8.8 litres of water daily per head while one household in (1-5 persons) a household use 153 litres of water daily per head. These are higher than the minimum quantity of water (3 — 10 litres) required per head daily fornormal functiofiñg-ðfQhe body as classified by (WHO, 1987; WHO, 2008). This implies that the size of a household affects the quantity of water used daily per head in the study communities. The health implication of this on the people of the study communities might differ from the assertion of Howard and Bar-tram (2003), because households might not suffer from water scarcity but may be challenged with quality issues, because households used water from both improved and unimproved sources.

45.3. Domestic Water Supply and Health

Pollution is a major factor influencing water quality, access and use. About 87% of respondents indicate that water sources get polluted by various means as shown on Table 4.6. This affects the quality of water creating dire health risks. The 87% who face pollution problems indicated it affects water access and quality. Among the reasons they gave to support their opinions are that pollution makes water dirty and unclean hence, unsafe for use and it takes a lot of time to treat water before use. Also, water become polluted with all kinds of substances and these make bathing difficult and due to the lack of improved sources in the communities, respondents use polluted water. This partly explains why some of the residents suffer some water related diseases like typhoid. This confirms the assertion by WHO (1987) that, the lack of sanitation facilities result in poor hygiene and water borne diseases such as diarrhoea, cholera, typhoid and several parasitic infections and the incidence of round worm, guinea worm and schistosomiasis.

The study indicates that, 115 (41%) of households suffered from various water related diseases including diarrhoea, dysentery, typhoid, cholera, yellow fever, malaria, skin sepsis/ulcer and lice/typhus. But the most common water related diseases experienced by respondents in the study communities are typhoid (48%), malaria (45%) and diarrhoea (7%). Typhoid is a water-borne disease caused by the consumption of contaminated •váter through human faeces or urine (WHO, 2003). This implies that respondents might have consumed water contaminated by faecal and urine in the study communities.

Typhoid and diarrhoea are water-borne diseases caused by lack of access to water for domestic purposes and hygiene-(WHO, 2003). This implies that some respondents have no access to water leading to the occurrence of typhoid and diarrhoea among respondents. This can partly be explained by the levels of access to water by respondents which show that 61% and 38% of respondents have basic access and no access to water respectively, hence might be the cause of water washed diseases due to inadequate access to water to observe basic hygiene. In addition, pollution affects the quantity of water households

collect and use by reducing the quantity after treatment. This confirms the proposition that, incidence of water related diseases is a function of inadequate water supply in Saboba District because diarrhoea and typhoid are water-borne diseases.

Malaria is a water related insect/vector diseases WHO (1987). Therefore, the cause of malaria is not related to water consumed by respondents, rather insects that breed near water bodies such as mosquitoes. This indicates that not all the water related diseases identified in the study are due to the water used/consumed by the people in the study communities. With reference to the top ten diseases in the district from 2009 to 2011, malarja has always been on top of the list, typhoid third and diarrhoea fourth as shown in Table 2.2.

Data from health officers in the district reveals that the most common diseases in Saboba district are typhoid, malaria, diarrhoea and dysentery. This has been buttressed by data from the Out Patient Department attendance of health facilities in the district that these diseases are among the top ten diseases for the period 2009-2011 in the district as shown in Table 2.2. However, the District Health Director noted that though diseases such as cholera, yellow fever, onchocerciasis and lice/typhus have not been reported in the district, conditions were ripe for their transmission except that there are no sources of infection. He further indicates that for two years now, no guinea worm case has been recorded in the district. On hepatitis, the District Health Director said, there are cases of hepatitis in the district but they have not been able to isolate any hepatitis 'A' case which is transmitted through water. Statistics on out-patient department attendance 2009-2011 (Table 2.2) indicates that the water related diseases in Saboba District are typhoid, and diarrhoea.

Table 4.10: Relationship between most used sources of water for domestic purposes and common water related diseases in study communities.

Sources Most used for Domestic Purposes	Common Disease in Household/Community	Total

		Malaria	Typhoid	Diarrhoea	Na	
	Pipe Borne	5	17	1	8	31
	Borehole	15	13	1	71	100
	River	25	22	6	72	125
	well	3	1	0	8	12
	Bottled/ Sachet	4	2	0	5	11
	Spring	0	o	0	5	5
Total		52	55	8	169	284

SYMMETRIC MEASURES		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.079	.059	1.335	.183C
Ordinal by Ordinal	Spearman Correlation	.033	.061	.557	.578C
ofVaIid Cases		284			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Source: Field Data, 2011.

The correlation between the water respondents in the study communities use most for domestic purposes and water related diseases using the spearman correlation produced the figure (.033). This indicates that there is a weak positive relationship between the water households use for their domestic purposes and the common water related diseases they experience (Malaria, Typhoid and Diarrhoea). To further confirm this relationship, a water test was conducted on three most used sources for domestic purposes to examine the quality of water from these sources (River, dam and well). The quality test was based on microbiological organisms and physio-chemical test. Refer to appendices 4, 5, 6 and 7 for the water test results. The results of the water test have confirmed high levels of water pollution of these sources in the study communities. Hence the 41% of respondents who experienced water related diseases may partly be attributed to the water they use. This may be due to the presence of faecal coliform and E. coli (microbiological variables) that are harmful pathogens. The results reveal that, the values of these pathogens are above

WHQ/Ghana standards. By implication, the continuous dependence on these sources for water for domestic purposes will cause water related diseases such as typhoid and diarrhoea as experienced in the study area.

In terms of physio-chemical properties, apart from nitrate, nitrogen and turbidity whose values are above the WHO/Ghana standards in the test of water from the well, the rest of the variables have values within the WHO/Ghana standards. For the water from dam and river, all the physio-chemical variables are within WHO/Ghana standards except total iron, turbidity and colour of water. These substances (iron, turbidity and colour of water) in river and dam confirms WHO (2006) assertion that, the presence of iron in water may cause objectionable reddish-brown colour to the water and stain laundry. The primary health risk associated with elevated nitrate levels in water is Methemoglobinemia, which causes the "blue baby" syndrome in infants (an infant born with a bluish colour; usually has a defective heart). It is important to note that Methemoglobinemia a water related disease is not one of the diseases experienced in Saboba district despite the presence of nitrate in the well water usually used for drinking.

The correlation also has the probability of being wrong if we assume that the relationship we find in our sample accurately reflects the relationship between: 'sources respondents use for domestic purposes and common water related diseases' that exist in the total population from which the sample was drawn, that is the P — Value 0.578 (the significance level of the relationship), which is well greater than the margin of error of 0.05% signifying that the relationship between the two variables is insignificant. The decision rule states that if the P-value is less than the alpha (a) level (the margin of error), it implies a significant relationship and when the P-value is greater than the margin of error it means an insignificant relationship. From the Table 4.10, since the P-value is

greater than the margin of error (0.578 > 0.05), we can conclude at 95% that the relationship between the two variable is insignificant.

This further indicates that the common water related diseases in the district might not necessarily originate from the sources of water only, but might be due to other random factors considering other factors like water treatment at home during domestic use in most of our homes, nature of water storage and exposure to contamination by flies, including drinking habit etc. The implication of the above is that Ghana Health Service, NGOs, SCWSDB etc in the district need to carry out more education at household level on water handling, use and storage.

4.6. EFFECTS OF WATER SUPPLY ON EDUCATION

Some of the schools have water facilities such as pipe, poly tanks and other small containers for harvesting and storing water in the study area. However, pupils/students especially, girls carry water daily to school and Plate 4.11 show girls at St Charles JHS carrying water to school at Nalongni.

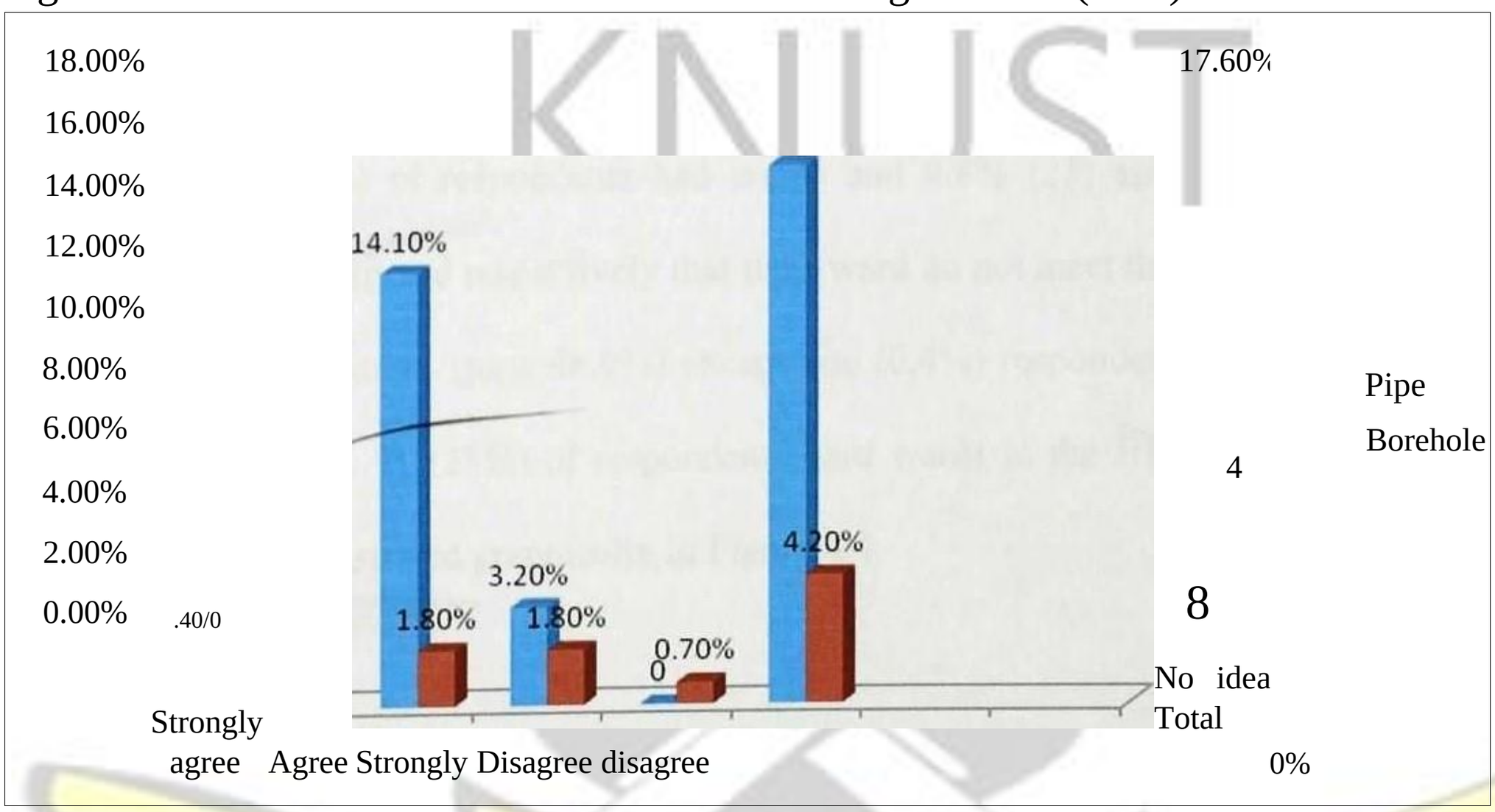
Plate 4.11: Students carrying water to school at St Charles JHS at Nalongni

Source: Field observation, 2011.

About 62 (21.8%) of respondents had students attending Senior High School (Secondary/Technical) and 50 (17.6%) and 12 (4.2%) of respondents indicated that pipe

and borehole respectively are the main sources of water in the schools their wards attend. However, 40 (14.1% pipe) and 5 (1.8% borehole) of respondents revealed that their wards do not meet their water needs at school from these sources. This is shown in Figure 4.2.

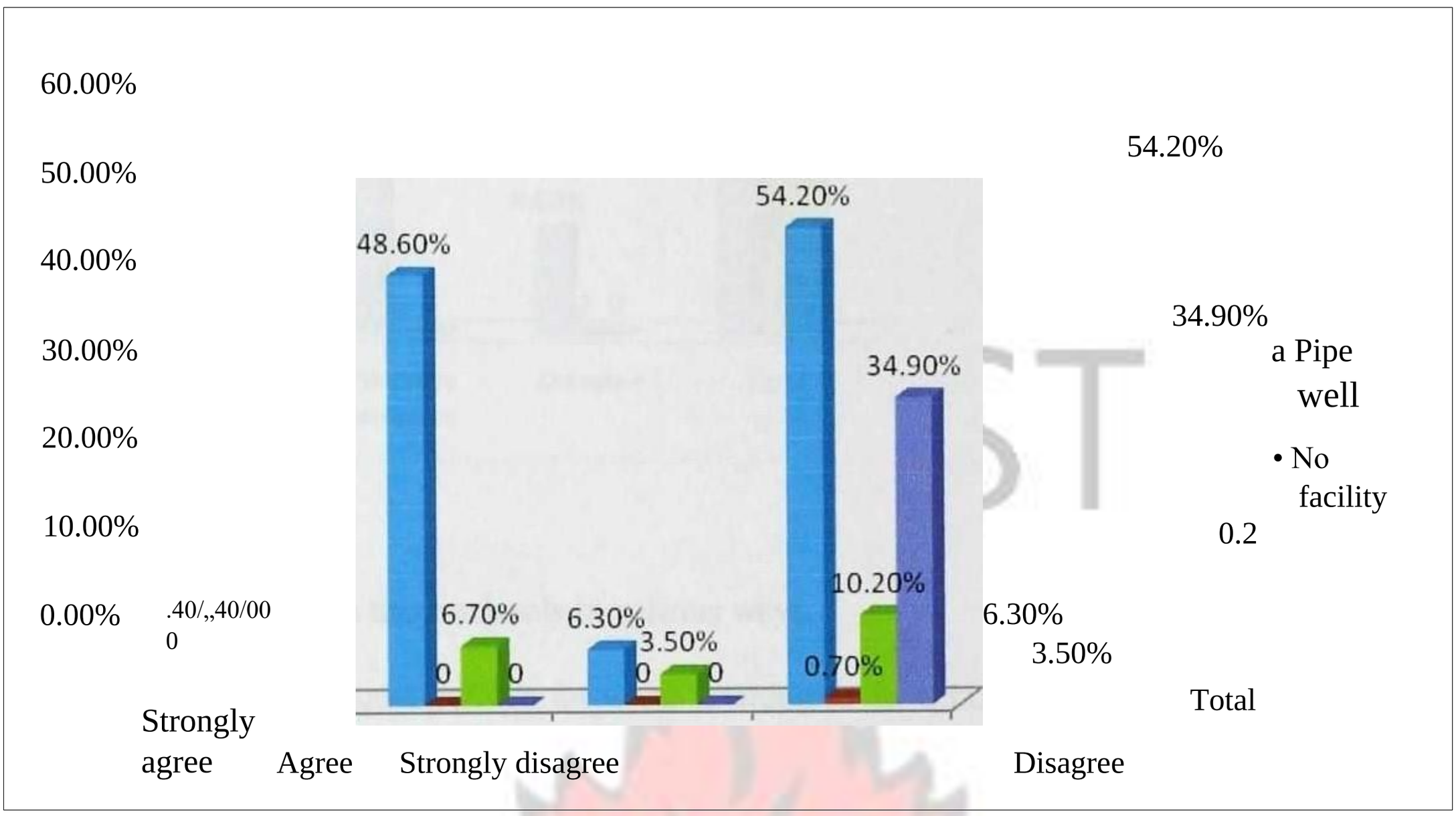
Figure 4.2: Water sources and access for Senior High School (SHS).



Source: Field data, 2011.

About 99.9% of respondents had wards in the primary school and out of these 0.4% (I) and 0.8% (2) meet their water needs from their main sources from pipe and well respectively while 10.2% (29) respondents indicated that the primary schools their wards attend have no water facility and 54.9% (156) of respondents said their wards do not meet their water needs from school water sources. This is shown in Figure 4.3.

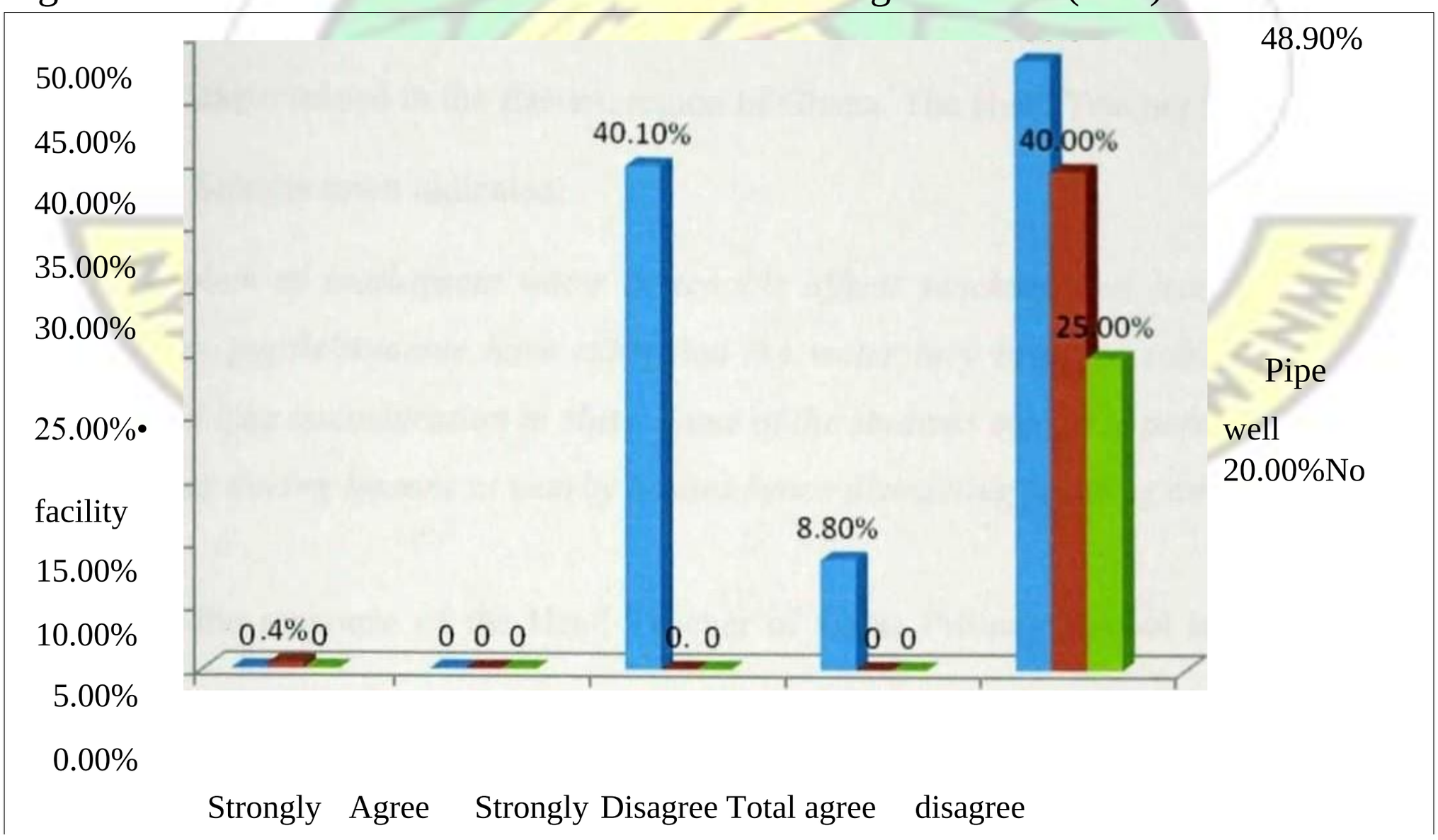
Figure 4.3; Water sources and access for primary schools



Source: Field data, 2011.

For the JHS, 74.3% (211) of respondents had wards and 8.8% (25) and 40.1% (114) disagreed and strongly disagreed respectively that their ward do not meet their water needs from their school main sources (pipe 48.9%) except one (0.4%) respondent who said his ward does from the well. 71 (25%) of respondents hard wards in the JHS that have no waterfacilities. This is illustrated graphically in Figure 4,4,

Figure 4.4: Water Sources and Access for Junior High Schools (JHS)



Source: Field data, 2011.

These have affected academic work in these schools in various ways.

At the E.P SHS, students use instructional periods for water fetching to the school kitchen. The primary and JHS pupils/students miss some of their morning lessons due to lateness because they travel distances and sometimes, join long queues at boreholes and wells to fetch water for use at school resulting in tiredness hence distracts learning due to fatigue. This butresses Tay's (2005) assertion that problems of water of this kind is evident in rural Ghana, as pupils/students fetch water early in the mornings before they go to school as their common-chores as>trt-9SWof the study area is described as being rural. In addition, the pupils/students who cannot send water to school are sometimes, returned home. Some of the respondents also expressed their views that their wards spend too much time on water fetching in the evenings at the expense of their studies. Furthermore, some of the pupils/students do not bath before they go to school and this confirms the assertion of Tay (2005) that there was a reduction in the rate of interaction between teachers and their pupils due to bad body odour as a result of lack of water to bath in his study in the eastern region of Ghana. But this has not resulted in a reduction in interaction between the pupils/students and their teachers due to bad body odour and skin diseases in Saboba district as experienced in the Eastern region of Ghana. The Head Teacher of Galaa Primary School in Saboba town indicated:

"The problem of inadequate water in schools affects teaching and learning because at noon when pupils/students have exhausted the water they bring to school, they become thirsty and lose concentration in class. Some ofthe students also seekpermission to go and drink water during lessons at nearby houses hence distracting learning and class control ".

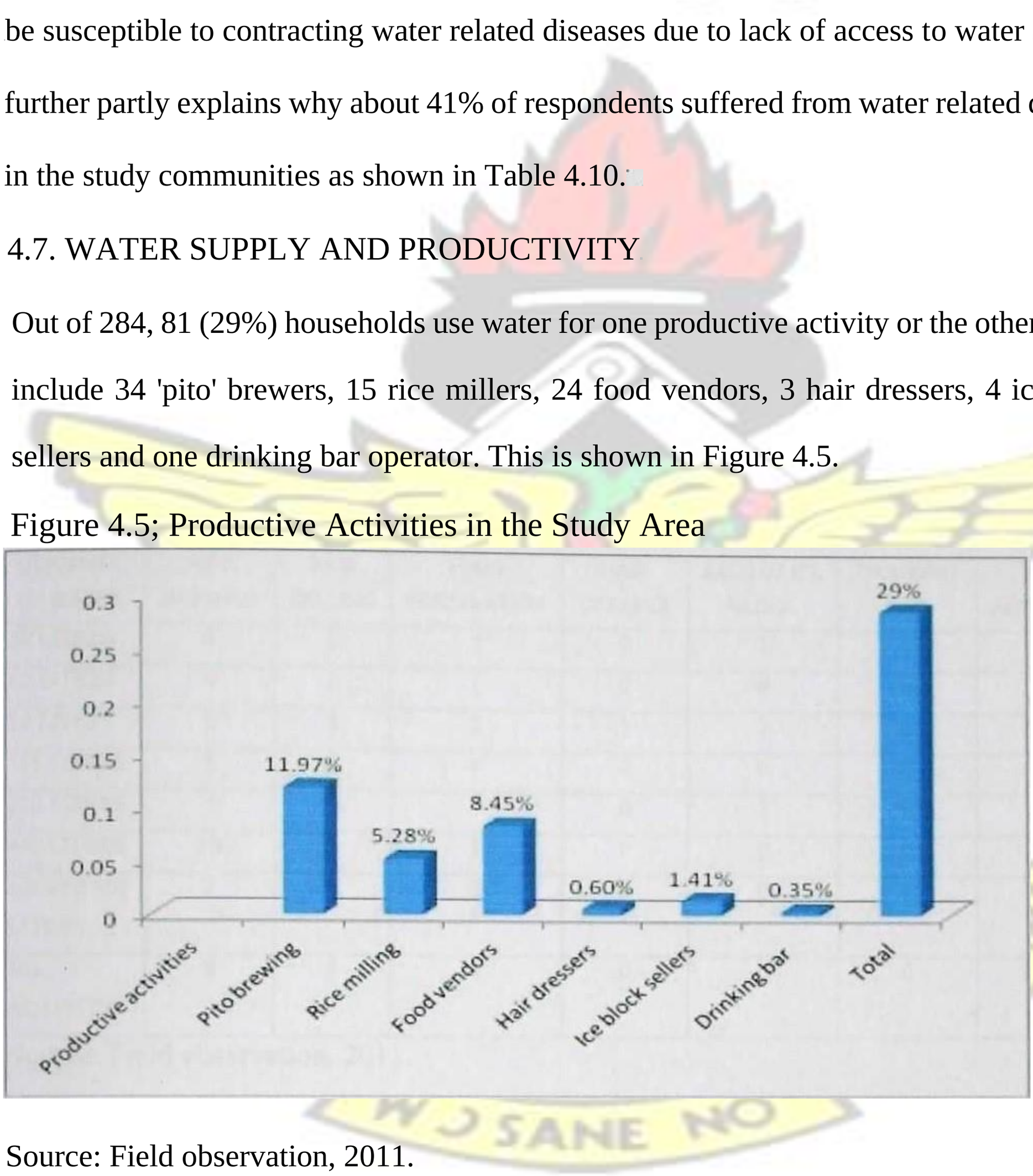
This was the response of the Head Teacher of Galaa Primary School in responds to an open question on how water affects the education in his school. The situation affects hygiene practices such as hand washing after toilet and urination. The above reasons by respondents confirm the proposition that inadequate supply of water in educational institutions distract teaching and learning.

The lack of access to water in schools and the absence of alternative sources of water compelled pupils/students to use water at their disposal ignoring its quality. This implies that pupils/students in schools are very likely not to meet the minimum quantity of water they are supposed to use while at school as day students (15-30 litres) and boarding students (90-140 litres) as indicated by WHO (1987). The implication on the over 23,000 school children in the district (Saboba District Education Office, 2011) is that they are can be susceptible to contracting water related diseases due to lack of access to water and this further partly explains why about 41% of respondents suffered from water related diseases in the study communities as shown in Table 4.10.

4.7. WATER SUPPLY AND PRODUCTIVITY

Out of 284, 81 (29%) households use water for one productive activity or the other. These include 34 'pito' brewers, 15 rice millers, 24 food vendors, 3 hair dressers, 4 ice block sellers and one drinking bar operator. This is shown in Figure 4.5.

Figure 4.5; Productive Activities in the Study Area



Source: Field observation, 2011.

Figure 4.5, indicates that the dominant productive activities in Saboba district are pito brewing and preparation of food for sale. The quantity of water respondents use for productive activities vary from one activity to the other. The quantity of water used for the

individual productive activities daily is shown in Table 4.11, About 2.46% of respondents use 30 litres, about 0.35% of respondent uses 60 litres, about 1.76% of respondents use 90 litres and about 4,570/0 of respondents use 115 litres. Also, about 13.38% of respondents use 230 litres, about 4.57% of respondents use 460 litres and about 1.40% of respondents use above 460 water daily. The study shows that the quantity of water respondents used for each of the productive activities is a function of the size of production of each specific productive activity, However, respondents in pito brewing and rice milling productive activities use much more water than the other productive activities. This is shown in Table 4.11.

Table 4.11: The quantity of water respondents use for their various productive activities in litres.

QUANTITY OF WATER	PITO BREWING	RICE MILLING	FOOD PREPARATION	HAIR DRESSER	SALE OF ICE BLOCK	DRINKING BAR	NO ACTIVITY	TOTAL
30 LITRES								
60 LITRES								
90 LITRES								
115 LITRES								13
230 LITRES	19	11						38
460 LITRES	10							13
ABOVE 460 LITRES								
NO ACTIVITY							203	203

Source: Field observation, 2011.

Out of 81 (29%) respondents, 56 (19.7%) meet their desired water quantity needs for productive activities while 25 (8.8%) do not. However, 203 (71.47%) do not use water for any productive activity. Taking the individual productive activities into consideration, most of the respondents under each productive activity meet their water needs as shown in Table 4.12.

Table 4.12: The respondents who meet their water needs.

PRODUCTIVE ACTIVITY	YES		NO				TOTAL

Pito Brewing	22	7.74	12				34
Rice Milling		2.46		2.81			15
Food Preparation	21	7.39		1.05			24
Hair Dressing		0.70		0.35			
Sale of Ice Block/Water		1.05		0.35			
Drinking Bar		0.35					
No Productive Activity					203	71.47	203
TOTAL	56	19.7	25	8.8	203	71.47	284

Source: Field observation, 201 Iv

The respondents normally use various means to meet their water needs such as fetching water in advance sometimes three days earlier and the small scale of operation of some of the productive activities enable producers to meet their water needs. They also buy water from water vendors. Most of these sources they rely on are unimproved sources by WHO (2008) classification. However, long queues at water sources, frequent breakdown of pipe system and boreholes, longer distance to river site and low pressure of the pipe water system to supply adequate water are the factors that make access to water difficult for producers to meet their water needs for productive activities.

On the whole, 70 (25%) of households have improved water sources in their communities and out of this figure, 19 (7%) use improved water for productive activities. About 214 (75%) do not use improved water and out of these, 62 (21.8%) use this water for their productive activities. The 19 (7%) respondents who use treated water are composed of 3 pito brewers (borehole), 2 rice millers (borehole and pipe), 10 food venders (borehole), 2 hair dressers (borehole) and 2 ice block sellers (borehole). The 75% who use unimproved water fetch from the dam, dug outs, pond, river and wells but WHO/UNICEF (2008) indicates that these are unimproved sources. Since they deal with consumable items, it implies the consumers are exposed to various water related diseases in the study area and this partly confirms why 41% of respondents experienced water related diseases especially typhoid and diarrhoea.

Out of 81 households, 14 (5%) do not spend time in search for water for their productive activities while 67 (24%) do. For the households who search for water, 42 (15%) spend an average of two hours daily (pito brewers, food sellers and rice millers). Thiš Implies respondents spend two hours daily in search of water for their productive activities and 28.5% of respondents spend six hours and above performing their productive activities daily. The study further indicates that those who have water operate on full scale and make enough profits while those who do not have access to water lose their customers due to their inability to meet their daily needs/expectations (disappointment especially the pito brewers and hair dressers). They also temporarily stop production and some reduce their scale of production and this result in less or no profits due to lack of access to water.

About 32 (11%) of 284 households buy water for their productive activities and out of this, 12 (4%) buy water at GH 4.00 and above daily. This situation affects the profit level of producers.

Respondents with access to adequate water for their productive activities experience improvement in their productive activities. Out of 284 households, only 5 (2%) have experienced significant improvement in their productive activities due to their intermediate access to water from pipe sources; whereas 51 (18%) and 25 (8.8%) of households have their productive activities fairly improved and no improvement respectively due to the problem of no access to water. This confirms the proposition that limited access to water lowers productivity of levels.

4.8. INSTITUTIONAL CHALLENGES AFFECTING WATER ACCESS AND USE

The main institutions in the water sector in the study communities are Saboba Community Water and Sanitation Development Board (SCWSDB), District Water and Sanitation Team (DWST), Water and Sanitation Committees (WATSAN) and World Vision Ghana (WVG), a Non Governmental Organization.

The institutional challenges affect household lack of access to water. Water facilities such as the small town pips_systenyand boreholes frequently break down and this lead to interruption of water supply from these water sources in the study communities. The wells, spring, river and dam are generally not under any water management authority and by their nature (open sources), are confronted with the problem of pollution and poor sanitation conditions. Each of the water supply and management institutions and their challenges has been discussed into details in the proceeding sections.

4.8.1. Saboba Community Water And Sanitation Development Board (SCWSDB).

SCWSDB manages the small town pipe water system located in Saboba town. In a Focus Group Discussion (FGD) with 1 1 of the selected board members on water treatment and the kind of chemicals and water pumping machine they use, the pump operator to the pipe water system indicated:

'SCWSDB uses a conventional plant to treat and purify the water it supplies through the application of chlorine, alum and lime (all water treatment chemicals). However, due to non-payment of water bills by consumers, SCWSDB is sometimes compelled to filter water for supply due to lack offunds to buy water treatment chemicals. This is why water consumers complain SCWSDB supplies untreated water' (May, 2011). This implies the water system supplied both treated and untreated water to households in the study area due to lack of filnds.

Further discussion reveals that, the water system often breaks down and this affects the frequency of water supply to consumers. To confirm this, in the year 2011 from the month of January to May when this data was collected, the system functioned for a minimum of one week in some communities and a maximum of one month in others. In some communities too, water did not flow at all during the period due to frequent breakdown. This implies that the breakdown of the pipe system affects the already inadequate quantity of water (90,000 gallons / 360,000 litres) it supplies to households daily.

During the discussion on the challenges of the board, the Chairman of SCWSDB noted:

'It costs SCWSDB two hundred and twenty Ghana cedis (GI-IÇ 220) to produce 360,000 litres of water daily and that SCWSDB has no water metres for billing water they supply hence, the board uses a 'flat rate billing method' where households pay bills based on the activities they use waterfor at their various places. This system makes collection ofwater bills difficult ' (May, 2011). This explains the financial and management problems faced by SCWSDB.

The FGD indicates that, customers refused to pay water bills because of interrupted water supply and the unfair use of the flat rate billing method used by SCWSDB. A member of the board noted:

'SCWSDB lacks the means of transport for her inadequate and ineffective revenue collection staffand that SCWSDB is challenged with inability to track and bill water used by numerous unconnected households who fetch water from public standpipes and from nearby household pipes. These have affected optimal revenue collection from water customers' (May, 2011). By implication, the above points to the root cause of financial problems of SCWSDB base on human behaviour.

This confirms the proposition that the effective management of water facilities is affected by the behaviour of the people in Saboba District.

In discussing the financial position of the board, the Chairman said:

'SCWSDB is not able to meet daily operational cost ofsupplying water and also pay their staff and this accounts for why SCWSDA owes electricity bills to a tune of over Ten Thousand Ghana Cedis (GHÇ 10,000.00) as at May, 2011. This resulted in numerous disconnections thereby hampering continuous water supply to consumers' (May, 2011). This affirms that the study communities connected with the pipe system faced interrupted water supply challenges leading to adequate water supply.

Further discussions on the issue of involvement of water consumers in SCWSDB activities, the Secretary to the board indicated:

'Though SCWSDB tries to involve their customers (water consumers) in their activities through invitations to meetings, these attempts are met with poor attendance ofmeetings including some of SCWSDB members themselves' (May, 2011). This means the poor patronage of meetings of the SCWSDB (bahaviour) by members themselves and other water consumers in the study_Area--affected the management of the water system.

Amofig the other problems discussed, peoples' refusal to pay water bills, attend meetings on water and allowing of relatives and nearby households to fetch water from their household standpipe that is unaccounted for are the most serious problems pose by water consumers that further confirms the proposition that effective management of water facilities is affected by the behaviour of the people in Saboba district.

Discussing the poor quality of water produced by SCWSDB, the Station Manager of the pipe water station noted:

'Though water is supposed to be colourless by WHO guidelines. SCWSDB was still battling to achieving this and the quality issue was more pronounced in the rainy seasons due tofloods and erosion. Attempts to produce colourless water sometimes lead to the over application of alum which consumers complain affect water taste' (May, 2011). This implies the water supplied by SCWSDB was challenged with quality issues that affected the taste and colour of water.

This supports Gadgil (1998) assertion that, some of the factors that affect the quality and quantity of water is rain causing erosion that over power sedimentation and filtration methods in treating water in the communities and this consequently increases health risks.

On the renovation of water supply facilities, the Chairman of SCWSDB indicated:

'The pipe water system was built in 1970 and functioned successfully up to 1986. The system broke down and was repaired in 1986. The system underwent a full rehabilitation and expansion work in 1999 and this greatly improved the water supply situation in the town as extensions were made to new areas and this increased the water supply coverage in the town. But for I I years now, the system has not had any major rehabilitation again. Due to this, the pipe water system breaks down very often' (May, 2011). This implies that maintenance and renovation of water facilities would enhance water supply in the Saboba District.

4.8.2.. Water and Sanitation Committee (WA TSAN).

The management of boreholes at the community level is the responsibility of Water and Sanitation Committees (WATSAN). WATSAN is absent in Saboba town and this accounts for the lack of care for the bGÃ7Kthe town and also, one of the reasons why some of theboreholes break down and are not repaired. This compounded water supply situation in the town during the month this data was collected (May, 2011 The study shows that some

of the boreholes have low water table (Saboba town). ET. Senior High School and Nakpando people are told their boreholes have high levels of fluoride and therefore, they should not drink the water untreated. Drinking the water untreated would lead to tecth molting and a disease called fluorosis as indicated by 1999). The lack of secuity

personnel over water facilities (boreholes) lead to mishandling of boreholes in the study communities including lack of funds to maintain boreholes.

A water test to find the micro-biological and physio-chemical properties of the three most used sources of water in the study area at CSIR Water Research Institute's Water Quality Control Laboratory in Tamale indicates that the dam water contains total iron well above the WHO/Ghana guidelines including colour and turbidity. The test on a well in Saboba town revealed high levels of nitrates above the WHO/Ghana guidelines. The detail test results on the dam, well and river are shown in appendix 4, 5, 6 and 7. Saywell (1999) indicates that the presence of nitrate in water can cause a condition called Methemaglobinaemia that causes the "blue baby" syndrome in infants (an infant born with a bluish colour; usually with a defective heart).

4.8.3. District Water Sanitation Team (DWST)

The DWST lack the requisite tools to carry out its core function which include rehabilitation of water facilities and capacity building of communities to provide protection/security to water sources. However, most of the water sources need rehabilitation (dredging and construction). Apart from the pipe water system, the rest of the water sources have not had any rehabilitation since they were constructed for many years in the district (wells, dam and pond) but they continue to serve as important sources of water supplyíó the study communities.

In conclusion, the preceding discussions have indicated the sources of water as well as those not captured by existing literature (dam, pond and sachet water) and that 25% of respondents have improved sources of water in the communities. Factors that affect water access in the study area among others include breakdown of water facilities, lack of water management bodies, sanitation and pollution challenges have resulted in 109 households not having access to water. These have compelled households in the study area to depend

on unimproved sources of water to meet their daily water needs including schools and water use for productive activities. About 41% of respondents experienced some water related diseases (diarrhoea and typhoid) partly as a result of the water they use. A test of the most used water sources in Saboba town indicates that these sources were highly polluted by faecal coli form and E. coli form that are detrimental to human life. The water management institutions in the district also encountered a lot of problems ranging from finance, frequent breakdown of facilities and poor attitude of water consumers, lack of tools and capacity for WATSAN and DWST to work.

CHAPTER FIVE

MEETING WATER SUPPLY NEEDS

5.1. INTERVENTION FROM HEALTH INSTITUTIONS

Based on the problems of water access and use particularly, pollution and sanitation problems at water sources in the study area, the District Health Directorate periodically undertake public health education programmes on the dangers of drinking polluted water and water treatment methods. Furthermore, they educate the public on personal hygiene and sensitize them on the treatment of water related diseases. The public health department

also embarks on constant health promotion campaign to create awareness on water related diseases through radio discussions made adequate and appropriate drugs available to give prompt treatment should the outbreak of any water related disease occur. Finally, they hold review and evaluation meetings of their activities on public health education. All these efforts are aimed at empowering residents against the use of water from unimproved sources that will have adverse effects on the health of the people.

5.2. INTERVENTIONS FROM EDUCATIONAL INSTITUTIONS

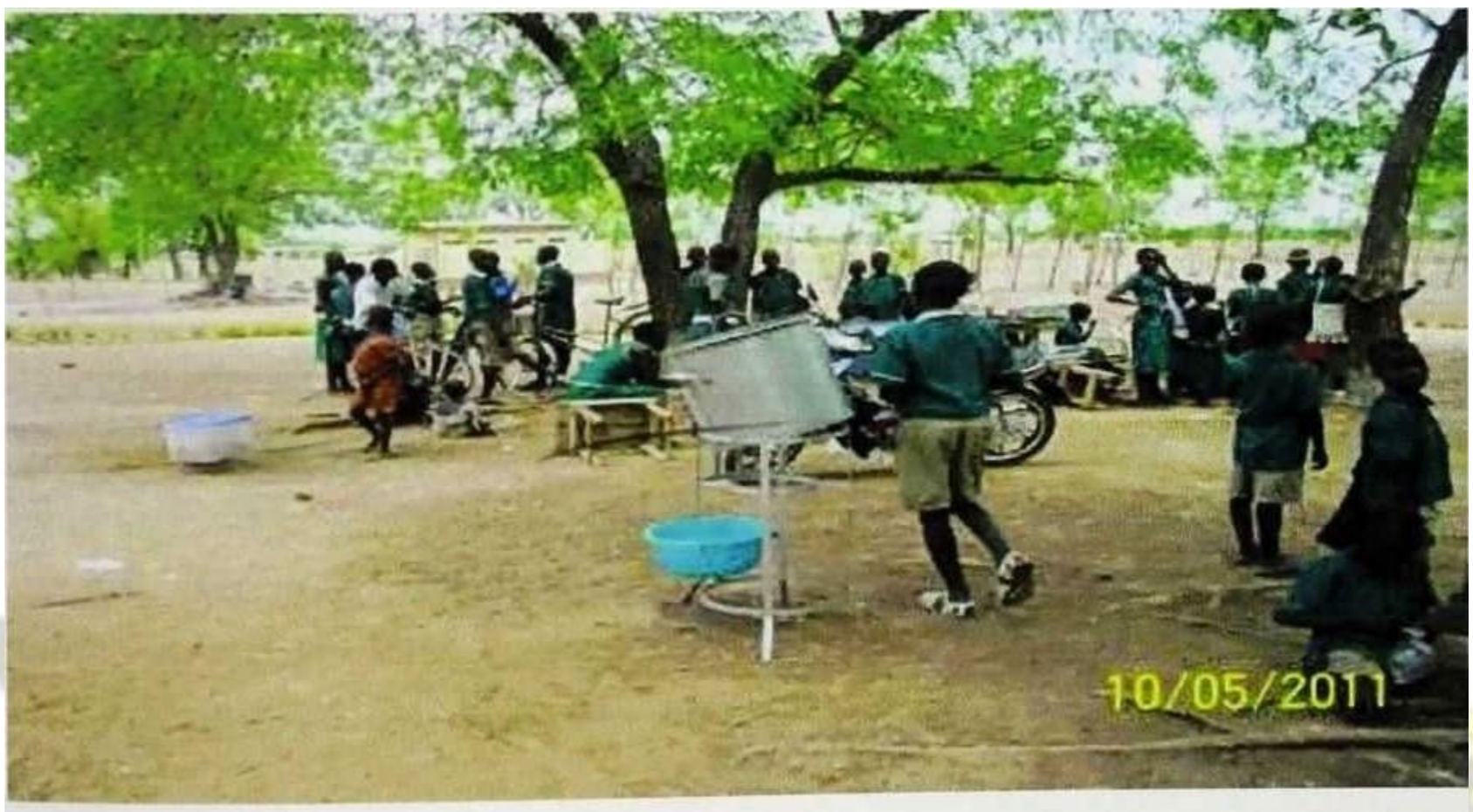
School authorities have put some mechanisms in place to help solve the water problems in their schools. At St Joseph's Technical School, the school vehicle is used to fetch water for the preparation of student's meals. The District Education Office has donated poly tanks •to schoðls (St. Charles JHS, E.P. JHS, Buakoli JHS) for water harvesting and storage

f0&Nse at school. Other schools such as St. Charles Junior High School (JHS), E.P. JHS, Galaa JHS) received water purification pots from the Local Council of Churches in the district for filtering drinking water for the staff and students. Ghana Health Service and World Vision Ghana (WVG) educate pupils/students on how to handle water and observe basic hygienic practices both in their schools and at home. In addition, WVG provided some of the schools (St. Charles primary and JHS, E.P. Primary and JHS, Galaa Primary and JHS) washing basins which the school authorities have placed on the campus with soap for the students and teachers to wash their hands especially after eating and attending 'nature's call'.

School authorities at Galaa JHS and Evangelical Presbyterian Senior High School benefited from WVG's borehole drilling programme in schools, Though the boreholes were drilled, there was low water table at Gaala JHS to establish a borehole and a caution note to E.P SHS Authority shows that the water has high fluoride content and should not be drunk untreated. Some of the interventions are also yet to yield results for example,

appeal by some of the schools (Buakoli Primary and JHS,) for pipe water facilities at their schools through District Education Office. Parent Teacher Associations (PTA) of some of the schools (Galaa JHS and E.p. SHS) also appealed to NGOs and District Assembly (DA) to drill boreholes and mechanize them in their schools. Plates 5.1 5.2 show some of the interventions in some of the schools in the study area. This implies that there have been some interventions ofwater facilities in schools that would enhance teaching and learning,

Plate 5.1: WVG's water basin in use at school St Charles JHS



Source: Field observation, 2012.

Plate 5.2; A poly tank and a water purification pot at St, Charles JHS donated by

District Education Office and Local Council of Churches respectively.

Source: Field observation, 2011

5.3. INTERVENTION BY GOVERNMENT

Intervention from government has been the drilling of 10 boreholes in the district as a whole in 2010 according to the District Water and Sanitation Team (2009).

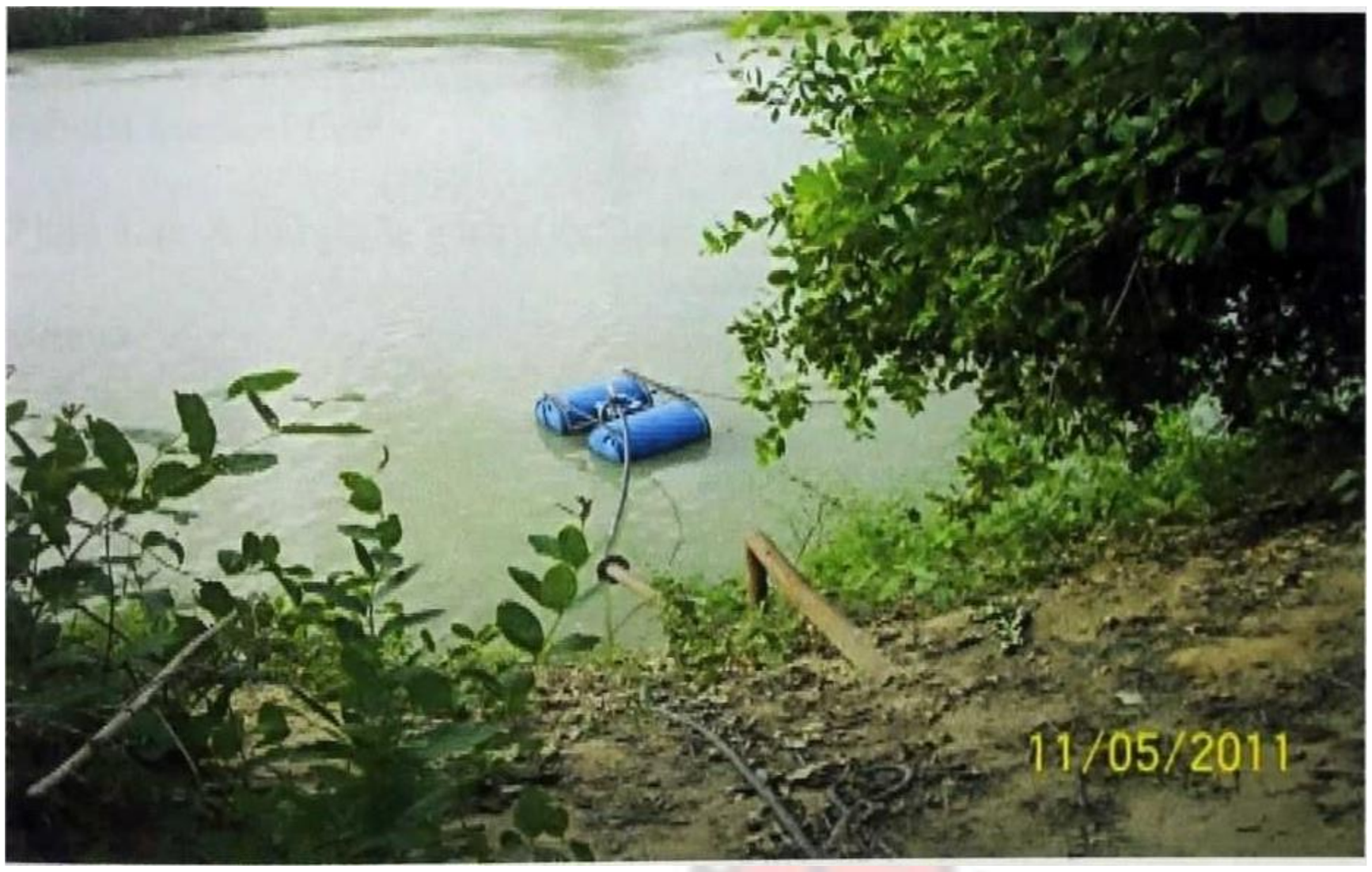
The intervention from the District Assembly (DA) was in the form of financial assistance to the SCWSDB. In a focus group discussion, the Chairman of SCWSDB said:

'The DA has been the main source offinance to SCWSDB to manage its pipe water system andfor maintenance (such as the purchase of low lift water pumping machines). The DA spent about Thirty Thousand-Ghña Cedis (GHÇ 30,000) on the purchase of pumping machines, electrical repairs andfive new low lift water pumping machines. However, not alUare still in good condition. The DWST has also assisted SCWSDB to replace its submersive pump with floating barrels on which the low lift pumping machine has been mounted on River Oti SCWSDB data ' (May, 2011), This is shown on plate 5.3,

DWST educate communities on how to apply for water facilities from the DA (borehole) by first opening an account as a pre-condition. The study reveals that for the above interventions, some of the boreholes are still in use and the pipe water system also

supplies water any time it was maintained and during such periods, households that have stand pipes or household pipes have access to water and do not depend on unimproved sources any more. Some of these interventions have led to improved access to water and accounts for 1.8% significant improvement in productive activities. The inability of these facilities to supply water always is the main reason why respondents use unimproved sources of water to meet their water needs. Plate 5.3 shows an intervention by the District Assembly on the suspension of a water pumping machine on River Oti to pump water through the pipe water system for treatment and further distribution to Saboba town and the surrounding communities it serve.

Plate 5.3: A low lift pump suspended on River Oti



Source: Field observation, 29J_l————

5.4. ANTERVENTIONS FROM NON-GOVERNMENTAL ORGANIZATIONS (NGOs)

World Vision Ghana (WVG) and Integrated Development Centre (IDC) are the main NGOs in the District whose activities involve water. WVG provide water facilities while IDC builds capacity of communities to apply for water facilities.

The study reveals that WVG hold meetings with communities and educate them on how to apply for boreholes from their office. They also organize education programmes on water problems in the district, and teach people how to manage water sources especially boreholes well (WATSAN). Moreover, WVG teaches households water treatment methods such as water boiling and filtration, including water hygiene and storage. Also, WVG drilled five boreholes in Saboba town and mechanized two of them for Saboba Medical Centre. They also service and maintain some broken down boreholes including deflouridization of boreholes in the district (E.P. SHS and Nankpando). Plate 5.4 shows a borehole at Nankpando drilled by WVG, WVG supply schools in the district with water basins to store water for use. These interventions have helped students to store and use water on their various campuses and the main source of water for patients and staff of Saboba Medical Centre.

Plate 5.4: A borehole with a defunct de-fluorization machine by World Vision Ghana.

Source: Field observation, 2011.

5.5. IMPACT OF INTERVENTION

The study indicates that because respondents have different levels of access to water at their various communities, the impact also affect respondents differently. The interventions were aimed at alleviating the problems of water access in the District. Generally, the impact of the interventions on respondents did not solve their water supply problems significantly. According to the 15 informants composed of SCWSDB, DWST, DA and WVG, 60% agreed the interventions have improved water supply while 40%, disagreed mainly due to breakdown of water facilities and dry ups.

On the impact of the water supply interventions on the lives of the main respondents 16% agreed that the interventions have fairly improved water supply while 84% disagreed. The respondents who agreed these interventions have fairly improved water supply acknowledged that most rural communities now use water from boreholes and this has reduced guinea worm infection in the district. Also, the pipe water system has now been maintained and was supplying pipe borne water but on rationed basis among the various communities. Other respondents indicated that, though the interventions received so far are not enough, households have pipe-borne water for cooking, bathing and washing

except for drinking, because the water supplied was not treated. The maintenance of the pipe Water system has reduced the pressure on the boreholes (long queues, fighting and struggle) for—water. However, as high as 84% of the respondents indicated that the interventions have not solved their water supply problems. The study reveals that, the town was still confronted with inadequate water supply and most people still wake up and fetch water at dawn. In addition, the water supply system has never functioned continuously throughout the year and despite the DA's efforts to fix the system, water supply is still inadequate and irregular. The few boreholes in Saboba town are also inadequate to meet the town's water needs. Some of the boreholes are abandoned due to breakdown low water table. In addition, households depend on the river's untreated water for domestic purposes daily.

In conclusion, there have been various interventions from GHS, GES, DA, WVG, Local Council of Churches in the form of education, provision of poly tanks, washing basins, water filtering containers, drilling and mechanizing of boreholes and repairing and maintaining of the Saboba town pipe water system. These interventions brought some relief in providing access to water for use but as high as 84% of respondents indicated the interventions did not create much impact on the water supply situation of Saboba District.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1. SUMMARY OF FINDINGS

The Study confirmed the sources of water indicated by GSS (2000) but reveals additional sources of water such as the dam, pond and sachet water in. the study communities. Among these sources, only 25% (pipe and borehole) are improved sources in the study communities. Improved sources increased by only 0.4% (from 24.6% in 2000 to 25% in 2011).

In terms of water access, no single household has optimum access to water and only two households have intermediate access, 173 have basic access and 109 have no access to water. But in terms of the minimum quantity of water collected daily per head from various sources of water for use at the various levels by households as stipulated in WHO (2003), three households had optimum access, 46 had intermediate access, 181 had basic acce4 and 31 had no access to water in the study area. Households spend averagely between two hours, thirty minutes and three hours, thirty minutes daily on water collection at their various water sources.

The pipe water system is managed by SCWSDB while some of the boreholes are under the care of WATSAN Committees, though weak and non functional in most communities—The other sources-of-water are not under any organized managing authority in the study area (pond, dam, well, sachet water). This accounts for why about 61% of respondents are dissatisfied with the quantity of water they collect from their water sources.

The lack of control of animals, washing, sewage/latrine, transport of water through pipelines, maintenance of pipe, stagnant water at water sources, food processing, encroachment of people to water sources and swimming were identified as the anthropogenic factors responsible for water pollution and sanitation problems in the study

The factors that affected water access and use in the study were identified as frequent break down of pipe and boreholes, the lack of effective management of water facilities, supply Of untreated water, non-payment of water bills due to lack of water metres, indebtedness to the Electricity Company of Ghana, failure to attend meetings on water by both SCWSDB and customers, dry up of well and springs, presence of fluoride in water, ineffective WATSAN committees and the lack of maintenance of water facilities. These are the institutional problems that affect access to water.

The most used water sources for domestic purposes (river, dam and well) contained unacceptable substances such as faecal coli forms and E. coli form that are injurious to human health. A water test conducted on water from these sources confirms this which can result in water related diseases especially, typhoid and diarrhoea. A test on the relationship between the most common water related diseases experienced in the study area and the water the respondents use indicated that there is a positive weak relationship between the water respondents use and water related diseases they experienced with a p. value of .578^{c} that implies that the relationship is insignificant indicating there are other remote causes of water related diseases in the study area.

On education, students carry water for use at school resulting in fatigue which affects learning. The problem of water make pupils to fetch water before they go to school hence

•school late and use of instructional hours to fetch water. Inadequate water at schools exposes pupils/students to thirst while some students are returned home for not sending water to school. Pupils/students use much time on water fetching, use poor quality water and search for water at nearby houses hence, distract teaching and learning.

On the effects of water on productivity, the study shows that though producers meet their water needs they do so by using unimproved sources. They spend an average of two hours in seqrch for water thus reducing their daily active productive hours and spend GH 4.00 and above on water daily. These have created negative impact on their productive activities by reducing their profit levels as confirmed by as high as 94% of respondents who have

recorded little or no improvement in their productive activities due to lack of access to water.

The Ghana Health Service, District Education Office, World Vision Ghana, Local Council of Churches and the Saboba District Assembly are the institutions and organizations that intervened to solving the problems of water access through the provision of some water facilities and storage facilities as well as educational programmes to help minimize the impact of the water problems in the study communities. These were aimed at improving the quality of life of the people but the respondents indicates that the interventions produced unsatisfactory results.

6.2. CONCLUSION

The survival of human beings and other creatures on earth is based on water and hence the people of Saboba district are not an exception. The people of Saboba depend on river, pipe, borehole, dam, pond, dug outs, well, pure/ sachet water and vendor/tanker services as their sources otwaterfor ~~both domestic and~~ commercial purposes. However, the savannah climatic belt within which Saboba is located has untold impact on water sources as indicated in 3.1.3, including anthropogenic and institutional factors resulting in 38% of respondents not having access to water. A test of water from some of the water sources (river, dam and well) reveals the presence of pathogenic substances such as faecal properties and E. coli and some physical properties whose minimum values are above the WHO/Ghana standards. The common water related diseases in Saboba district are typhoid, malaria and diarrhoea. However, the water people consume in the district is not solely responsible for the cause of water diseases because malaria for example is not caused by the water people consume rather by insects that breed by water sources. Attempts to establish the relationship between water used for domestic purposes and water related diseases using spearman correlation shows .033 meaning a weak positive relationship with a P-Value of $.578^{c}$ that further indicates that the relationship is insignificant. This implies

there are other remote causes of water related diseases in the study area. This has negatively affected the quality of life of the people (health, education and productivity).

The study has also confirmed all the stated objectives by identifying additional water sources (pond, dam and sachet water) and indeed identified some of the factors that affect water access and use and how it affect the quality of life of the people. The DA, Ghana Health Service and District Education Service, World Vision Ghana, Christian Council of Local Churches are the bodies that brought in some interventions to avert the problems of water access and use in the district.

The report indeed confirmed the entire stated propositions that incidence of water related diseases is a frinction of inadequate water supply in Saboba district due to the diseases respondents experienced. Inadequate supply of water in educational institutions distracts teaching and learning because pupils/students spend much time out of the classroom in seareh of water. Limited access to water supply leads to low productivity in Saboba District because it reduced the scale of productivity and increase cost of water leadíng to low profit levels of respondents and finally, the effectiveness of Water Supply Institutions is adversely affected by the behaviour of the people in the study area. This is confirmed by the management of-water sources, lack of maintenance and the poor attitude of people to attending meetings on water issues and the payment of water utility bills.

However, the following are some of the limitations encountered in course of the study. There was inadequate literature on water access and use particularly on small towns in Ghana and Saboba being a new district, there was no water access and use data apart from the total population based on Population and Housing Census, 2000 hence most of the data used for this study was based on Population and Housing Census, 2000. Furthermore, the collection of water for test was done by the researcher himself, hence any limitations with regard to this is to be borne by the researcher though, the collection of water from the various sources was done based on the guiding principles of water collection for laboratory

test.

Based on the above, I recommend that further research should focus on:

l. An appraisal of community management of water supply systems and their effect on water supply on beneficiary districts in Ghana.

2. The use of government and organizational resources in the provision and management of water facilities in small towns in Ghana.

3. The impact of lack of renovation/ rehabilitation on water supply systems in small towns in Ghana.

4. Indigenous management of water systems for effective supply of water in small towns in Ghana.

6.3. RECOMMENDATIONS

Based on this study, the following short and long term measures have been recommended to hClp solve the water supply and utilization problems in Saboba District.

The DA and SCWSDB should employ an expert to manage (water manager) the day-to-day operations and management of the water system, and he/she should report to the board (SCWSDB). This would add expertise knowledge in the management of the pipe water system and further enable the manager and SCWSDB develop a culture of maintenance system and the acquisition of water metres for prompt submission of water bills. They Manager and SCWSDB should engage and orientate efficient personnel as revenue collectors to help solve the delay in the distribution of water bills and prompt collection of payments.

SCWSDB should carry on community education on their activities and public health issues through community visits and radio discussion to encourage water consumers especially women and children to keep their water sources clean. The discussion on SWSDB's activities would inform and encourage Board members and the general public to patronize their meetings hence involve themselves in the management of water issues instead of the current poor or non attendance of meetings on water issues.

The staff and committee members of various water institutions should be remunerated adequately by the DA and SCWSDB to motivate them work well by introducing incentive packages such as allowances. This would motivate SCWSDB board members especially to attend meetings and do other work for the board.

The District Assembly should equip the DWST to carry out minor rehabilitations on water sources that are without any managing authority (dam, well, dug outs, spring) since the SCWSDB manages only the pipe water system in the district. This would enable DWST carry out its core functions in the district.

The DWST-Should _____ help reconstruct the worn out spillover of the dam at Saboba that has opened up the dam hence allowing the harvested water in the dam to flow/spill out whëií It rains. It should be bridged to its formal level to help the optimum collection and storage of water. This will prevent the dry up of the dam in the dry seasons.

In the long term, the pipe water system should be totally changed to an urban water system by the Ministry of Water Resources, Works and Housing, NRCWSA and SDA. With a population of 65,706 people GSS (2013) Saboba is no more a small town. This would help the Saboba District Assembly and SCWSDB extend pipe water to communities without and also supply water adequately to households, schools, clinics and for productive purposes. It would solve the problem of inadequate supply of water through the pipe/tap.

The current location of the Pipe water system should be changed by the DA and SCWSDB to hill top at Nankpando to facilitate the free flow of water to many communities in Saboba. This will solve the problem of households with pipe but do not get water due to low pressure from the pipe water system.

The DA should ensure that stringent measures are put in place by SCWSDB to ensure optimum revenue collection for the payment of electricity bills to avoid discohnections by ECG to ensure continuous water supply from the pipe water system.

This would solve the problem of frequent disconnections of the pipe water system by ECG due to indebtedness in electricity bills and hence, interrupted water supply.

The District Assembly and CWSA should turn high potential wells and dugouts into boreholes to solve the problem of lack of access to water in the study communities. This will provide quality and reliable access to water for domestic purposes in these communities.

SCWSDB and CWSA should train borehole mechanics especially among WATSAN Committees broken and abandoned boreholes. This will lead to prompt maintenance of boreholes and also save the communities resources used to hire mechanics elsewhere.

A fee should be charged on borehole water so that the proceeds are used to maintain them especially in the replacement of parts. The free fetching delay repairs due to lack of resources.

For pollution problems to be solved, all households especially, those located by water sources should have toilets and refuse dumps and the processing of food stuffs into/by the banks of water sources should be stopped. Animals should be controlled and people educated and prevented from entering into open water sources with their bare feet such as the dam that does not flow. The above can be achieved by the DA and SCWSDB providing security men at all the water sources to arrest offenders and stray animals. The provision of security at water sources would help solve the sanitation problems and mishandling of boreholes that lead to their breakdown.

The District Sanitation Team should step up their inspection activities especially in communities located close to water sources in the District to arrest and punished household without toilet and refuse facilities.

The District Assembly should seek financial assistance from NGOs (for example, World Vision Ghana) and International Organizations (World Bank) and award the dam at Saboba on contract for dredging. In addition, the dam should be banked and an area created for livestock water use since the dam serves as an important source of water for both human and livestock. This would solve the problem of the seasonal dry up of the dam and pollution and sanitation problems.

The DA, NGOs, should provide major communities that are located in areas with low water table-with dams instead of the boreholes and hand dug wells they provide that are without water for most part of the year. This would prevent the seasonal dry up of these water facilities especially in the dry seasons. A standard dam should be able to store water throughout the year for easy access and use.

The DWST through the District Assembly should seek the assistance of CWSA to periodically treat water from the dam, wells with water treatment chemicals to improve the quality of water obtained from these sources. This would help control the amount of unacceptable substances in the water from these sources such as faecal substances and E. coli form. The government can also spray rivers with same chemicals by air.

The DWST through the District Assembly should contact NRCWSA for assistance for all the old, dilapidated and unprotected wells in the District to be dredged, rehabilited and protected to ensure all year round water supply and also help solve the pollution and sanitation problems. With this, wells will not dry up for most part of the year again.

The government through the Ministry of Water Resources, Works and Housing should ensure the construction of underground reserviours to all government buildings for the harvesting and storage of rain water. This would serve as alternative sources of water for schools, clinics and also when pipe and boreholes break down or when the dam/wells dry up, to enhance water access in these institutions.

Various communities should be supported by the DA and NGOs working in the water sector to construct water harvesting reserviours to store rain water during the rainy

seasons for use in the dry seasons especially for communities without access to water due to distance / rely on only natural sources due to lack of any alternative water facility to improve access to water in the dry seasons.

Finally, the local government system in the study area should be strengthened. This will ensure community acceptability and participation in the community water production. This Will further enhance community sense of ownership of the water system.

It is the anticipation of the researcher that when all these ideas expressed in the recommendations are put into the Water Access and Use model designed in Figure 1.2 for this study, it would lead to water adequacy, access and use in the Saboba District that will affect health, education and productive activities positively in the district.

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APPENDICES

APPENDIX 1

Al : STUDY COMMUNITIES AND THE POPULATION SAMPLES USED FOR THE

STUDY.

NAME OF COMMUNITY	TOTAL POPULATION (PHC, 2000)	TOTAL POPULATION OF HOUSEHOLDS (PHC, 2000)	SAMPLE
Buagben (Buagbaln)	207	29	24
Buakuli (Buakun)	236	34	29
Dicheeni	115	17	21
Kuteg (Kitieg)	312	50	29
Nankpando	346	44	31
Nalongni	430	63	34
Saboba	3, 687	623	43
Toma	616	91	33
Saboba E.P. Senior High Community	99	21	25
Leaders of Food Venders at Saboba			5
Leaders, Pito Brewers at Saboba			5
New Dokondo	72	10	5
Total	6,093	982	284

SOURCE: Ghana Statistical Service, 2000 Population and Housing Census.\\

2

A2: POPULATION OF KEY PERSONA

LITIES AND THE SAMPLE POPULATION USED IN THE STUDY.

NAME OF GROUP	TOTAL MEMBERSHIP	SAMPLE POPULATION
District Assembly Key Staff	3	1
District Water and Sanitation Team	3	2
SCWSDB	18	11
Heads of schools	12	12
GHS Personnel	6	6
NGO	2	1
TOTAL	46	33

Source: Field Data, 2011.

3

SAMPLING TECHNIQUE

The sampling technique formular is given as:

$$n = N/(1 + N(a)^2)$$

Where:

'n' is the sample size

'N' is the total number of households

'a' is the margin of error estimated at 5% $(0.05)^2$

APPENDIX

Source: Saunder et al., 2007.

Saboba town has 982 households hence,

N=982 n = 982 / (1 +982 $(0.05)^2$) n = 982/ (1+982(0.0025) n = 982/3.455 n = 284.226

n ~284

Hence, a total of 284 households took part in the study.

RESULTS OF ANALYSIS ON WELL, RIVER AND DAM

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
WATER RESEARCH INSTITUTE
WATER QUALITY LABORATORY TAMALE

RESULTS OF ANALYSIS

Analysis Start Date: 05/09/2011 Analysis stop Date: 07/09/2011

SOURCE: well, River and Dam CLIENT: Kotin

	Well	Dam	River	WHO/ GHANA STANDARD
TOTAL COLIFORM (cfu/IOOmI)	640	3250	1750	
FAECAL COLIFORM (cfu/IOOmI)	396	620	716	

E. COLI (cfu/IOOmI)	320	250	310	
THB (cfu/l ml)	534	462	555	500

REMARKS: The Results Qflhe parameters analysed welt? outside W/I() and Ghana Standards valuefor drinking water except THBýôr the Dam.

.....

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APPENDIX

WATER QUALITY RESULTS ON

WELL

WATER QUALITY RESULTS

Receipt Date: 05/09/11 Analysis Start Date: 05/09/11

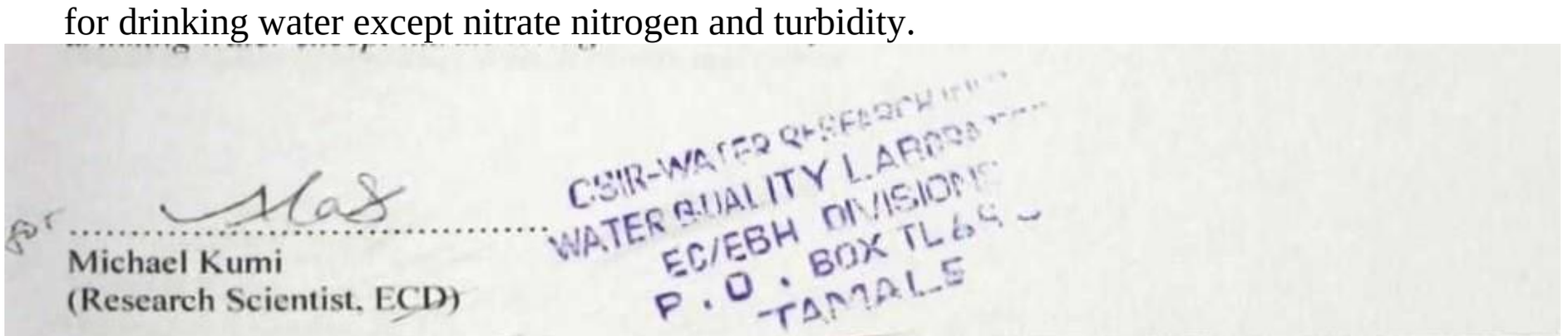
Sam le ID: Well CLIENT: Kotin

Parameter	Unit	Value	WHO Guideline
"IDS		89.5	1000
Conductivit	S/cm	149.2	
	El-unit	6.60	6.5-8.5
Total Alkalinit		12	1000
Bicarbonate		14.64	
Sul hatc (S04		<0.01	400
Chloride		13.90	250
Nitrate-N NO,,N		98.63	10
Phos hate-P P04		< 0.001	
Fluoride		<0.01	1.5
Calcium	M	8.02	200
Ma nesium		9.71	150
Sodium		3.8	200
Potassium		2.7	30
Silica (.Si04)		10.5	
Tot. I lardness		60	500
Cal. Hardness		20	
Ma .1 lardness		40	
Colour		15	15
Turbidit	NTU	12	5
Manvynese		0.01	0.5)
Total Iron		0.30	0.3
Zinc		< 0.005	5.0
Co r		< 0.020	
Cadmium		< 0.005	0.003
Lead		< 0.005	0.05

APPENDIX

WATER QUALITY RESULTS ON

REMA RRS: The Results eflhe parameters analysed were within WHO and Ghana Standards value for drinking water except nitrate nitrogen and turbidity.



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RIVER

WATER QUALITY RESULTS

Receipt Date: 05/09/11 Analysis Start Date: 05/09/11

Sam le ID: River CLIENT: Kotin

Parameter	Unit	Value	WHO Guideline
IDS		31.2	1000
Conductivit	S/cm	51.3	
	H-unit	6.75	6.5-8.5
Total Alkalinit		16.0	1000
Bicarbonate		19.52	
Sul hate SO.		19.9	400
Chloride		4.96	250
Nitrate-N (NOa-N		2.39	10
Phos hate-P (1>04		< 0.001	
F luoride		<O.OI	1.5

APPENDIX

WATER QUALITY RESULTS ON

Calcium		5.61	200
Ma nesium		1.94	150
Sodium		11.9	200
Potassium		8.7	30
Silica		26.0	
Tot. Hardness		22	500
Cal. Hardness		14.03	
Ma '. 1 lardness		7.97	
Colour		250	15
Turbidit	NTU	172	5
Manganese		0.03	0.5
Total Iron		4.00	0.3
Z. inc		< 0.005	5.0
Cop r		< 0.020	2
Cadmium		< 0.005	0.003
Lead		< 0.005	0.05

REMARKS: The Results ofthe parameters analysed were within WHO and Ghana Standards valuefor drinking water except total Iron, turbidity and colour.

.....

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DAM

WATER QUALITY RESULTS

Receipt Date: 05/09/11 Analysis Start Date: 05/09/11

Sam le ID: Dam CLIENT: Kotin

Parameter	Unit	Value	WHO Guideline
TDS		13.84	1000
Conductivit	S/cm	23.1	
1-1	Il-unit	6.53	6.5-8.5
Total Alkalinit		8.0	1000
Bicarbonate		9.76	

APPENDIX

WATER QUALITY RESULTS ON

Sul hate (SO.		6.4	400
Chloride		3.97	250
Nitrate-N (NO,,N)		1.42	10
Phos hate-P poa		< 0.001	
Fluoride		<0.01	1.5
Calcium		4.01	200
Ma nesium		3.4	150
Sodium		2.5	200
Potassium		0.7	30
Silica (Si04		18.5	
Tot. Hardness		24	500
Cal. Hardness		10.02	
Ma .Hardness		14	
Colour		125	15
Turbidit	NTU	92	5
Man nese		0.07	0.51
Total Iron		1.42	0.3
Zinc		< 0.005	5.0
Co er		< 0.020	2
Cadmium		< 0.005	0.003
Lead		< 0.005	0.05

REMARKS: The Results "f the parameters analysed were within WHO and Ghana Standards value for drinking water except total Iron, turbidity and colour,

for .....
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8

SCHOOL OF GRADUATE STUDIES
UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI
FACULTY OF ARTS AND SOCIAL SCIENCES
DEPARTMENT OF GEOGRAPHY AND RURAL DEVELOPMENT

THIS IS A POST GRADUATE THESIS PROJECT DESIGNED TO COLLECT DATA ON

THE TOPIC: WATER SUPPLY AND UTILIZATION IN SMALL TOWNS IN GHANA. A CASE STUDY OF SABOBA DISTRICT.

As a resident of Saboba District, data will be collected from your Household on the above topic through interview schedule.

This is solely an academic project and the data you shall provide will be used for this purpose only. Besides, your anonymity is assured.

INSTRUCTION: INTERVIEW SCHEDULE FOR HOUSEHOLDS.

Please, tick ( ) the appropriate option and provide your own appropriate responses in writing to appropriate questions.

PERSONAL DATA

Sex							
Locali							
Educational level	1. Terti	2. SHS	3. Basic	4.Never schooled			
Occupation	1. Farming	2. 'Pito' brewin	3.F00d vendor	4. Teaching	5. Health worker	6. Trading	7. Others
Average monthly income	1. GH. 10-30	40-60	70-100	110-130	5.GH 140160	6. GH. 170 200	7.GH 200 and above
Size of household	1. 1-5 persons	2. 6-10 persons	3.11-15 persons	4. 16 and above ersons			

7. Which of these water sources do you depend in your community? (Can tick more than one)

l. Household connection ( )

2. Public standpipe ( )

3. Borehole ( )

4. Protected dug well ( )

5. Protected spring ( )

6. Rainwater collection ( )

7. Unprotected well ( )

8. Unprotected spring ( )

9. Vendor-provided water ( )

10. Bottled water( )

I l. Tanker truck/Lorry/Motor service ( )

12. Dug out( )

13. Stream( )

14. River( )

15. Pond ( )

16. Dam( )

8. Main source of water during the dry season.....

9. Main source of water during the rainy season.....

10. In a year, which of these sources will you consider to be your main water source.....

11. Level of access to water in kilometres?

l. Optimum access- Multiple taps in the house ( )

2. Intermediate access- Single tap in the house ( )

3. Basic access-within Ikm ( )

4. No access- more than Ikm ( )

12, What is the walking distance to your main source of water supply in minutes?

1. Under 1 minute—eo
2. Under 5 minutes( )
3. Within 30 minutes ( )
4. More than 30 minutes ( )

13. Number of hours spent fetching water daily?

l. 30mins ( ) 2. I hr ( ) 3. 2 hrs( ) 4. 3hrs( ) 5. 4 hrs( ) 6. 5 hrs ( )
7. 5 and above hrs ( ) 8. Bought water( )

14. Do you queue for water? 1. Yes( ) 2. No( )

15. If.yes, how many minutes do you spend queuing to fetch water daily'?

1. Within 15 minutes( )
2. Within 30 minutes( )
4. Within 60 minutes( )
5. 60 minutes and above( )

3. Within 45 minutes( )6. Not applicable ( )

16. What quantity of water do you collect or fetch in drums in your household per day?

1.30 litres ( )

2.60 litres ( )

3.90 litres ( )

4. 115 litres or 1/2 a drum( )

5.230 litres 11 drum ( )

6. 345 litres/1 1/2 drums ( )

7.460 litres/ 2 drums ( )

8. 460 litres / 2 drums and above ( )

17. Are you able to meet your daily water requirement from your main water source?

1. Yes ( )

18. If yes, what quantity of water do you actually use in your household daily in drums?

1.30 litres ( )

2.60 litres ( )

3.90 litres ( )

4. 115 litres or 1/2 a drum ( )

5. 230 litres Il drum ( )

6. 345 litres/1 1/2 drums ( )

7. 460 litres/ 2 drums ( )

8.460 litres / 2 drums and above ( )

19. Is the water you fetch or is water supplied to you treated? l. Yes( ) 2. No ( )

20. If yes, is your water potable or drinkable? 1. Yes ( ) 2. No ( )

21. Give reason(s) for your answer....

22. How often does your household treat water before use?

l. Very often ( ) 2. Quite often( ) 3. Not often( ) 4. Not at all ( )

23. Are there any interruptions ~~in your source~~ of water supply in a year? l. Yes ( ) 2. No ( )

24. Give reason for your answer. ....

25. If yes as in (223 above, how often are these interruptions?

l. Daily( ) 2. Weekly( ) 3. Monthly( ) 4. Once in three months( )

5. Seasonally( ) 6. Yearly( ) 7. Not at all ( )

26. How often do you experience water shortage in your household?

1. Daily( ) 2. Weekly( ) 3. Monthly( ) 4. Once in three months ( )

5. Seasonally ( ) 6. Yearly ( ) 7. No shortage in household ( )

27. Give reason for your answer.

.....

---

28. Do you buy water for household use? 1. Yes ( ) 2. No ( )

29. If yes as in Q28 above, how much do you spend on water per day?

1. GH 50p( ) 2. GH 1.00P (GH 1.50p ( ) 4. GH2.OO ( )

5. GH 2.50P ( ) 6. GH2.50p and above( ) 7.)

30. Source of potable water?

1. Pipe borne water ( )
2. Borehole ( )
3. River( )
4. Well ( )
5. Bottled/sachet water ( )
6. Spring water( )

31. Who manages the potable water source?

1. Community elected members (WASAN) ( )
2. Saboba Water and Sanitation Development Board( )
3. Under nobody's management ( )
4. Community elders ( )
5. Bottled/sachet water companies ( )
6. No idea ( )

32. How long has the supplied you with water this year (2011)?

1. Fetched from January till date ( ) 2. Three months ( ) 3. Two months ( )
4. One month ( ) 5. One week( ) 6. Not at all ( )

33. Give reason foryour answer_____

34. Do you pay for the water your household uses in the form of water bills?

1. Yes ( ) 2. No ( )

35. If yes as in Q34 above, how regularly do you pay water bills?

1. Daily ( ) 2. Monthly( ) 3. Quarterly( ) 4. Yearly( ) 5. No( )

36. If no as in (234 above, state the specific reasons why you do not pay water bills.....

37. Æe you satisfied with the quantity of water supplied to your household per day?

1. Very satisfied( ) 2. Satisfied( ) 3. Dissatisfied ( ) 4. Very dissatisfied( )

38. Give reason(s) for your answer.·····

39. Does the water quantity problems affect the daily water consumption and use of your household? 1. Yes( ) 2.)

40. Give reason(s) for your answer.……

---

41. How will you agree on the following physical, chemical and microbiological properties of drinking watec that they affect the quality of water your household uses?

Drinking Water Quality Parameters	1 Strongly Agree	2.Agree	3 Disagree	4.Strongly Disagree	5.N0 Idea
Physical property:					
Colour of water					
Taste and odour					
Stain					
Faecal pollution					
Erosion					
Chemical property:					
Dissolved metals					
Salinity					
Corrosion					
Microbiological property:					
Living organisms (bacteria, virus and protozoa)					

42. How will you agree to the following pollutants as source of pollution to your source of water?

Source of pollution	1.Strongly agree	2.Agree	3.Disagree	4.Strongly disagree	5.N0 idea
Sêwage/latrine					
Refuse dump					
Bathroom waste					
Transport through pipe lines					
Maintenance of water facilities					
Animals					
Washing (cars and clothes)					
Entering to fetch by humans					

Container and rope use					

43. Does the water pollution (quality) problems affect the daily water consumption of your household? 1. Yes ( )2.

44. Give reason(s) for your answer.....

45. Are you satisfied with the sanitation conditions around your source(s) of water in your community? 1. Very satisfied ( ) 2. Satisfied ( ) 3. Dissatisfied ( ) 4. Very dissatisfied( )

46. Give specific reason(s) for yo r answer.....

47. Do you experience any kind of the water related diseases in your household as a result of the water you drink or use? 1. Yes ( ) 2. No( )

48. If yes, how will you agree that the following water related diseases are found in your community and are as a result of the water you use?

Categories of Water Related Diseases	1.Strongly Agree	2.Agree	3.Disagree	4.Strongly Disagree	5.No Idea
WATER-BORNE					
Diarrhoea					
Dysentery					
Typhoid					
Cholera					
Hepatitis					
WATER-BASED					
Bilharzia					
Guinea worm					
WATER-RELATED VECTOR					
Yellow fever					
Malaria					
Onchocerciasis					
WATER WASH/SCARCE					
Skin sepsis and ulcers					
Yaws					

Leprosy					
Lice and typhus					
Trachoma					

49. Among the stated diseases Q48, which are the most common water related diseases in your community.....

50. How frequent do these diseases occur?

1. Yearly ( ) 2. Quarterly( ) 3. Monthly ( ) 4. Weekly ( ) 5. Not at all ( )

51. How severe or long does it take the victims to treat these diseases?

l. Within one year ( ) 2. Within six months ( ) 3. Within three months ( )

4. Within one month ( ) 5.Within on week ( ) 6. Not at all ( )

52. Which Of the following will you agree are some of the effects of water related diseases on the health of your household and community? (Can tick more than one options)

1. Illnesses ( )
2. Death ( )
3. Lower the body's immune system and resistance to diseases ( )
4. Lowers the body's intake of nourishment leading to malnutrition in children ( )
5. Decrease individual and social productivity ( )
6. Hampers children's education ( )
7. Hampers human resource development ( )
8. Increase health expenditure ( )

53. Which of these educational institutions do your children attend in the district?

(You can tick more than one). 1. Primary( ) 2. JHS( ) 3. SHS( )

54. Do these educational institutions have drinkable water supply facilities?

1. Yes( )2.

55. Give reason for your answer...

.....

56. If yes as in Q54 above, how would you agree that these facilities function throughout school sessions in a year? 1. Strongly agree ( ) 2. Agree ( ) 3. Disagree ( ) 4. Strongly disagree ( )

57. If disagree as in (254 above, state how students get water for drinking, cooking and other sanitary activities in their school(s)?.....

58. How does interruÿion of water supply affect the education of pupils/students in your household.....

59. How will you agree the problem of water availability/ water interruption affect your pupils/students education in the following areas in the table below?

Variable	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
Lateness					
Performance					
Absenteeism					
Hygiene					
Boys					
Girls					

60. Give reason for your answer...

61. How many hours do pupils/students in your household spend on water fetching daily?

1. Ihr( ) 2. 2hrs( ) 3. 3hrs( ) 4. 4hrs( ) 5. 5hrs( ) 6. Others ( ) 7. Notat all ( )

62. What are the various ways water related diseases affect education in your community? ....

.....

63. In what other ways does the problem of water supply affect school children (education) in your household.....

.....

64. Suggest ways these problems can be solved...

65, Do you use water as a raw material in any economic activity you do?

1. Yes ( ) 2. No ( )

66. If yes, for what specific economic activity....

67. What quantity of water do you need in drums per day to carry out your economic

activity?

1. 30 litres ( )
2. 60 litres ( )
3. 90 litres ( )
4. 1 15 litres or 1/2 a drum ( )
5. 230 litres /1 drum( )
6. 345 litres/1 1/2 drums ( )
7. 460 litres/ 2 drums ( )
8. 460 litres / 2 drums and above ( )

68. Do you get the desired quantity of water for your daily productive activities?

1. Yes ( ) 2.)

69. Give reason for your answer.... . . . . ..

---

70. If•yes/no as in Q62 above, has this improved your daily productivity levels?

l. Significantly improved ( ) 2. Fairly improved ( ) 3. Not improved ( )

71. Give reason(s) for your answer. ... .

---

72. Are you satisfied with the quality of water that you use for your daily productive activity?

1. Yes ( ) 2.)

73. Give reasons for your answer. , ...

74.Repeatition 75[Repeatition of uestion 70.

76. How much time do you spend on your productive activity daily?

1. 30mins ( )
2. Ihrs ( )
3. 1 1/2hrs ( )
4. 2hrs ( )
5. 3hrs ( )
6. 4hrs ( )
7. 5hrs ( )
8. 6hrs and above ( )

77. How many hours do you spend looking for the right quantity and quality of water for your daily productivity?

1. 30mins ( )
2. Ihrs ( ) 3. 1 1/2hrs ( ) 4. 2hrs( ) 5. 2hrs and above ( ) 6. No( )

78. How much do you spend on water for your daily productivity activity?

1. GH 1.00 ( ) 4. GH4.OO ( )

• 2. GH2.OO ( ) 5, GH 4.00 and above ( )

3. GH 3.OO ( )

79. In what ways does water related diseases affect your productivity.....

---

80. In productive activities, men and women, who are most affected by water problems?

1. Men ( ) 2. Women ( ) 3. No idea ( )

81. Give reason(s) for your answer.....

---

82. Does water shortage affect your income levels? 1. Yes ( ) 2. No ( )

83. Give reason(s) for your answer. . . . .

---

84. Do you face any problems with water management institutions in relation to your productive activity? 1. Yes ( ) 2. No ( )

85. If yes, state the-problems ygu-$aee-witywater management institutions in general in relation to your productive activity.....

---

86. State how these problems affect your productivity levels.. . . ..

.....

---

87. What suggestions/recommendations will you offer to help solve these water problems in relation to your productive activity..

.....

88. Are you involved in the management of water supply in your community as a water consumer? 1. Yes ( )2. No

89. Give reason for your answer.

.....

---

90. Are you aware of any intervention by the Government to solve the water problem in your district? 1. Yes ( )

91. If yes, state the form of intervention...

92. Are you aware of any intervention by the District Assembly? 1. Yes ( ) 2. No ( )

93. If yes, state the form of intervention..

94. Are you aware of any intervention by Non Governmental Organizations (NGOs) to the water problem? 1. Yes ( ) 2.)

95. If yes, state the form of intervention. . .

96. Are you aware of any intervention by International Corporations supporting the water sector in Ghana?1. Ye

97. If yes, state the form of intervention...

98. If there have been intervention(s), have they solved the water problem(s) in the district?

l. Fully solved ( ) 2. Fairly solved ( ) 3. Not solved ( )

99. Give reason(s) for your answer.. ..

100. State generally, other observed problems of water supply in your locality..

101. Suggest how these problem(s) can be solved..

102. State the problems of water supply caused by water consumers...

103. Suggest ways problems caused by water consumers can be solved to facility water supply in your locality..

.....

_____

_____

104. What policy recommendations can you offer to help solve the water problems in the

District as a whole?.....

_____

_____

..... .THANK YOU FOR YOUR PRECIOUS TIME

APPENDIX 9

SCHOOL OF GRADUATE STUDIES

UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

FACULTY OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND RURAL DEVELOPMENT

THIS IS A POST GRADUATE THESIS PROJECT DESIGNED TO COLLECT DATA

ON THE TOPIC: WATER SUPPLY AND UTILIZATION IN SMALL TOWNS IN GHANA.

A CASE STUDY OF SABOBA DISTRICT.

As a resident and key person of Saboba District in the water sector, data will be collected from you on the above topic through questionnaires.

This is solely an academic project and the data you shall provide will be used for academic purposes only. Besides, your anonymity is assured.

INSTRUCTION: QUESTIONNAIRES FOR DISTRICT ASSEMBLY STAFF,

WATER AND SANITATION TEAM AND NGOs USE ONLY.

Please, tick ( ) the appropriate option and provide your own appropriate response in writing to appropriate questions.

PERSONAL DATA

Sex		2.F					
Locality							
Educational level	1. Tertiary	2. SHS	3. Basic	4. Never schooled			
Occupation——	1. Farmin	~~2. 'Pito'~~ brewing	3. Food vendor	4. Teaching	5. Health Worker	6. Trading	7. Others
			3. WST	4 NGOs			
Member of	1. SDA	2. CWSDB					

6. What type of water system do you manage? (Can tick more than one option)

1. Pipe borne water system ( ) 2. Borehole ( )

3. Dam( ) 4. Well ( )

5. Others (specify).. . .

7. Main source of water to the water system?

1. River( ) 2. Underground ( )

3. Dam( ) 4. Well ( )

5. Borehole ( ) 6. Others (specify). . .

8. Do you treat the water before it is supplied for public consumption?

1. Yes ( ) 2. No ( )

9. Give reason(s) for your answer... .

10. If yes as in Q8 above, what water treatment system do you use?.....

1 1. What type of chemicals do you use to treat water before supply..

12. How regular do you treat water before supply?

1. Very regular( ) 2. Not regular( ) 3. Not at all ( )

13. Give reason(s) for your answer...

14. How long have yousupplied water for the year 2011 ? .....

15. What quantity of water do you produce daily in gallons.

16. How-much does it cost your system to treat this water per day..

17. Which of the following water billing methods do you use?

1. Flat rate billing ( ) 2. Metric billing ( )

18. Are you able to optimally collect water bills with the method you use?

1. Yes( ) 2.)

19.

Give reason(s) for your answer...

20. Aie you able to meet your operations cost per day? 1. Yes ( )

2. No

21. Give reason(s) for your answer..

.....

---

22. Are you able to pay your workers with the revenue you raise? l . Yes( ) 2. No ( )

23. How long have you been a member of the water unit/body you represent?....

24. Which sector of the water management do you represent?

I. Marketing ( ) 2. Revenue collection( ) 3. Leakages ( ) 4. Administration( )

5. Complains and conflict resolution( ) 6. Technical unit ( )

7. Assess replacement ( )

8. Others (specify). . . ..

25. Have you received any training on water management? 1. Yes ( )2. N

26. Briefly state the functions of the unit you are a member of in relation to the provision of water in the district?.....

---

27. What has the unit or board done so far to ensure the availability of potable water in the

districto.....

---

28. What problems do you encounter with water consumers or customers..... . . . . .

.....

29. Suggest how the problems of water consumers can be solved...

.....

30. Do you involve water consumers in the management of your water system in the district?

1. Always ( ) 2. Sometimes ( ) 3. Not at all ( )

31. .....

.....

32. How many members are you on the unit you belong?.....

Give reason(s) for your answer...

33. Out of the number, how many are women?...

.....

34. How will you agree that the management board of your water supply institution undertake health education on the following to help improve water quality, sanitation and water hygiene in the district?

ea uca on	trong y Agree	. gree	Isagree	. trong y Disagree	o Idea
Isposa o aece					
onstruc ono atnnes					
an was Ing					
ater storage					
se Ispos					
atntenance o re se ump					
gemen o was e m a e					
atntenanceo water aci ltles					

35. What water quality challenges does the water supply institution face in the district? . . . . .

.....

36. How often does the water supply institution supply water to consumers?

1. Daily( ) 2. Weekly( ) 3. Monthly( ) 4. Yearly( )

37. Give reason for your answer.....

39. How old is the water system in the district... ..……

40. Has the system ever had any renovation or rehabilitation? l. Yes ( ) 2. No( )

41. Give reason for your answer...

42. If yes as in Q40 above, for how many years till date... ..……

43. Has it improved water supply to consumers in the district? I. Yes ( ) 2. No( )

44. ……

Give reason(s) for your answer...

45. Has there been any intervention by the government to solve this water problem?

1. Yes ( )2.

46. Ifyes, specifically state the intervention...

.....

.....

47. Has there been any intervention on the part of the District Assembly? 1. Yes ( ) 2.

48. If yes, specifically state the intervention... . . . . .

.....

---

49. Has there been any intervention by Non Governmental Organizations (NGOs) to the water problem? 1. Yes ( )2. No

50. If yes, specifically state the form of intervention..……

---

51. Has there been any intervention by the international corporations working in the water sector to solving the water problem? 1. Yes ( ) 2. No ( )

52. If yes, state the specific of intervention..……

53. Has there been any intervention by the community to solve the water problem?

1. Yes ( )

54. If yes as in Q54 above, state the form of intervention..……

.....

55. How will you agree that all these interventions have solved the water problem(s) in the district? I . Strongly agree ( ) 2. Agree( ) 3. Disagree ( ) 4. Strongly disagree( )

56. Give reason(s) for your answer. . . . .……

.....

57. State the problems that water institution(s) in the district face in general in the district...……

58. Suggest how these problems stated above can be solved to facilitate water supply...

.....

59. What do you recommend as policy to help solve all the problems facing your water management institution to enable it meet her water supply task?.....

---

60. How sustainable is the water supply system in terms of service delivery, based on all the above information you have provided?

I. Very sustainable ( ) 2. Sustainable( ) 3. Not sustainable ( )

63. Give reason for your answer.... . . . . .

THANK YOU FOR YOUR PRECIOUS TIME.

APPENDIX 10

SCHOOL OF GRADUATE STUDIES

UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

FACULTY OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND RURAL DEVELOPMENT

THIS IS A POST GRADUATE THESIS PROJECT DESIGNED TO COLLECT DATA

ON THE TOPIC: WATER SUPPLYAND UTILIZATION IN SMALL TOWNS IN GHANA.

A CASE STUDY OF SABOBA DISTRICT

As a head of an educational institution in Saboba District, data will be collected from you on the above topic to respond on the impact of water supply on education, through questionnaires.

This is solely an academic project and the data you shall provide will be used for this purpose only. Besides, your anonymity is assured

INSTRUCTION: QUESTIONNAIRES FOR GHANA EDUCATION SERVICE

PERSONNEL

Please, tick ( ) the appropriate option and provide your own appropriate response in writing to appropriate questions.

PERSONAL DATA

Sex	.M	2.F		
Locality				
Edücational level	1.Tertiary	2.SHS	3.Basic	
Occupation				
Institution	I.SHS	2.JHS	3.Primary	4.KG

5. Main sources of water supply in your educational institution (can tick more than one option)

1. Household connection ( )
2. Public standpipe ( )
3. Borehole ( )
4. Protected dug well ( )
5. Protected spring ( )
6. Rainwater collection ( )
7. Unprotected well ( )
8. Unprotected spring ( )
9. Vendor-provided water ( )
10. Bottled water ( )
11. Tanker truck/Lorry/Motor service ( )
12. Dugout ( )
13. Stream( )
14. River( )
15. Pond ( )
16. Dam ( )

6. Main source of water during the dry season.....

7. Main source of water during the rainy season..……

8. Which of the various sources of water is the main source of water to your institution?..... .

9. Do these sources supply you water throughout school sessions? 1. Yes( ) 2. No ( )

10. Give reason(s) for your answer..……

……

l l. What alternative sources of ~~water do stu~~dents use if your response is no as in Q8 above?..……

12. Is the water used in your school treated from its source? 1. Yes( ) 2. No ( )

13. If yes, is the water drinkable? 1. Yes ( ) 2. No ( )

14. Give reason for your answer. . . .……

15. If yes as in Q13 above, are you satisfied in terms of the quantity of water supplied to your institution?.....

……

1. Very satisfied ( ) 2. Satisfied( ) 3. Dissatisfied( ) 4. Very dissatisfied ( )

5. Don't know ( )

16. Give reason(s) for your answer... ...

……

---

17. How will you agree that water quantity problems faced by your institution affect the daily water use of your pupils/students?

1. Strongly agree ( ) 2. Agree ( ) 3. Disagree ( ) 4. Strongly disagree

5. Don't know ( )

18.Give reason for your answer...

……

19.Are you satisfied with regard to the quality of water supplied to your institution?

1. Very satisfied ( ) 2. Satisfied ( ) 3. Dissatisfied ( ) 4. Very dissatisfied ( )

5. Don't know ( )

20.Give reason for your answer..……

21.Has the water quality problems affected the daily water consumption of your pupils/students in the district? 1. Strongly agree ( ) 2. Agree ( ) 3. Disagree ( ) 4. Strongly disagree ( )

5. Don't know ( )

22. Give reason for your answer...

23. Does water availability affect school attendance ofyour pupils/students?

1. Yes ( ) 2. No ( )

24. If yes, how will you agree that the problem of water availability affect your pupils/students in the following areas in the table below?

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
Lateness					
Performance					
Absenteeism					
Hygiene					

25. Give reason(s) for your answers.....

---

26. Do you face any problem(s) related to pollution of source(s) of water that your institution depends on? 1. Yes( ) 2.)

27. Give reason for your answer.....

---

28. Are you satisfied with the sanitation conditions around the source(s) of water your pupils/students use? 1. Very satisfied ( ) 2. Satisfied( ) 3. Dissatisfied ( )

4. Very dissatisfied ( ) 5. Don't know ( )

29. Give reason(s) for your answer.....

30. Is the water in your institution drinkable? 1. Yes ( ) 2. No ( )

31. Give reason(s) @your answer..r.....

32. Have you put any system/mechanism in place on campus to ensure that pupils/ students

maintain their hygienic practices after attending to toilet, urination and others?

1. Yes( ) 2. No ( )

33. If yes, what system/mechanism have you put in place. .....

34. Are there any water related diseases in your institution which are a result of the water pupils/students drink or use? 1. Yes ( ) 2. No ( )

35. State them.... . . . . .

36. State the effects of these water diseases on the education of your pupils/students.....

37. What is done by your institution to help solve the problem(s) of water your pupils/students face to promote academic work in your school/institution...

.....

---

38. Are you aware of any intervention by the government to solve this water problem?

1. Yes ( )2.

39. If yes, state the form of intervention..……

---

40. Are you aware of any intervention on the part of the District Assembly? 1. Yes ( ) 2.

41. If yes, state the form of intervention.. .....

42. Are you aware of any intervention by Non Governmental Organizations working in the water sector in the country to solving the water problem in your district?

1. Yes ( ) 2. No ( )

43. State the form of intervention.....

.....

44. Are you aware of any intervention by the international corporations working in the water' sector in the country to solving the water problem? 1. Yes ( )

45. If yes, state the form ofintervention.....

46. Are you aware of any intervention by the community to solving the water problem?

1. Yes ( ) 2. No ( )

47.If yes as in Q46 above, state the form of intervention....

48.Have all these interventions solved Ft'blcrn n your institution? t. Ya ( ) 2.

49.If no as in Q50 above, state the shortfalls you have observed from theataventions

SO. After all the above, what have you observed to bc the mam of waterproblems in the district

51. What do you recommend as solution(s) to the water rxoblcms in your institution and other educational institutions in general in the dtstnct toeducation

THANK YOU FOR YOUR PRECIOUS TIME

APPENDIX 11

SCHOOL OF GRADUATE STUDIES

UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

FACULTY OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND RURAL DEVELOPMENT

THIS IS A POST GRADUATE THESIS PROJECT DESIGNED TO COLLECT DATA ON THE TOPIC: WATER SUPPLY AND UTILIZATION IN SMALL TOWNS IN GHANA. A CASE STUDY OF SABOBA DISTRICT.

As health personnel in Saboba District, data will be collected from you on the above topic and the implication of water supply on the health of the people, through interview.

This is solely an academic project and the data you shall provide will be used for this purpose only. Besides, your anonymity is assured

INSTRUCTION: QUESTIONNAIRES FOR HEALTH PERSONNEL

Please, tick ( ) the appropriate option and provide your own appropriate response in writing to appropriate questions.

PERSONAL DATA

Sex		2.F	
Locality			
Educational level	1.Tertiary	2. SHS	3. Basic
Position/ Status			

5. Main sources of water in the district (Can tick more than one option).

l. Household connection ( )
2. Public standpipe ( )
3. Borehole ( )
4. Protected dug well ( )
10. Bottled water( )
11. Tanker truck/Lorry/Motor service ( )
12. Dugout( )
13. Stream( )
5. Protected spring ( )

6. Rainwater collection ( )
7. Unprotected well ( )
8. Unprotected spring ( )
9. Vendor-provided water ( )
14. River( )
15. Pond ( )
16. Dam( )

6. Main source of water during the dry season..

.....

7. Main source of water during the rainy season...

.....

8. Which one of the following will you consider to be the main source of water in Saboba?.....

9. Is the water from this main source drinkable? 1. Yes ( ) 2. No ( )

10. Give reason for your answer.....

---

l l. Are you satisfied with the Sanitation conditions of the source(s) of water that the district depends on?

1. Very satisfied ( ) 2. Satisfied( ) 3. Dissatisfied( ) 4. Very dissatisfied( )

12. Give reason for your answer..

.....

---

13. How will you agree that the quality of water used in the district meets health standards?

1. Strongly agree ( ) 2. Agree ( ) 3. Disagree ( ) 4. Strongly disagreed ( )

14. Give reason(s) for your answer..er.....

.....

15. Do you face any problem(s) related to pollution of water sources in the district?

1. Yes ( ) 2. No ( )

16. If yes, how will you agree to the following pollutants are a source of pollution to water sources in the district?

Source of Pollution	1 Strongly Agree	2.Agree	3 Disagree	4.Strongly disagree	5.No idea
Sewage/latrine					
Refuse dump					
Bath room					
Transport through pipe lines					
Maintenance of water facilities					
Animals and their waste					
Washing (cars and clothes)					
Entering to fetch by humans					
Contain and rope use					

17. Do you experience any kind of water related diseases in the district?

1. Yes ( ) 2. No (

18. If yes, how will you agree that the following water related diseases exist in the district and that they are as a result of water the people use?

Categories of Water Related Diseases	1 Strongly agree	2.Agree	3.Disagree	4.Strongly disagree	5.No
WATER-BORNE					
Diarrhoea					
Dysentery					
Typhoid					
Cholera					

Hepatitis					
WATER-BASED					
Bilharzia					
Guinea worm					
WATER-RELATED VECTOR					
Yellow fever					
Malaria					
Onchocerciasis					
WATER WASHED					
Skin sepsis and ulcers					
Yaws					
Leprosy					
Lice and typhus					
Trachoma					

19. Among the stated diseases Q18, which are the most prevalent/common water related diseases in the district?.....

.....

20. How frequent do these diseases occur?

4. Not at all ( )

1. Very often( ) 2. Quite often( ) 3. Not often( )

21 How severe are these diseases on the victims?

4. Not severe at all ( )

l. Very severe ( ) 2. Severe( ) 3. Not severe ( )

22. How can people in the district prevent these water related diseases....

.....

23. What is done by health institutions in the district to help prevent the problem of water related diseases in the district. . . .

.....

24. What do you recommend as solution(s) to the water problems in the district

.....

.....

25. Do you think the kinds of water supply systems in the district are sustainable in terms of water delivery in the district?

1. Very sustainable ( ) 2. Sustainable ( ) 3. Not sustainable ( )

26. Give reason for your answer.... . . . . ……

.....

APPENDIX 12

INTERVIEW GUIDE AS USED IN THE FOCUS GROUP DISCUSSION FOR SCWSDB

The focus group discussion centred on the following themes:

l. Source of water to the water system

2. Water treatment

3. Quantity and quality of water supplied

4. Challenges of the water system

5. Renovation of the water system

6. Interventions from external sources

The discussion were based on the following issues

- The sources of water to your water system
- Type of system used to supply water
- Water treatment and kinds of chemicals used
- Quantity of water supplied daily to the public

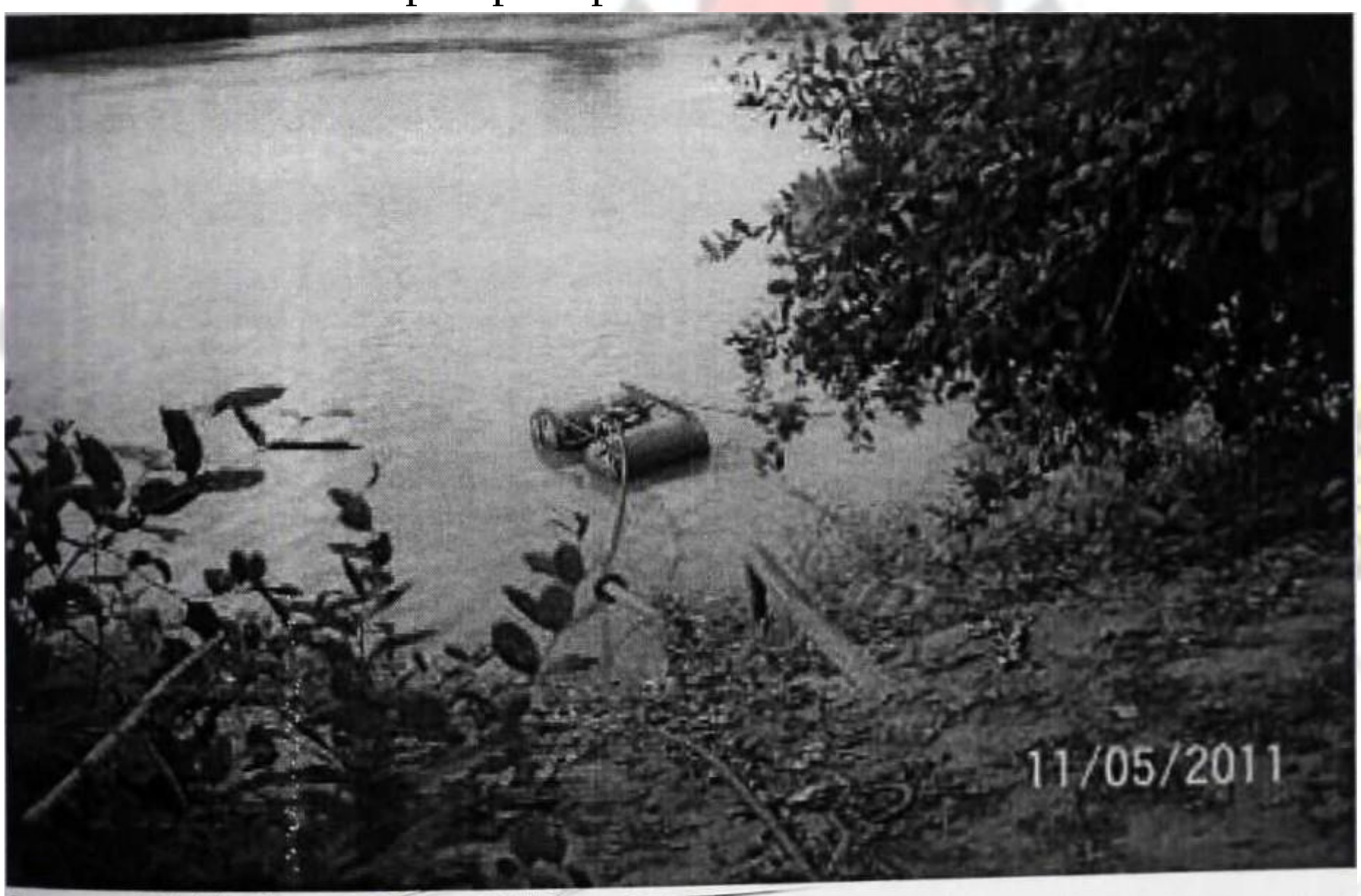
>The challenges faced by Saboba Community Water and Sanitation Development Board in managing the pipe water system

> Any renovation of water system since its establishment and in what form

> Any intervention both fro within and outside the district

supplies water any time it was maintained and during such periods, households that have stand pipes or household pipes have access to water and do not depend on unimproved sources any more. Some of these interventions have led to improved access to water and accounts for 1.8% significant improvement in productive activities. The inability of these facilities to supply water always is the main reason why respondents use unimproved sources of water to meet their water needs. Plate 5.3 shows an intervention by the District Assembly on the suspension of a water pumping machine on River Oti to pump water through the pipe water system for treatment and further distribution to Saboba town and the surrounding communities it serve.

Plate 5.3: A low lift pump suspended on River Oti



Source: Field observation, 2011.

5.4. 'INTERVENTIONS FROM NON-GOVERNMENTAL ORGANIZATIONS (NGOs)

World Vision Ghana (WVG) andAntegrated Development Centre (IDC) are the main NGOs in the District whose activities involve water. WVG provide water facilities while IDC builds capacity of communities to apply for water facilities.