

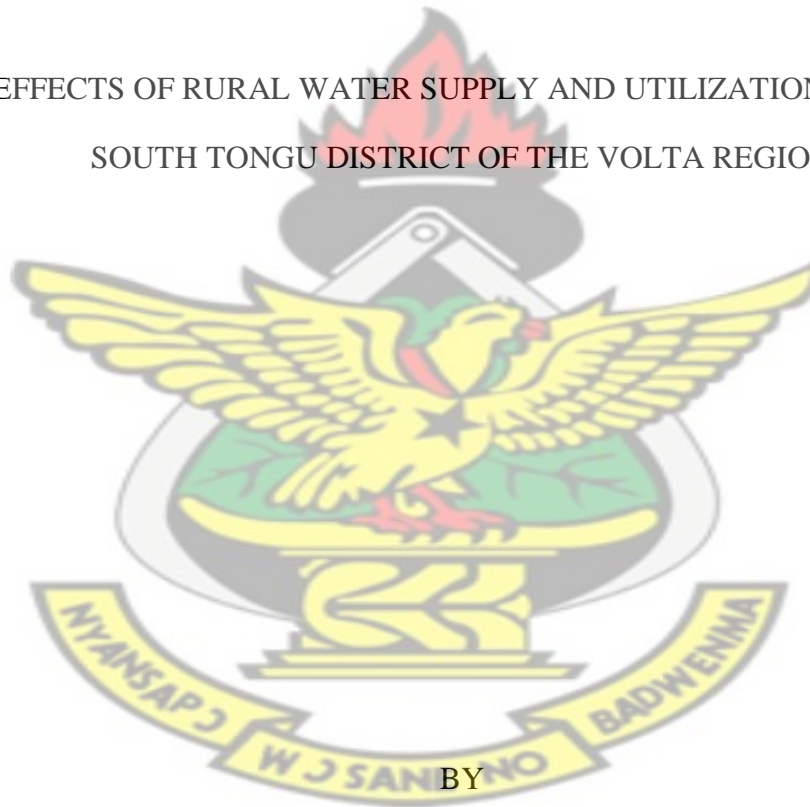
KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ART AND SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND RURAL DEVELOPMENT

KNUST

EFFECTS OF RURAL WATER SUPPLY AND UTILIZATION IN THE
SOUTH TONGU DISTRICT OF THE VOLTA REGION



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MARCH, 2011

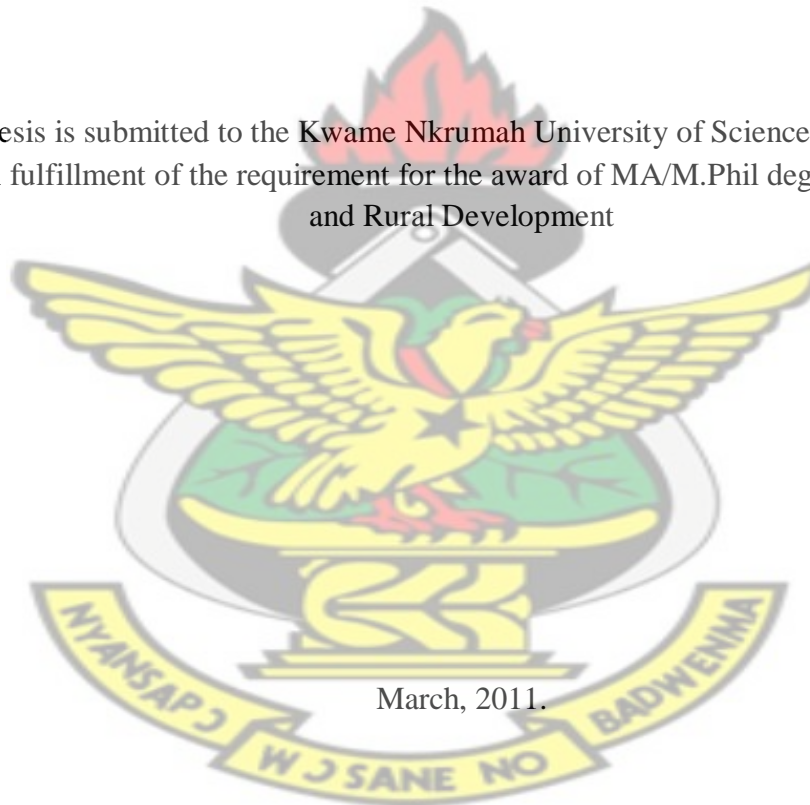
EFFECTS OF RURAL WATER SUPPLY AND UTILIZATION IN THE SOUTH
TONGU DISTRICT IN THE VOLTA REGION

BY

REDEEMER APEAMENYO (B. A. Hons.)

KNUST

This Thesis is submitted to the Kwame Nkrumah University of Science and Technology
in partial fulfillment of the requirement for the award of MA/M.Phil degree in Geography
and Rural Development



March, 2011.

DECLARATION

I do hereby declare that, except for references to other people's work which have been duly acknowledged, this work is the result of my own original research and it has neither in whole nor in part been presented for any degree elsewhere.

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Date

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We declare that we have supervised the student in undertaking the study submitted herein and we confirm that the student has been in consultation with us and has our permission to present this work for assessment.

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DEDICATION

I dedicate this work to my wife, Mrs. Apeamenyo Regina Forgive and children, Seyram, Setumte and Mawunyo.

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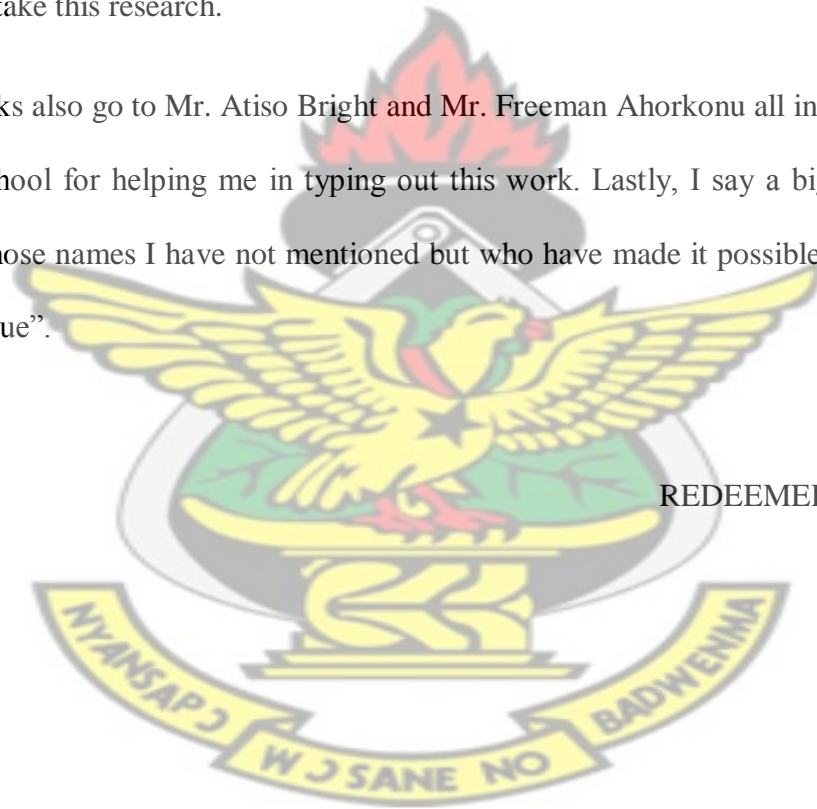


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REDEEMER APEAMENYO

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ACRONYMS

ADRA	-Adventist Relief Agency
CHPS	-Community-based Health Planning Services
CWSD	-Community Water and Sanitation Division
CWSA	-Community Water and Sanitation Agency
DA	-District Assembly
DANIDA	-Danish International Development Agency
DE	-District Engineer
DHA	-District Health Administration
DHD	-District Health Directorate
DHMT	-District Health Management Team
DWST	- District Water and Sanitation Team
EHU	-Environmental Health Unit
GSS	-Ghana Statistical Service
GWSC	-Ghana Water and Sewage Corporation
GWCL	-Ghana Water Company Limited
IWSC	-International Water and Sanitation Centre
IFFM	-International Fact Finding Mission
IWMI	-International Water Management Institute
MDGS	-Millennium Development Goals
MOH	-Ministry of Health
NCWSP	-National Community Water and Sanitation Programme
NGO	-Non-Governmental Organization
NHIA	-National Health Insurance Authority
TOYACE	-Tongu Youth Association of Christians Evangelists
UN	-United Nations
UNEP	-United Nations and Environment Programme
UNDP	-United Nations Development Programme
UNICEF	-United Nations International Children's Emergency Fund
UNIFEM	-United Nations Development Fund for Women

VCWSP

-Volta Community Water and Sanitation Programme

VRWSP

-Volta Rural Water and Sanitation Project

WATSA

-Water and Sanitation Agency

WHO

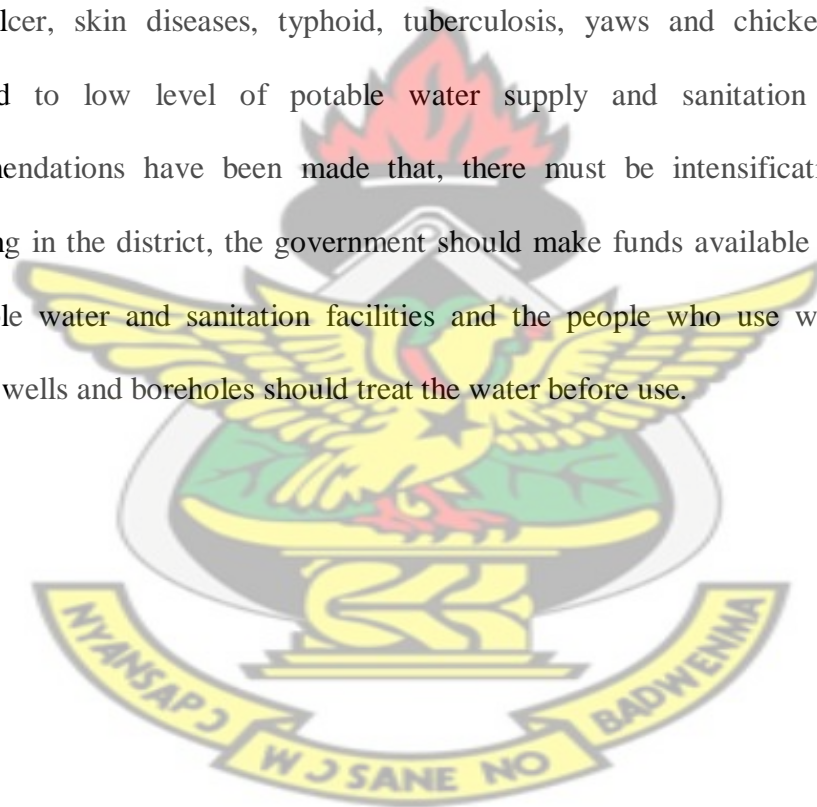
-World Health Organization

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ABSTRACT

The study examined the health effects of rural Water supply and utilization in the South Tongu District. The questionnaires, interview schedules, focus group discussion and personal observation were the methods used to collect the data. Computer software such as SPSS version 16.0 was used to assist in the data analysis. The hypotheses used for the study were tested using Pearson Correlation. The study has established that there is high prevalence rate of water-related diseases such as malaria, diarrhoea, schistosomiasis, buruli ulcer, skin diseases, typhoid, tuberculosis, yaws and chicken pox which is attributed to low level of potable water supply and sanitation in the district. Recommendations have been made that, there must be intensification of rainwater harvesting in the district, the government should make funds available for the provision of potable water and sanitation facilities and the people who use water from rivers, streams, wells and boreholes should treat the water before use.



CHAPTER ONE

1.0. INTRODUCTION

1.1 BACKGROUND TO THE STUDY

One of the characteristics of developing countries is the sharp disparity in infrastructure between rural and urban centres. Rural areas of developing countries lag behind in the provision of physical infrastructure. Prominent among these types of infrastructure is water and sanitation facilities. According to the WHO (2000) more than 1300 million people had no access to safe and adequate water supply and more than 85 percent of these people live in rural areas of developing countries.

It has been estimated that 80 percent of diseases in under developed countries is associated with water. Few people have access to adequate quality or quantity of water supply or to an effective sewage disposal. This applies to both urban areas and rural areas and the result is the high level of faecally-related diseases such as hookworm, cholera and chronic dysentery (Platt, 1996).

Approximately 4 billion cases of diarrhoea each year causing 2.2 million deaths, mostly among children under the age of five is due to poor water supply and sanitation (WHO, 2000). Intestinal worms infect about 10% of the population of the developing world. Intestinal parasitic infections can lead to malnutrition, anaemia and retarded growth, depending upon the severity of the infection. This is also due to unsafe drinking water (WHO, 2000). It is estimated that 6 million people are blind from trachoma and the population at risk from this disease is approximately 500 million (WHO, 2000). Two

hundred million people in the world are infected with schistosomiasis, of which 20 million suffer severe consequences (WHO, 2000).

Ensuring that rural dwellers around the world do not have to walk for hours to collect sufficient and safe drinking water is a huge challenge. Based on this, considerable investments have been made in rural water supplies. Springs have been protected, wells have been dug or drilled, and fitted with hand pumps; piped water schemes have been undertaken. However, the sobering fact is that progress is still much too slow, and rural water supply coverage significantly lags behind that of urban supply. Eight out of ten people without access to an improved water supply live in a rural area. This corresponds to 780 million rural dwellers, compared to 136 million urban dwellers (Sutton, 2007).

A safe and sustainable water supply, basic sanitation and good hygiene are fundamental for a healthy, productive and dignified life. Yet many of the world's poor rural people lack access to an improved water supply (nine hundred million) and improved sanitation facilities (twenty-six billion) (Joint Monitoring, Programme for Water and Sanitation, 2006). Progress towards the United Nations Millennium Development Goal 7 for water and sanitation is particularly poor in sub-Saharan Africa. Poor access to water, sanitation and hygiene results in tremendous human and economic costs and reinforces gender and other societal inequalities, most notably, for women and girls. Chronic diarrhoea diseases debilitate victims and, coupled with malnutrition, induce a negative spiral into poverty. The productive activities of poor rural people, such as schooling and farming, are severely restricted by ill-health from water and excreta-related diseases as well as by the time and energy spent fetching water.

Environmental problems are coupled with the growth of towns and cities in Africa. Among the serious environmental problems are waste accumulation and lack of adequate and safe water supply (Benneh, 1992). The accumulation of waste and disposal problems have made some water bodies such as rivers, streams, lakes and others being the receptacles of waste leading to their pollution and gradual extinction.

Polluted air, insufficient and unclean water are some of the sources of infection in Africa and most developing countries. It is believed that, clean and sufficient water would be the best solution to most of the health problems in Africa. Biological, physical and chemical agents in the human environment contribute to millions of premature deaths and to the ill health and disablement of hundreds of millions (Sloof, 1992). Such disease agents are mostly carried in water and the air.

Water –borne diseases which people always refer to as dirty water diseases, are a result of using water contaminated by human, animal or chemical wastes. These diseases cause an estimated 12 million deaths a year, 5 million of them from diarrhoea associated diseases. Most of the victims are children in developing countries (Davidson et al, 1992; United Nations, 1997). Polluted water is the source of viral hepatitis, cholera, leptospirosis, typhoid fever, amoebiasis, schistosomiasis, and dracunculiasis, malaria and onchocerciasis (Feachem et al, 1986).

Human faeces also contain pathogenic micro organisms that can cause cholera, typhoid fever and dysentery (Mader, 1993). The health problems of unsafe and insufficient quantities of water and inadequate sanitation services have also been found to present itself in high rates of trachoma (Koos et al, 1995). In Africa, the number of rural

dwellers without access to safe water supplies went up from 243 million in 1990 to 272 million in 2006 (Stravato, 2007).

In Sub-Saharan Africa, there are about 272 million rural dwellers lacking access to safe water, compared to 54 million in urban areas (Stravato, 2007). Poor rural water supply in Ghana is very serious. That is almost all the rural areas in Ghana have no access to potable water. It has been estimated that about only one-third of the rural population of Ghana has benefited from an improved water supply system (hand pump or piped) during the last two decades, with a service potential of about four million people. This state of affairs resulted in drudgery for women and children who have to travel long distances to fetch water, in addition to high incidence of water and sanitation related diseases in the rural areas (Cairncross, 1990).

The government of Ghana established the National Community Water and Sanitation Programme (NCWSP) in 1994, as a framework for the provision of water supply and sanitation services to rural communities and small towns but much has not been done as far as potable water supply and sanitation services are concerned. WATER, a UK International organization that supports deprived communities to gain access to safe water and sanitation has selected three regions in Ghana to benefit from an earmarked six hundred thousand pounds (£600,000) project to provide water and sanitation facilities for deprived communities (Daily Graphic, 2001).

Ghanaians have been confronted with acute water shortage problems for along time. Many people in several parts of the country still rely on open streams, rivers, lakes, ponds, dug-outs and impoundment reservoirs for their domestic water needs. These streams often serve as drinking places for animals as well. The health hazards posed by

this situation are endless and far reaching. Persistent water shortages are part of life even in urban areas. During acute period, workers scramble for water for long hours before going to work, resulting in the loss of significant and productive man-hours. School children also waste precious study hours looking for water. Ministries, Governments Departments, Health and Educational Institutions often face serious sanitation problems because of lack of water. Residents of newly developed estate and areas also cry for water.

Ghana enjoys substantial rainfall most of the year. With limited treated water resources on one hand and the increasing demand for water on the other hand, there is the need to look again at rainwater harvesting and also make more efficient use of water. For many years, mankind has relied on rainwater harvesting for household and agricultural water needs. Rain water was collected from roofs and stored in tanks and other receptacles. With the development of water treatment and distribution systems and well – drilling equipment, rainwater harvesting has been relegated to the background, even though the practice offers a source of reliable water.

The issue of water in Ghana has been viewed principally from the perspective of drinking water and sanitation. The wider implications of the contribution of water to socio-economic development are not often addressed in a multi-sectored and multi-stakeholder context at the various sector levels to support the requirements for water for drinking, energy and agriculture. In practice the full potential of water contribution to socio-economic development is yet to be fully harnessed. It is in the light of this that the Ministry of Water Resources, Works and Housing through the Water Directorate

organized the 1st Ghana Water Forum. The theme was, “Accelerating Water Security for Ghana’s Socio-Economic Development’.

Despite progressive improvement in the provision of sanitation since 1990, providing safe water and sanitation to large parts of the human population remains a challenge, especially in developing countries such as Ghana. Today 1.1 billion people around the world still lack access to improved water supply and more than 2.6 billion people lack access to improved sanitation (WHO, 2008). Improvements in sanitation have been far less in rural areas than in urban areas.

Furthermore, the Volta Rural Water and Sanitation Project (now called the Volta Community Water and Sanitation Programme) was formulated as a 10-year project (1993-2002) under the National Community Water and Sanitation Programme of the Ministry of Works and Housing. This forms part of a development co-operation agreement between the government (s) of Ghana and Denmark. The project is aimed at contributing towards the improvement on the living standard of the target population through the provision of reliable, safe and easily accessible drinking water, the involvement of the beneficiary community in the planning, implementation and management of selected water systems so as to ensure sustainability of each system by the community, and the reduction in water and excreta related diseases through health education and household adoption of improved latrines.

Over the years, some principles have been established as to what underpins the success and sustainability of rural water supply. Expressions such as “demand responsive approach”, “appropriate technology”, “village level operation and maintenance”, “community management” and “private sector participation”, have become well

entrenched in policy and strategy. However, subscription to these and other principles has not yielded the results expected. Sometimes, they are very poorly implemented, in other cases, they are simply inadequate. It is therefore time for us to reflect on some of the paradoxes and myths of rural water supply service delivery.

In the South Tongu District, the supply of these facilities has been slow. It is because, since 1990, the government of Ghana through District Assembly in collaboration with donor agencies such as DANIDA, ADRA and TOYACE provided only 171 facilities which comprised of stand pipes, boreholes and hand dug wells. However, not only has progress been slow, but, more shamefully, many of the constructed services have not continued to work over time. It has been estimated that only two out of three installed boreholes are working at any given time. Thousands of people, who once benefited from a safe drinking water supply, now walk past broken boreholes or taps and on to their traditional dirty water point.

1.2. STATEMENT OF THE PROBLEM

The population of the South Tongu district is estimated at 64,811 with females dominating at an estimated population of 35,404 while male population was estimated at 29,407 at growth rate of 1.22% per annum (Ghana Statistical Services, 2009). Out of the total population, only 36.6 % have access to potable water. There are 20 boreholes out of which 10 are functioning. There are also three communal wells (South Tongu District Assembly, 2009).

It is clear that about 63.4% have no access to potable water in the district. Besides being inadequate, the water is generally unhygienic. This might have contributed

to health hazards which the people are exposed to. The level of sanitation practice within the district is very low. Percentage of District population at present served by sanitation is 5.7% (CWSA, South Tongu District Assembly, 2009). About 32% of households have access to toilet facilities (South Tongu District Assembly 2009). The district has prevalence of diseases. Diseases such as malaria, diarrhoea, schistosomiasis, buruli ulcer, skin diseases, typhoid, tuberculosis, yaws and chicken pox are the diseases that are prevalent in the district. Malaria has the highest prevalence rate followed by diarrhoea, skin diseases, typhoid, schistosomiasis, tuberculosis, yaws, chicken pox and buruli ulcer have the lowest prevalence rate (District Health Administration, South Tongu, 2009).

There are also cases of bilharzias and intestinal worm infection which have not been reported to either clinic or hospital for treatment. There is high salinity of the underground water. Also, there is poor rainfall pattern, which prevents most community members from harvesting rain and store for domestic use.

Furthermore, most communities are far from Ghana Water Company Limited (GWCL) main lines. This demands huge capital for the construction of additional pipe lines to those communities. Lack of capital on the part of the Government has made it impossible for GWCL lines to be extended to the affected communities.

From the above, it is realized that the problem of poor rural water supply and utilization has effects on the people in the district, so there is the need for it to be addressed. This has made the researcher to come out with the following research questions

1. What types of water and sanitation facilities were created in the district?

2. What effects does the poor rural water supply have on the people in the district?
3. What measures are being put in place to ensure the sustainability of the water and sanitation facilities created in the district?

1.3. GENERAL OBJECTIVES

The general objective of the study is:

To examine the effects of rural water supply on the people of South Tongu District

1.3.1. Specific Objectives

1. To identify the various sources of drinking water and their spatial distribution.
2. To assess the health effects of rural water supply in the South Tongu District.
3. To examine the effects the rural water supply has on the socio-economic activities of the people in the South Tongu district.
4. To examine the contributions of donor agencies and institutions in the provision of water and sanitation facilities.

1.4. HYPOTHESES

The hypotheses to be tested in this research are as follows:

1. Rural water supply is strongly related to health
2. Water source is related to wealth

1.5. CONCEPTUAL FRAMEWORK

There have been different conceptual models that explain how water supply and sanitation generate health benefits. It was revealed from the observations made from time to time that, the harmful effects of unhygienic water are the evidence of water – borne epidemics such as typhoid, cholera, diarrhoea, intestinal worms, skin infections, malaria, schistosomiasis, filariasis, yellow fever, and dengue fever. The public health perception on health and its interrelation with the environment and socio-economic development also called for broadening the concept of the effects of water supply and sanitation.

Bradley (1980) extended the concept of water-borne diseases by classifying water-related diseases in several groups depending on transmission routes. Moreover, he stressed on the human factor approach which other writers also advocated. Saunders and Warford (1976) in their extensive review of the problem pointed to the “multiple disease source” and various modes of transmission of many water –related diseases. They have put forward the idea of a “water- use link” considering that the water –use patterns of a population play a crucial role. They also related their concept of “water-use link”, to the health benefits derived from various “program mixes” of physical facilities, health education and water use. Shuval et al (1981) further expanded the above concepts and proposed their “threshold - saturation theory” which relates health status to socio-economic level, pointing out that there is a threshold of socio-economic and health status below which no health benefits can be achieved by investing in sanitation, and an upper limit of “sanitation when further investments in sanitation do not result in further improvement of health status.

Schiffman et al (1978) also proposed a conceptual scheme linking environmental improvements, health and economic changes. In this scheme, the basic idea being that inputs (direct and indirect) generating health benefits are multiple and complex. It is therefore realised that many authors also talked about the various other factors playing a role in the health benefits derived from investments in water supply and sanitation, such as improved nutrition, economy and education.

The conceptual scheme linking environmental improvements, health and economic changes proposed by Schiffman et al is shown in figure 1.1. The environmental, economic, cultural and social factors included in this scheme are far from exhaustive, the basic idea being that inputs (direct and indirect) generating health benefits are multiple and complex.

From the scheme, an initial input in the improvement of water supply and sanitation produces “direct” health benefits by preventing the spread of waterborne diseases and improving nutritional status. The resulting reduction in sickness allows more time for productive work and educational pursuits which themselves increase the general wellbeing, thus generating further “indirect” health benefits.

Direct input	Improvements	Outputs	Selected	Selected
	Health	Economic		
		Outputs	Outputs	

```

graph LR
    subgraph Direct_Inputs [Direct input]
        A1[Water quality]
        A2[Environmental Improvements]
        A3[Health Education]
        A4[Other factors]
    end

    subgraph Improvements
        B1[Water consumption]
        B2[Household sanitation]
        B3[Animal barriers]
        B4[Food storage]
        B5[Water storage]
        B6[Use of soap]
        B7[Personal hygiene]
        B8[Beliefs]
        B9[Attitudes]
        B10[Knowledge]
    end

    subgraph Outputs
        C1[Morbidity]
        C2[Work lost]
        C3[Nutritional status]
        C4[Population malabsorption]
    end

    subgraph Selected_Outcomes [Selected]
        D1[Diarrhoeal]
        D2[Growth]
        D3[Food wastage]
        D4[Cost of food wasted]
    end

    A1 --> B1
    A2 --> B2
    A3 --> B6
    A4 --> B10

    B1 --> C1
    B1 --> C2
    B2 --> C3
    B2 --> C4
    B3 --> C4
    B4 --> C4
    B5 --> C4
    B6 --> C4
    B7 --> C4
    B8 --> C4
    B9 --> C4
    B10 --> C4

    C1 --> D1
    C2 --> D1
    C3 --> D2
    C4 --> D3
    C4 --> D4

    D1 --> E1[productivity loss]
    D1 --> E2[Medical costs]
    D2 --> E3[Future productivity losses]
    D3 --> E4[Cost of food wasted]
  
```

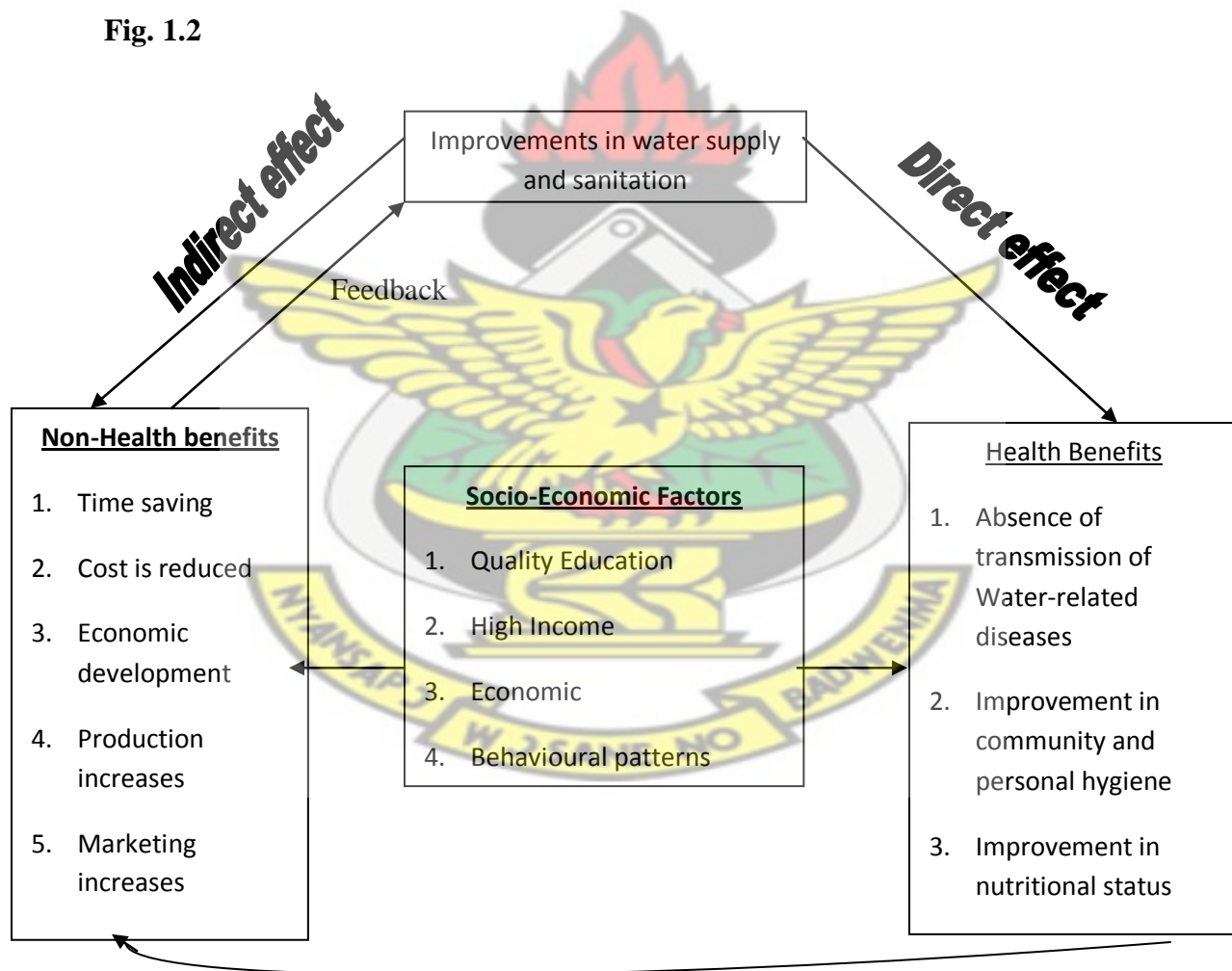
The flowchart illustrates the WASH intervention model, showing the progression from Direct Inputs to Selected Outcomes. The Direct Inputs include Water quality, Environmental Improvements, Health Education, and Other factors. These lead to Improvements in Water consumption, Household sanitation, Animal barriers, Food storage, Water storage, Use of soap, Personal hygiene, Beliefs, Attitudes, and Knowledge. These improvements then lead to Outputs: Morbidity, Work lost, Nutritional status, and Population malabsorption. Finally, these outputs lead to Selected Outcomes: Diarrhoeal, Growth, Food wastage, and Cost of food wasted. The Selected Outcomes are further categorized into productivity loss, Medical costs, Future productivity losses, and Cost of food wasted.

12

From this, the researcher designed a conceptual model that shows relationship between the health benefits derived from improved water supply and sanitation and non – health benefits. It also shows the relationship between health and non-health benefits that are derived from socio-economic factors such as education, income, economic, cultural, and behavioural patterns.

A CONCEPTUAL FRAMEWORK ON DIRECT AND INDIRECT EFFECTS OF RURAL WATER SUPPLY AND SANITATION ON HEALTH

Fig. 1.2



Source: Adapted from Schiffman et al (1978).

From the framework, improvements in water supply and sanitation lead to both health and non-health benefits. Concerning the health benefits, there is an absence of transmission of water-related diseases, improvement in community and personal hygiene and improvement in nutritional status. Non-health benefits such as time saving, that is much time wasted in looking for water is drastically reduced. Cost of spending on water and sanitation is also reduced; production increases, marketing also increases leading to economic development. These are derived from the improvement in the water supply and sanitation.

Apart from the improvement in water supply and sanitation, there are other socio-economic factors such as quality education, high income, economic and behavioural patterns also give health and non-health benefits. This conceptual framework talks about the direct and indirect effects of water supply and sanitation on health.

1.6. METHODOLOGY

1.6.1 Sources of Data

Data for the study came from two main sources, namely primary and secondary data. Primary source of data collection was mainly fieldwork. It included the use of both questionnaires and interviews. Secondary data were derived from documents, records obtained from the offices of the District Health Management Team at Sogakofe District Health Directorate and the head office of the Community Water and Sanitation Division of Ghana Water Company Limited. Finally, secondary data were also obtained from books, journals, magazines, newspapers and information also sought from the electronic sources.

1.6.2 Methods for Data Collection

Questionnaires were used mostly for the members of the District Water and Sanitation Team (D.W.S.T) and some literate members of the communities such as teachers, bankers and business men and women for the study. Questionnaires were used to collect information from doctors, nurses and the sanitary inspectors in the district and it was done by 'drop and take later' technique. This was done as the researcher wanted the doctors, nurses and the sanitary inspectors to have enough time and give more information about the problem of the poor water supply in the district.

In addition, interview schedules were used for the largely illiterate members of the selected communities. Furthermore, focus group discussion was also used to collect information from the community members in the study area. Besides, personal observation was used to crosscheck the information obtained during and after the interviews.

1.6.3.Sampling Design

There are 331 communities in the study area, but due to constraints imposed by time and money, only eighty-three (83) of these communities were sampled for the studies. Systematic sampling technique (with a random start of 4) was used to select the eighty-three (83) communities. Within each selected community, purposive sampling was used in selecting three respondents for the study. The sample size of 249 was used for the study. This was based on the number of communities selected and the respective respondents from each community selected. This was done in order to capture the entire district.

Despite the constraints of time and money, the researcher took care to remedy those weaknesses by using personal observation and informal interactions with members of the communities and the District Water and Sanitation Team (DWST). Finally the researcher's familiarity with the study area provided important insight into the problem under study.

1.6.4.Data Analysis

Data analysed were presented in the form of table, graphs, maps and charts. Computer software such as SPSS 16.0 was used to assist in the data analysis. The hypotheses used for the study were tested using Pearson Correlation.

1.7. SCOPE OF THE STUDY

The study was carried out in the four (4) area councils in the district. This study did not go beyond South Tongu District as far as the supply of potable water is concerned. The study sought to discover the factors contributing to the poor rural water supply in the district. That is the study examined the spatial distribution of potable water in the district. The research was not only to identify the health hazards of not having access to potable water but also the effects that the poor rural water supply has on the people's socio-economic activities in the South Tongu District.

1.8. JUSTIFICATION

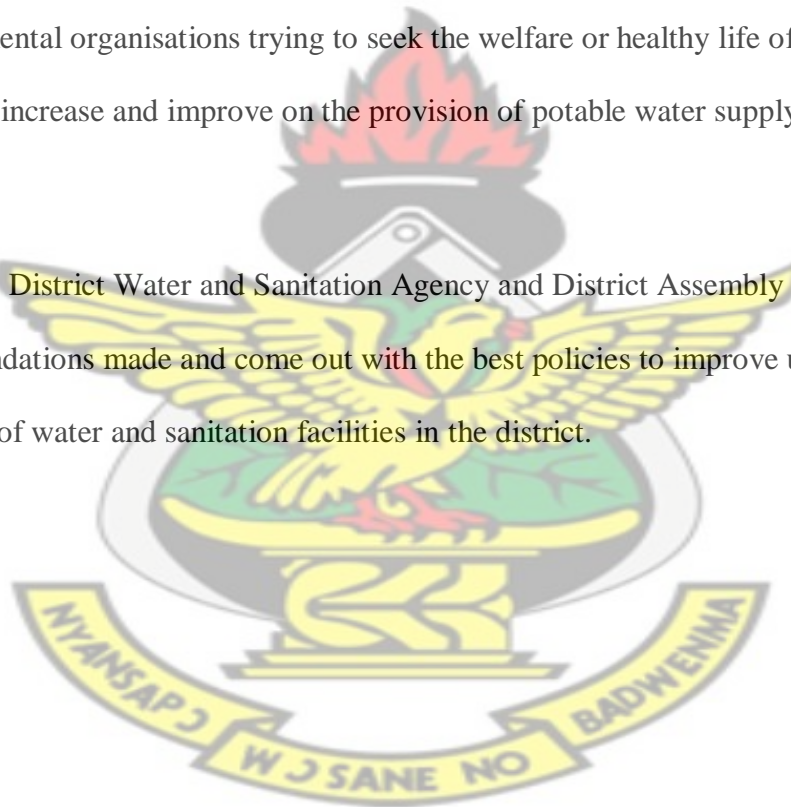
The fundamental reason for this study is to identify and assess the health hazards of poor rural water supply in the South Tongu District in the Volta Region of Ghana and also to generate new knowledge and skills so that the District Water Sanitation Team in

collaboration with the District Assembly, Ghana Water Company Ltd and Environmental Health unit will plan and develop strategies and policies to help solve problem of water and sanitation in the district.

It is hoped that the information that this study will unearth will be useful to the District Engineer, Community Water and Sanitation Agency in their effort to determine remedies to the problem of rural water supply and sanitation.

Furthermore, all institutions, international and local organisation, donor agencies and non - governmental organisations trying to seek the welfare or healthy life of the people will be able to increase and improve on the provision of potable water supply and sanitation facilities.

Above all, District Water and Sanitation Agency and District Assembly can adapt the recommendations made and come out with the best policies to improve upon the provision of water and sanitation facilities in the district.



CHAPTER TWO

2.0. LITERATURE REVIEW

2.1. INTRODUCTION

This chapter reviews literature on the effects of rural water supply and utilisation. Lack of access to clean water and sanitation systems are central public health concerns, globally and in Ghana. Human survival is dependent on water and it has been ranked by experts as second only to oxygen as essential to life (The Mirror, 2006).

It is against this background that water scarcity should be a matter of serious concern to all. Based on this, literature of the study was therefore reviewed under the following themes: The global water crisis, the causes of global water scarcity, water scarcity and women's burden, water supply, sanitation and health, benefits of rural water supply and sanitation projects and community participation and rural water supply.

2.2 THE GLOBAL WATER CRISIS

"If man is in movement; water is history, If man is a people; water is the world

If man is alive; water is life"(The Water Manifesto, 2001).

The above quote points to the fact that water is very essential for the survival of man in his journey on earth. In other words, if man has life, the very source of that life is water. Man and water are therefore inextricably linked in a web of unending relationships. In this direction, in a situation of adequate supply of water to a given community, their very existence is threatened. It has been established that our planet is

unique among the order known celestial bodies. It has water which covers three-fourths of its surface and constitutes 60-70 percent of the living world.

Water regenerates and is redistributed through evaporation, making it seem endlessly renewable. However, only one percent of the world's water is usable to mankind. About 97 percent is salty sea water and 2 percent is frozen in glaciers and polar ice caps. Consequently, that one percent of the world's water supply is precious commodity necessary for mankind's survival. Dehydration will kill us faster than starvation (The Green Dove Magazine, 2005). Water is a fundamental part of our lives. It is easy to forget how completely we depend on it. Human survival is dependent on water and it has been ranked by experts as second only to oxygen as essential to life (The Mirror, 2006). It is against this background that water scarcity should be a matter of serious concern to all. Some residents in the big cities and towns have to struggle daily in order to get water for their survival.

At the dawn of the new millennium, a number of factors appeared to be leading the world slowly towards severe water crisis. The increasing demand for water both domestic and agricultural use, change in consumption patterns, desertification, pollution and inadequate infrastructure are some of the factors responsible for this. In fact, it is no longer in dispute that, 31 countries, mostly in the Middle East and Africa have severe water shortages (The Green Dove Magazine, 2005). No wonder it is commonly held now that 'the war of the 21st century will be fought over water'. Again, it is projected that by the year 2025, 17 countries will be added to this list including Ethiopia, India and Nigeria (African Agenda, 2004).

The current global water crisis especially in the ever fast growing urban communities is a sure recipe for future human tragedy. According to the African Agenda (2004) about 1.4 billion people (one out of five) lack access to clean drinking water and about 80 countries, (some 40 percent of the world's population), had experienced water shortages by the 1990s. It was pointed out that even though water supply is expected to increase globally by 40 percent by 2020, the UN estimates that by 2025, two-thirds of the world's population will experience shortages of clean water. The hardest hit continent is Africa. This is because; whilst the average African family uses five gallons of water a day, its American counterpart uses about 100 gallon a day. In addition, about a quarter of Africans in the urban centres spend 10 - 20 percent of their income on water (Africa Agenda 2004).

Water is essential to human life and to all life on Earth. The freshwater resources are part of the global commons, a collective resource. In this direction, access to drinking water is one of the key aims of the UN's Millennium Development Goals (MDGs) to be achieved by 2015 and is directly linked to the achievement of other MDGs related to poverty, food, health and housing (Social Watch, 2003). Indeed, it was noted in that report that some 2.4 billion people worldwide are estimated to lack adequate access to sanitation, and more importantly, more than twice the number of persons will lack access to safe drinking water.

According to the Social Watch (2003), one-third of India is drought prone and water is the country's most contested natural resource, having significant impact on rights to livelihood of people in general, and the marginalized in particular. The report noted that there is increasing disparity in access to water and inter-and intra-regional conflict

over water is increasing. In many cases, water is being brought from Adivasi and rural areas to feed the growing water needs in urban areas. For example, drinking water for Bombay is obtained from the Adivasi area in Thane. Since income levels are already low in most African countries, the impact of water shortages on the poor cannot be over emphasized. As such, the 'water issue' will continue to be a major developmental issue in most developing countries for some time to come.

According to Winpenny (1994), water is becoming one of the largest and certainly the most universal of problems facing mankind as the earth moves into the twenty-first century. It is noted that the task of supplying enough water of the required quality to growing populations and the safe disposal of wastewater are straining many authorities to the limit. It is argued that the main cause of the current water situation globally is the failure to treat water as a scarce commodity. As a result, the depletion of freshwater resources for domestic, industrial and agricultural purposes is likely to become the single most important environmental issue facing many societies of the world especially, urban dwellers. Even countries not yet facing water crisis are likely to experience large increases in the cost of providing water to meet growing demands.

For many in the developing world, gaining access to clean and affordable water can be a difficult daily struggle. It has been noted that in most countries in North America and Europe, there is a water tap in every home and people take for granted that water will flow when they turn the tap. However, this is not the case in the developing world. More than a billion people lack access to clean and affordable water and approximately 2.4 billion people lack access to proper sanitation service. Over 2 million people, mostly

children, die annually from diarrhoea diseases related to lack of access to clean water (IFFM, 2003). The lowest rate of availability is in Asia and Africa.

It is important to note that one major cause of water scarcity globally is pollution of water bodies which serve as the main source of drinking water to many communities. According to Kenneth et al, (1997), contaminated water is a major problem even in the United States. Over the years virtually every major body of water in the nation has been polluted. Rivers, streams and lakes have been fouled with organic and inorganic chemical waste. Despite Federal Laws since the 1970s, to regulate and control water pollution, water pollution remains a form of environmental abuse that continues to cry out for attention. Water, like air is a prerequisite of life. We drink it, bathe in it, and use it for recreational purposes, eat many of the creatures that live in it, and rely on it for use at home and in our economy. Each day, the United States uses 338 billion gallons of fresh water, approximately 1,400 gallons per person. The United States has a higher rate of fresh water consumption than any other industrialized society. Water pollution thus constitutes a threat that is just as serious as the abuse of the earth's air. There is a distinct possibility that we could run short of water, not only because of pollution, but also because the demand for fresh water is subject to increase.

In the "Network Lines" (1995), a quarterly Newsletter for West Africa, it is noted that, current trends in growth of industries, economic and the general population put tremendous stress on the world's water resources. Most regions of the world are finding their water resources insufficient. Man continues to make blunders in water use and conservation, the worst of them being massive pollution of our water bodies. According to the newsletter, population is the most single factor that threatens exhaustion

of water resources. Whether the future generations will have enough water resources to meet all domestic, industrial and other needs will depend on how the present generation manages the available water resources today. The expansion in urban population growth and increasing use of water in farming activities largely compound the problem. Man's quest for development often leaves in its trail the degradation of water including water resources which often serve as a tool for development.

In many parts of the world, current patterns of water resource development and use are not sustainable. Water use has been growing at more than twice the rate of population increase during this century. Approximately one-third of the world's population is already living in areas facing moderate to severe water stress in terms of withdrawals relative to availability. Under current patterns of water use, with continued economic and population growth, this population could reach two-third of the world's population by 2025. Currently, it is estimated that some 1.2 billion people in developing countries, of whom approximately 300 million are located in urban areas, lack access to safe water supply. With the continuing rapid urbanization, developing countries would need to provide services for an additional 2.4 billion people in order to achieve full coverage by 2025. Given the urban explosion, developing countries will find it increasingly costly to provide continuous and reliable services to those sectors of their urban population currently served and to expand the distributional network to a growing urban sprawl. Already, in many cities both in developed and developing countries, ground water is being depleted and utilities are forced to develop resources located further away at increasing cost. Often, service is intermittent, available for only a few hours per day or even per week. Water losses in distribution systems in some cases

amount to as much as 50 percent of the total amount supplied to urban areas (Takashi et al, 1999).

According to a research conducted by the International Water Management Institute (1999), one third of the world's population will experience severe water scarcity within the next 25 years. The study, which is the first to look at the complete cycle of use and reuse of the world's fresh water, finds that the water sources that supply the world's wells, lakes and rivers are disappearing based on the study. Water scarcity is now the single greatest threat to human health, the environment, and the global food supply (International Water Management Institute, 1999). It also threatens global peace as countries in Asia and the Middle East seek to cope with shortages. The study, 'Water Scarcity in the Twenty-First Century', projects water supply and demand for 118 countries over the 1990/2025 period.

The study examines on a country-by-country basis not only how much water is withdrawn by the four major sectors that use water; agriculture, industry, households, and the environment but also how much remains to be used and how much returns to the ground to "recharge" aquifers. In recent years, as more water has been used to support growing populations in each of these sectors, there has been less water available to recharge groundwater supplies. Water scarcity is already a major destabilizing force within countries because different sectors of the economy are vying for scarce water resources. Within the next 25 years, there is great potential for more water conflict not just within countries but between them (International Water Management Institute, 1999).

Historically, Egypt has threatened to go to war with her neighbours to protect its water supplies if necessary. The study notes that those who will suffer most will be the

people in the world's poorest nations. Already the women and children of these countries walk great distances to retrieve water for cooking, drinking, and other household needs, farmers are losing their land as water sources decline, and wildlife is disappearing as wetlands dry up.

The single greatest impact of water scarcity will be on the food supplies of the poor. To meet the world food supplies in 2025, the study on food security provides two scenarios; a "business as usual scenario" where no increases in irrigation efficiency are foreseen and a scenario where irrigation efficiency is dramatically increased. Under the business-as-usual scenario, 60 percent more water will be required for irrigation to meet the world food supplies in 2025. Even if irrigation efficiency is greatly increased, between 13 and 17 percent more water will be needed and still 2.7 billion people will remain short of water. The study uses the United Nations "medium" projection for population growth (International Water Management Institute, 1999).

In January, 1998, the authorities of Papua New Guinea announced that more than a million people out of the country's population of 4.3 million were in a critical situation because of the drought-induced shortage of water (Ricardo, 2001). Also, in June, 1998, the international press reported violent protest demonstration (burnt-out cars, looted shops etc) in the popular district of Karachi in Pakistan. The cause; failure to distribute water for two whole days which is a common occurrence throughout the year. It is necessary to note that it is normal and understandable that populations which have suffered permanent (or frequent) amputation of their right of access to a vital necessity should rebel in a forceful manner. In this direction, if nothing is done to reverse present

trends, the number of people without access to drinking water in the years 2025 will rise above 4 billion, half the world's population (Ricardo, 2001).

Roland et al (1994) noted that though significant progress has been made during the "International Water Supply and Sanitation Decade (1981-1990), about 25 percent of the urban residents are still not served with safe drinking water. Of all the basic needs, water is undeniably the most essential to survival and to individual health and family welfare. Yet, it is one commodity that people are least able to provide for themselves. Roland et al (1994) pointed out that in Mexico City, tap water reaches 80 percent of the population. In addition, more than three quarters of Jakarta's (Indonesia) population have no direct connection to piped water. Some 10 percent depend solely on water vendors with water costing five times that of the piped water. Also, 35 percent of the population of Metro Manila who live outside the water distribution system either purchase water from private vendors or are served by groundwater. Lower income groups in Lima spend three times more per month on water from vendors but consume less than a sixth as those with running water.

Africa has the lowest water supply coverage in the world. More than 1 in 3 Africans do not have access to improved water supply facilities. Coverage level in the year 2000 for water was 62 percent. The sad reality is that the absolute number of people without water is increasing and unless drastic actions are taken, the absolute number will double between now and the year 2020 from 200 million to 400 million. The majority of these people will be those living in rural, informal and peri-urban communities (PRONET, 2004)

2.3 THE CAUSES OF GLOBAL WATER SCARCITY

Looking at the current gloomy water situation in the global context, Winpenny (1994), pointed out that a number of factors account for the inability of many societies to meet their growing water demands. In the first place, in many situations, supply systems and consumption habits have in general failed to adapt to the increasing pressure of demand on the water resources and to the environmental strains that it causes. In wetter parts of the world, the availability of water has been taken for granted, its provision has been a routine operation, and engineering solutions have tended to predominate. In drier regions, water has always been a central preoccupation and many different kinds of social arrangements have risen to deal with the allocation and use of this scarce resource. In these regions, the age-old problem is everywhere becoming more serious in the face of population growth and economic development.

Additionally, in most cases, water has been under priced as an economic resource. Users do not, in general treat water as an economic (that is, scarce) commodity, and the market is insufficiently used as a means of solving the problem of scarcity. In the same situation, water is available to users at little or no cost. For instance, with communities relying on natural supplies such small-scale roof catchments; once the relatively small installation cost has been paid for, this water becomes free for all, for all practical purposes.

2.4 WATER SCARCITY AND WOMEN'S BURDEN

According to Malini (1999), it was found out that women in the NepalMountains bear the lion's share of domestic and farm responsibility, much more than their men folk or even

their counterparts in the plains. The backbreaking daily chores of carrying water, fodder and fuel wood up and down steep mountain slopes consume a large portion of a woman's time and energy.

Though water is in natural abundance in Nepal, the hills reel under acute water scarcity and women have to travel miles for a bucket of water. The average woman in the hills spends at least a fourth of her day fetching water from sources that are getting farther and farther away as more and more natural springs dry up. This scarcity in a region of plenty seems like a cruel joke. Even as Bishnu Kumari trudges up and down the slopes six times daily carrying water for her household, in the valley below the blue Indrawati river flows down from the snowy mountains. But the water in the Indrawati is of little practical use to Bishnu Kumari who has to depend on the rains to irrigate her fields. If the rains fail or fall at an inopportune time, her crops are ruined. It is a common sight to see women-young and old- making their way along steep, rugged tracks with babies in arms, toddlers in tow, and huge containers of water on their heads. It is a journey fraught with perils- landslides, wild animals and with no medical help at hand (Malini, 1999).

Given the roles of women within the care economy, (defined as community support and unpaid house work provided by women including provision of water), it is clear that women carry heavier threats, burden and risks under this situation of water scarcity (IFFM, 2003). It was found out that as it is their responsibility to provide water to the household by any means necessary, and whatever the difficult conditions, the situation of unavailability of water leads to serious despair, reduced income that was already very limited aggravated poor health and sanitation, and even violence. Some

women have indicated that lack of water means lack of dignity and even sometimes violence in the home.

The IFFM report noted that because of their social position and high level of vulnerability women tend to have less access to water for their personal needs when the resource is lacking. Despite the fact that they are the household water providers, they serve themselves last. This situation of very limited access to water has dramatic impact on women's health in particular on pregnant women and those nursing mothers. Scarcity of water as well as skyrocketing water prices put poor women in situations where they are obliged to walk long distances to find cheaper water and use unsafe water from hand-dug wells. Moreso, it is a common practice to withdraw children from school, in particular girls to send them to fetch water to supplement the mother's heavier work burden. Other students, especially girls simply choose not to go to school because they have no water to bathe. Thus, given the role of women in providing community support and household labour, including provision of water, it is clear that women bear a greater burden under the current situation of water scarcity.

According to Miloon (2003), the consequences of having inadequate or no access to water are devastating, especially for women and children. When water is not readily available it is particularly the women and children who have to spend a large amount of time fetching water back to their houses. Women and girls carry the bulk of the burden in providing water for households and often have to walk great distances in search of water to meet minimal household needs. Truancy among school children is on the increase due to the fact that they rather use the school time to look for water. In addition, there is evidence of increasing daily household labour, especially health care responsibilities for

women and girls. The commercialization of water adds directly to this burden since as the Ministry of Health shows, 70 percent of all diseases treated in out- patient clinics in Ghana are water related. Water scarcity also increases household tensions that lead to violence against women and children (Tanoh and Cusack, 2003).

According to Social Watch (2003), there is evidence of increasing daily household labour, especially health care responsibilities for women and girls. Absence of adequate access to water leads to 'economizing' water. This means that the right amount of water to use, especially in sanitation will have to be reduced. Ghana Ministry of Health's campaign on the washing of hands after one has visited the toilet becomes useless and the purpose becomes defeated. When water is scarce, women and children are those who suffer. This is because they have to get water at all cost for the man who is seen as the 'boss' of the house. Women still carry most of the burden of domestic labour whether or not they are in waged work. Women have less free time than men and are more likely to spend it at home so that they are constantly 'on call' even when not actually working resulting in fragmented, interrupted periods of leisure (Taylor, 1999). This burden, obviously, includes water fetching for the household. Social Watch (2003) indicates that lack of availability and quality of privatized services makes it more time-consuming for women to access them and adds to the stress which they experience combining working and care taking roles. It continues that the good privatized services are expensive, thus, poor women are at a disadvantage. This confirms the fact that women are mostly at the receiving end when water, a social service, is scarce. They take their time and add to their already heavy burden. Environmental degradation means water

reserves dry up due to lack of forest cover, increasing the distance for women fetching water (Social Watch, 2003).

In the African society women are noted for doing all the household chores in addition to others outside the household. A study by Oppong and Abu (1987, page 70) showed that 10 out of 28 women worked as little as 0-2 hours daily outside home. Infact the mean of the hours spent outside home per day was 4.8. They use the remaining hours to do domestic work. They stated, “one young clerical worker lived with the parents and was the eldest of 8 children. She scarcely had any free time and when the piped water to the house was off, which was often, her day began at 4 in the morning with several trips to fetch water.” This observation confirms the fact that children and women have to wake up very early in the morning in search of water and walk long distance for that purpose.

The WATSAN NEWS (2003) indicated that, huge amount of time and energy are spent in caring for the sick as a direct result of diarrhoeal diseases. Added to these is the daily burden of women and children in collecting often unsafe water far from home. Women and children can lose up to 1/3 of their daily food intake energy in collecting water. The journal continues to state that the energy losses is particularly devastating to the health of growing children and to pregnant and breastfeeding women.

Oppong and Abu (1987) went on to state that children are also not left out. They stated that, Ghanaian households have in the past relied upon the services of children to maintain traditional labour intensive modes of agriculture and domestic production, processing and transportation of needed resources such as fuel and water. The need for children’s indispensable labour was the major reason given 20 years ago by Dagomba parents and elders for being reluctant to send their children to school (Oppong, 2004).

Cooking and laundry are the major tasks of women and where necessary water and fuel collection. All these are delegated, where possible, to the younger household members.

Domestic tasks have to be added to their productive and income earning work and so the working day tends to be long. Studies on time use all over the world show that compared to men, on the average, women everywhere spent more of their time working. They have less time for leisure. 'Women fetch water most of the time from Nsaki River. Even though the boreholes are situated within the village itself, women hardly use it because it is hard and salty. Whiles most women fetch water between 5 and 6.30 am, the actual time spent in carrying water home varies; this depends on where the source of water is (Yelbert, 1992). Yelbert goes on to state that a lot of time is spent to going long distances for water and this affects the women's time to socialize. It is clear from this that the fetching of water for the family is the prime responsibility of women and children whilst the man does virtually nothing. This affects the women and children health-wise. Every eight seconds a child dies from a water-borne illness. Every day, nearly 6,000 children die from water-related illnesses ([www. Worldvision.org](http://www.Worldvision.org)).

2.5 WATER SUPPLY, SANITATION AND HEALTH

The lack of access to clean water and sanitation systems are central public health concerns, globally and in Ghana. No single intervention has greater overall impact upon national development and public health than does the provision of safe drinking water and proper sanitation. Universal access to water is technologically possible in the twenty-first century. The current failure to provide universal access and the remaining prevalence of morbidity and mortality related to water related disease are public health crises of the first order (IFFM, 2003).

In addition, the IFFM noted that 16 percent of the world's population, approximately 1.1 billion people, is still without some form of improved water supply. The lowest rates of availability are in Asia and Africa. Over 5 million people a year die from illnesses linked to unsafe drinking water, unclean domestic environment and improper sanitation; mostly children under age 5. At any time over half the population in the developing world suffers from one or more of six diseases associated with water supply and sanitation. Cholera for example can only be reliably prevented by ensuring that all have access to adequate sanitation and more importantly, safe drinking water.

Diarrhoea is the most important public health problem affected by water and sanitation and can be both water-borne and water-washed. According to the WHO(2000), about four (4) billion cases of diarrhoea each year cause 2.2 million deaths, mostly among children under the age of 5. This is equivalent to one child dying every 15 seconds. These deaths represent approximately 15% percent of all child deaths under the age of five in developing countries. Water, sanitation and hygiene interventions reduce diarrhoea disease on average by between one-quarter and one-third. It is estimated that 6 million people are blind from trachoma and the population at risk from this disease is approximately 500 million. Considering the more rigorous epidemiological studies linking water to trachoma found that providing adequate quantities of water reduced the median infection by 25% percent (WHO, 2000).

According to the WHO (2000), approximately 200 million people in the world are infected with Schistosomiasis, of whom 20 million suffer severe consequences. The disease is still found in 74 countries of the world. In reviewing epidemiological studies, it

was found that there was a reduction in the disease by 77% from well-designed water and sanitation interventions (WHO, 2000).

Also, intestinal worms infect about 10% of the population of the developing world (WHO, 2000). Intestinal parasitic infections can lead to malnutrition, anaemia and retarded growth, depending upon the severity of the infection. These can be controlled through better sanitation, hygiene and water supply.

According to the IFFM, (2003), inadequate water and sanitation contributes to 70 percent of diseases in Ghana. In 2000, 40 percent of out-patient visit to health facilities were for malaria and an additional 12 percent for health problems (diarrhoeal diseases, skin diseases and acute eye infections) that are a direct consequence of poor and absence of water supply. In the same vein, in Ghana, the incidence of some water borne-diseases, including cholera has increased while the rate of decline for others, such as Guinea worm has slowed or has been reversed in recent years. Reduced access to water has contributed to the situation. Unless improved water is provided to the widest possible area, water related diseases are likely to remain prevalent throughout the entire population. However, uninterrupted access to treated and piped water is only significant in selected parts of urban areas especially Accra.

Relating the problem of water scarcity to health, the Ghana Poverty Reduction Strategy, (2003-2005), noted that the situation is even worse in the urban districts, especially those in the periphery of urban areas. A study of 60 communities in the second largest municipality in Ghana (Kumasi Metropolitan Assembly) and five other districts found that 23 percent of the sample did not have access to pipe-borne water or pipe network. Moreover 63 percent had pipe network but had no water or experienced

irregular flow of water and up to 30 percent of households depend on hand-dug wells. Using access to water as an indicator of poverty, the study estimated the level of poverty in this urban sample to be between 50-75 percent. The study suggests that some districts even in the larger urban classification would require prioritization of investments in water to alleviate poverty.

2.6. BENEFITS OF RURAL WATER SUPPLY AND SANITATION PROJECTS

Most rural water supply and sanitation projects have been justified on the basis of assumed improvements in health. The available evidence suggests that there is a very tenuous link between improvement in health and investment in water supply and sanitation services. The best that can be said is that these services may be necessary, but not sufficient to achieve any tangible effects on morbidity and mortality. The complex chain through which disease is transmitted does not lend itself to simple interventions. Other factors such as human behaviour and its interactions with the environment are just as important in determining overall health status as availability of clean water. Improvements in health are highly correlated with literacy, level of female education, employment, poverty and income rather than the level of water and sanitation services. Thus in practice, human behaviour, particularly in low-income rural areas, has overcome any theoretical links between improved services and improved health (Briscoe et al, 1986).

Fortunately, most investments in rural water supply can be justified on grounds other than achieving improvement in health. Besides the possible health effects, there are also some important non-health-related effects. In particular, rural water projects lead to a

saving for villagers in the time and effort required to get a given quantity of water to their home or workplace.

This time saving is often substantial. For the vast majority of rural dwellers, getting water is still time-consuming and heavy work, taking up about 40% of women's time in some areas. Improvement in the project reduced that burden. In some cases, the time-savings can be an hour or more per household per day (Briscoe et al, 1986).

A key step in estimating the time-savings effect is the determination of the value of household of the time saved. Saving time has greater or lesser value to a household, depending on what its members can do with the extra time. Regardless of what the members actually would do with the time, a valid measure of its value to them can be inferred from how much they could earn if they used it in income-producing work (Briscoe et al, 1988).

Furthermore, the cost of buying and transporting water is reduced when there is an improvement in the projects. This happens when low-cost technologies are employed for providing safe drinking water and basic sanitation as it is suitable especially in low-income groups in urban and rural areas of developing countries.

2.7. COMMUNITY PARTICIPATION IN RURAL WATER SUPPLY

There have been several attempts to define community participation. The World Bank (1998) defines it as “a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them”. Briscoe and Ferranti (1988), among other things, identify community participation as having occurred when the community itself in the course of implementing a project act as the

primary decision-maker, the primary investor, the primary maintainer, the primary organizer and the primary overseer. Chauchan et al (1983) were also of the view that participation implied beneficiaries being responsible, and exercising authority and control of their services. Srinivasan (1990) identifies four forms of community participation.

The cheap labour concept of participation involves the community providing free unskilled labour for construction usually by carrying pipes, digging trenches, and performing other unskilled construction tasks. Engineers and technicians do the more technical part of the projects. This type of participation is usually aimed at lowering project cost.

The 'cost-sharing' concept of participation takes the form of community making payments (even if they are just token payments) towards the maintenance of the facilities. According to her, this is taken by some project managers as an indication of a community's expression of the value they attach to a service and their service and their commitment to ensure its continuous operation.

The 'contractual obligation' concept of participation entails the formulating of a written contract detailing the roles and responsibilities of the various actors in the project design and implementation process, namely the government, the NGO and the community. This according to her, assumes that support of local leaders will legitimize the projects, while the water committees that are usually formed due to adoptions of this method will be able to promote, manage, and monitor local contributions and water usage. It is also assumed that training of locals in pump repair and maintenance will be a form of technology transfer.

The ‘community decision-making’ concept of participation takes the form of participatory community education and a broad-based decision making process involving especially village women. One of the best known arguments for participation has been the past failure of infrastructural projects that did not involve the users. Participation has therefore become a way of ensuring that, after the facilities have been installed in the communities, they remain operational under the management of the users after the providers have withdrawn their support.

The natural resources of the third world have been utilized and managed by the local inhabitants for centuries. They have developed their own ways of protecting and conserving these resources. They also usually have a better knowledge of these resources as well as some useful means of capturing potential benefits than outsiders. Involving them will therefore be a way tapping into their knowledge base and utilizing it to promote the sustainable use of the resources.

The concept and process of participation is a means of empowering ordinary citizens to make judicious use of their resources. It is also a means of developing decision-making and organizational structures upon which further development assistance can be built. If the methods used are broad-based and democratic, it can be a means of promoting good governance at the grassroots levels, as well as involving women, who are the users and managers of water. Participation is a means of developing within beneficiaries communities a sense of responsibility towards new infrastructure. It also gives projects a ‘demand orientation and build ownership throughout the project cycle by giving communities control and authority over decisions and recourses for implementation, operation and evaluation

There is growing consensus about the need to adopt an integrated approach to water resource management, involving “all sectors and institutions which use and effect resources. One of the operational principles in this regard is the adoption of a participatory approach that is involving users, planners and decision-makers at all levels. Thus community participation is part of a greater effort aimed at achieving integrated water resource management.

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CHAPTER THREE

3.0. STUDY AREA

3.1. INTRODUCTION

This chapter examines physical and socio – economic characteristics of the South Tongu district. Under the physical characteristics the following were discussed; Location and size, Climate, Vegetation and Geology and soils.

With the socio – economic characteristics the following were discussed; Population characteristics, Settlements, Education, Health, Water and Sanitation, Economic activities and Poverty status of the district.

3.2 PHYSICAL BACKGROUND

3.2.1. Location and Size

The South Tongu District, which was carved out of the Tongu District, is one of the eighteen Districts in the Volta Region. The District is located in the southern part of the Volta Region and bounded to the North by the North Tongu District, to the East by the Akatsi and Ketu Districts, to the West by the Dangme East District of the Greater Accra and to the South by the Keta District. The District has a total land area of 594.75 sq. km. and lies between latitude 6° 10' N and longitudes 30° 30' W, 0°45'W.

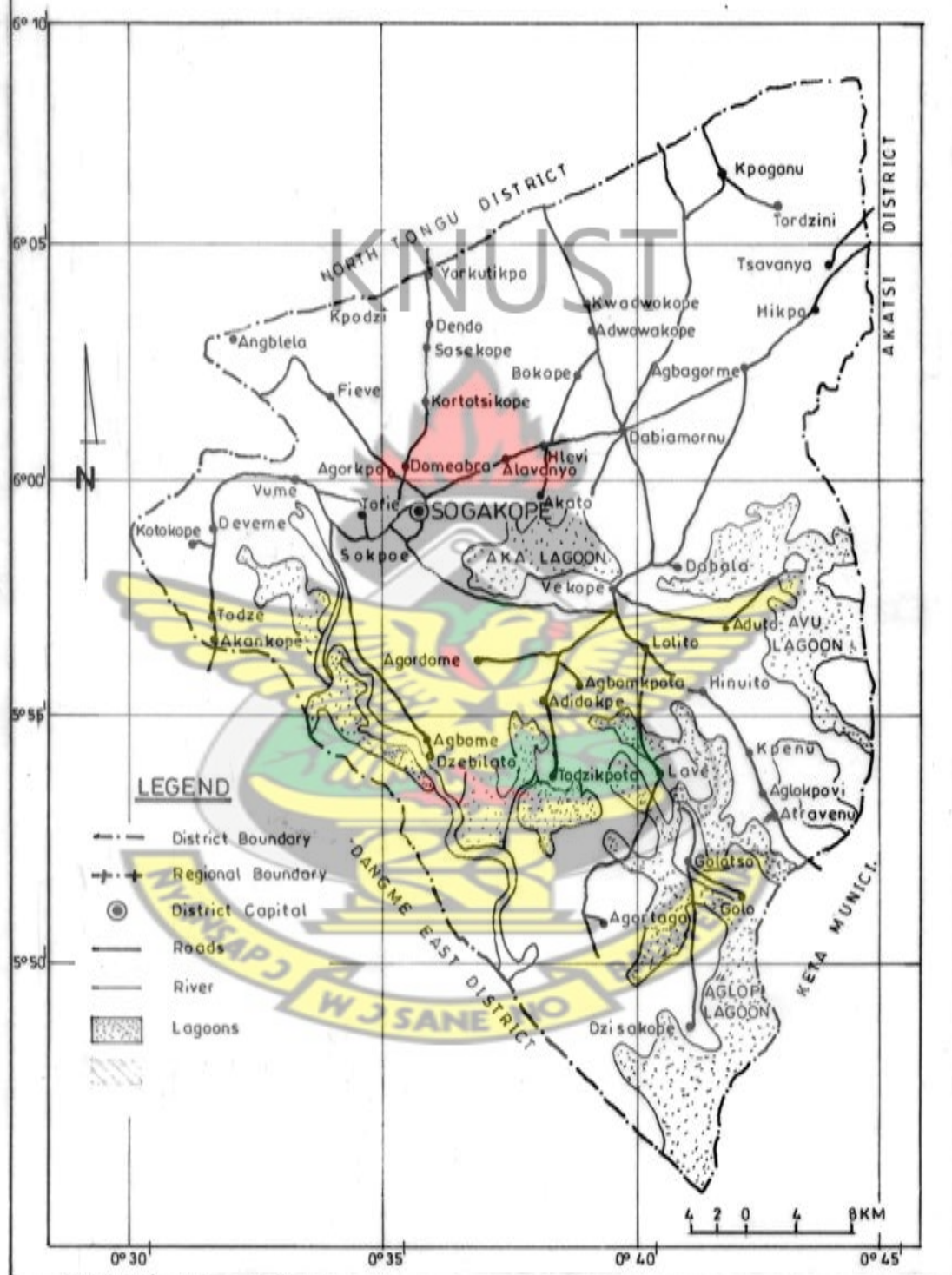
The district is low-lying flat land, grassland and greater portion is below sea level and the rest is 75meters above sea level. Due to the low-lying nature of the land it is easily flooded when there is little rainfall. The Accra – Aflao highway passes through the district of about 30km, in addition, the main road to Keta also passes through the district

of about 20km. The rest are feeder roads and track roads, which constitute about 50% and 30% respectively.

There are rivers and streams and the main river is the Volta River which most of the people use for their domestic purposes. There are also lakes and lagoons such as Angor lagoon, Avu lagoon and Aka lagoon where fishing is done on a large scale to earn a living. Almost all the towns and villages are linked with roads and tracks except those that are islands. These are shown on the South Tongu District map in figure 3.1.



FIG. 3.1 MAP OF SOUTH TONGU DISTRICT



SOURCE: South Tongu District Assembly

3.2.2 Climate

South Tongu District falls within the dry equatorial climate. Temperatures are between 22.6°C to 29.30°C. The district experiences two rainfall maxima seasons. The first one is between March to July and the second one from August to October. The average rainfall is about 195mm. Humidity is between 60% and 65% and daily evaporation rates range from 5.4mm to 6.8mm (South Tongu District Assembly, 2009).

The major dry season begins in November and extends through March during which only occasional rains are experienced. During the early part of the major dry season, the desiccating Harmattan wind from the Sahara regions blow across the area, this dries up the remaining water in stream, ponds and lakes and exposes the vegetation to bush fire (South Tongu District Assembly 2009).

3.2.3. Vegetation

The district lies in the coastal savannah vegetation. This vegetation is dominated by coconut trees and patches of coconut grooves. There are mangrove trees around River Volta and other creeks and streams. Tall and short grasses are also found in this vegetation.

3.2.4. Geology and Soils

The underlying rocks in the district are metamorphic in origin and consist of mainly of Dahomeyan Acidic gneiss and schist. There are clay deposits sand and gravel. There is also salt deposit at Gamenu (CWSA, South Tongu 2009).

The district has soils of high agronomic value.

They are the following: Ziwai-Zebe Complex (Dystrophic Plannosols), Agawtaw-Pejeglo Association (Stagnic Solontz), Toje-Agawtaw Associations.

Others include, Sogakope-Pejeglo Association (Ferric Luvisols), Amo-Tefle Association (Gregic Cambisols), Ada-Oyibi Association (Calcic Gleysols) and Aveyime-Zipa Association (Chromic Luvisols).

3.3.SOCIO – ECONOMIC CHARACTERISTICS

3.3.1. Population Characteristics

The population of the district is estimated at 64,811 with female slightly dominating at an estimated population of 35,404 while Male Populations was estimated at 29,407 at growth rate of 1.22% per annum (2000 Population and housing census, Ghana Statistics Services, 2009). This growth rate is low compared to the regional and national growth rate of 1.9% and 3.0% per annum respectively. Forty percent of the population is under 15 years of age. Average household size is 4.6% Children within the ages of 0- 14 constitute 2.4 % of the district's population. Out of this only 11.5% are within the ages of 0-4 years. The population aged above 65 years is 8.3%. The dependency ratio in the district is 103.4.

The district population reduced from 1.8% between 1970 – 1984 to 1.22% between 1984 – 2000. The reduction can basically be attributed to the out migration of citizens especially fisherman to other fishing communities and the migration of the youth to the cities. Out of the total population, only 11.3% live in the urban areas with 88.7% living in the rural areas. The total urban population of the district is lowest in the region, which is 27%. This is represented in table 3.1.

Table 3.1 Population Trend in South Tongu District.

YEAR	POPULATION	GROWTH RATE %
1970	41,618	-
1984	53,252	1.8
2000	64,811	1.22
2006	69,702	1.22
2007	70,552	1.22
2008	71,413	1.22
2009	72,285	1.22

Source: Ghana Statistical Services, 2000.

3.3.2.Settlements

The settlement pattern in the district was not well planned. There is a rural – urban split in the district. Rural settlement occupies 92% whilst urban settlement has 8 % (South Tongu District Assembly, 2009). Sogakope is the District Capital but it was not well planned. The buildings are not in any proper and acceptable layout. Because of this the Ghana Water Company Limited (GWCL) finds it very difficult to connect the whole township with pipe-born water as far as lying of the pipe lines is concerned. This also applies to other community in the district. Very few villages are nucleated where they benefit from borehole source of water. Majority of the villages are scattered or dispersed

and isolated which makes it difficult for them to be supplied with either borehole or pipe-borne water. Lastly most of the people do not avoid floodable areas in building their houses, and this is common in the rural areas in the district.

3.3.3. Education

The literacy rate in the district is encouraging. The youth literacy rate of 75% in the district is among the highest in the region. This implies that the district has a high trainable youth population. This is due to availability of basic and senior high schools in the district. There are 68 Kindergartens, 90 Primary schools and 43 Junior High Schools. The district has only two Senior High Schools and one Technical and Vocational Institute. This is shown in table 3.2.

Table: 3.2 Numbers of Basic and Senior High Schools in the District

Schools	Number
Kindergarten	68
Primary	90
Junior High School	43
Senior High School	02
Technical and Vocational Institute	01

Source: South Tongu District Assembly, 2009.

3.3.4. Health

For the purpose of effective health delivery, the District is sub-divided into six (6) sub-districts. The health service in the District is organized as a 3 level service delivery structure. The first level service is delivered by Community Health Officers at the demarcated 17 Community Based

Health Planning Service Zones, the second level by Health centres, while the third level by hospital services. The hospital acts as a referral point for health centres. The District Health Directorate oversees the entire Health delivery service in the District.

The District is fairly well served in terms of number of health facilities but many of those are not functioning well due to lack of critical qualified staff, logistics and equipment. It is served by 13 health facilities made up of one Government hospital, one polyclinic owned by Catholic Mission, 8 health centres, one private clinic-FAME clinic, one maternity home-Good Shepherd Maternity Home (accredited by NHIA) and 2 CHPS outreach points. There are also private chemical shops and sellers with no formal link with the government health service and traditional birth attendants some of whom had received training from the health sector.

Two pharmacy shops available are accredited by NHIA. Health services provided in the district are both curative and preventive services. The methods used for the health services are mainly orthodox (scientific) and traditional. The Government District Hospital and Comboni Polyclinic are the only well equipped facilities. Even though a lot of efforts have been made to improve access to health services delivery, patronage at the rural areas is still very low because of lack of education, ignorance and financial constraints.

The District currently has staff strength of 319 with a gap of 181. The total number of nurses at post is 73. Doctor to client ratio =1:3690 which is far high than the National figure of 1:500 (District Health Directorate, South Tongu, 2009)

The top ten diseases in the district are shown in the table 3.3.

Table 3.3 Top ten diseases in the South Tongu District

Diseases	YEAR			
	2006	2007	2008	2009
Diarrhoea diseases	649	978	1123	3179
Schistosomiasis	20	-	22	170
Buruli ulcer	-	-	-	08
Diseases of skin and ulcer	522	623	887	3761
Typhoid	-	-	-	343
Malaria	6542	7290	11737	16704
HIV/AIDS	67	217	189	244
Tuberculosis	22	23	20	18
Yaws	3	4	17	30
Chickenpox	9	0	0	0

Source: District Health Administration South Tongu 2009.

Table 3.3, shows that diseases such as diarrhoea, schistosomiasis, buruli ulcer, skin diseases, typhoid, malaria, HIV/AIDS, tuberculosis, yaws and chicken pox are the top ten diseases that are prevalent in the district. Among them, malaria is leading followed by

diarrhoea, skin diseases, HIV/AIDS, typhoid, schistosomiasis, tuberculosis, yaws, chicken pox and buruli ulcer, the least prevalent disease in the district.

3.3.5. Water and Sanitation

Water demand in South Tongu District far outweighs the supply. The main sources of drinking water currently in use in the district are rivers, ponds, dugout, pipe-borne, borehole, hand dug wells, rain harvesting and streams. About 36.6% of populations have access to potable water. There are 20 boreholes out of which 10 are functioning and there are also three communal wells (South Tongu District Assembly, 2009).

It is therefore realized that about 63.4% have no access to potable water in the district. Besides being inadequate the water, is generally unhygienic. This might have contributed to health hazards which the people are exposed to. The level of sanitation practice within the district is very low. About 32% of households have access to toilet facilities (South Tongu District Assembly, 2009). Apparently there is high incidence of indiscriminate dumping of refuse all over. The type of refuse disposal in the district is crude dumping, open incineration and burial.

3.3.6. Economic Activities

The people of South Tongu are predominantly Ewe speaking with the principal religions being Christianity and traditional religion. The main occupation, farming, is on subsistent scale and is rain fed. The main crops grown are, cassava, maize, okro, pepper, groundnut, tomatoes, sugarcane, mango, passion fruit, pawpaw, pineapple and a range of vegetables. Fishing forms part of the occupational activities of communities along the Volta River.

Others are engaged in pottery, mat weaving, basket weaving, poultry, livestock production and distilling.

Small-scale food hawking along the main Accra- Aflao road is a prominent feature of economic life of the district capital Sogakope. The Capital has a couple of hotels of repute such as Cisneros, Volta View, and tourism industries such as Cisneros Ostrich Farm, SPA Health Farm.

Table: 3.4 Percentage Distribution of Occupation in the South Tongu District

Occupation	Percentages
Agriculture	52%
Industry	09%
Commerce	16%
Services	23%

Source: South Tongu District Assembly, 2009.

From Table 3.4, agriculture is the main occupation which represents 52 percent followed by services which is 23 percent, commerce takes 16 percent and industry is the least which is 9 percent.

The economically active population of the district (15 years and above) according to the 2000 Housing and Population Census was 25,898 out of which 23,668 were employed. The percentage of the unemployed in the district is 8.6% which is higher than the economically active are involved in agriculture with about 23.0% in production transport and manual labour. The district has the highest rate of underemployment in the

region (29.6%) compared to the national (13.6%) and the regional figure (12.6%) (South-Tongu District Assembly, 2009).

3.3.7. Poverty

According to the Core Welfare Indicators Questionnaires (CWIQ) Survey conducted by the Ghana Statistical Service, two of the four Area Councils in the District are among the first twelve poorest Area Councils in the Region. The same survey conducted in 2003 indicated that the district was the 7th poorest among the 30 districts in the Eastern Zone of the country.



CHAPTER FOUR

4.0. RESULT AND DISCUSSIONS

4.1. INTRODUCTION

This chapter provides a discussion of the results obtained from the survey on the effects of rural water supply and utilisation in the South Tongu district in relation to the specific objectives and the reviewed literature.

4.2 SOCIO – ECONOMIC CHARACTERISTICS OF THE RESPONDENTS.

The socio-economic characteristics of the respondents such as educational level, occupation and income involved in the survey are summarized in the pie charts below.

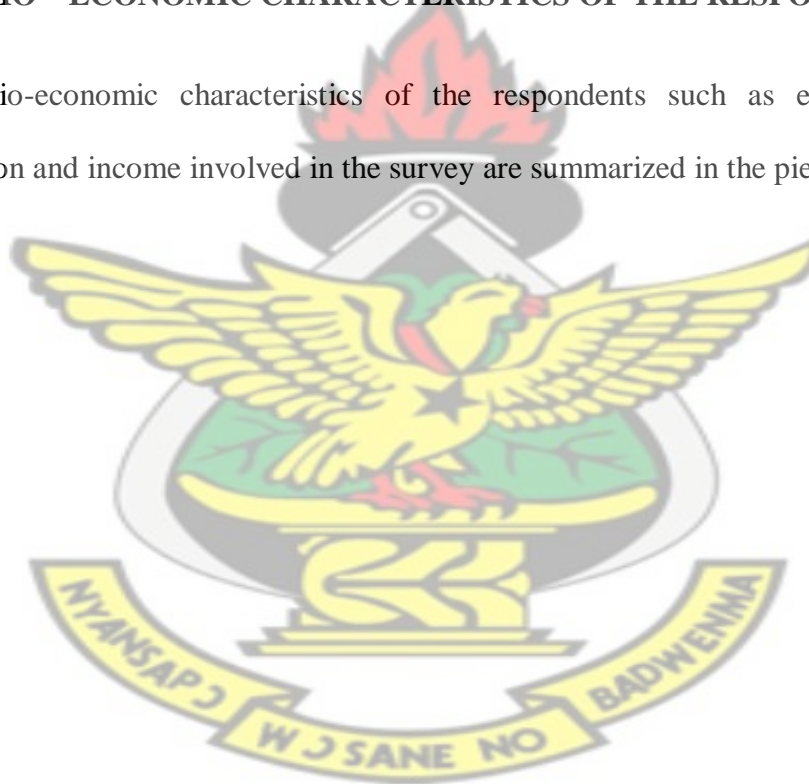
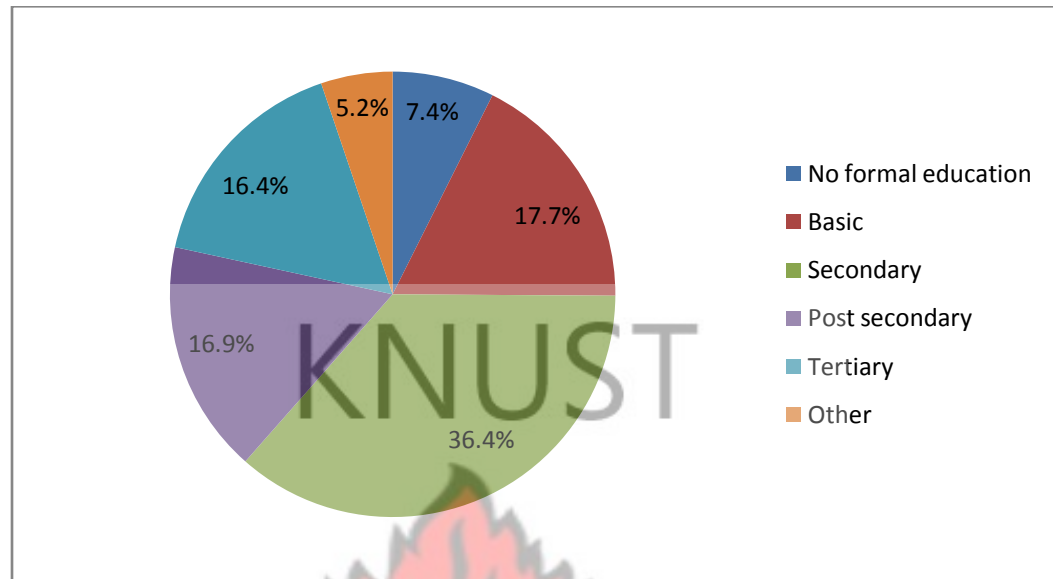
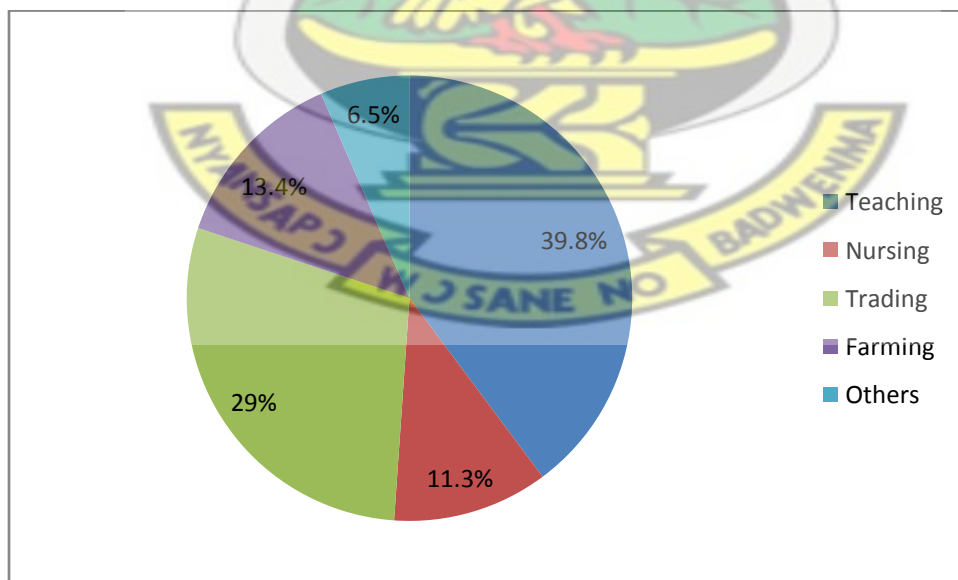


Fig 4.1 Percentage distribution of respondents by educational level



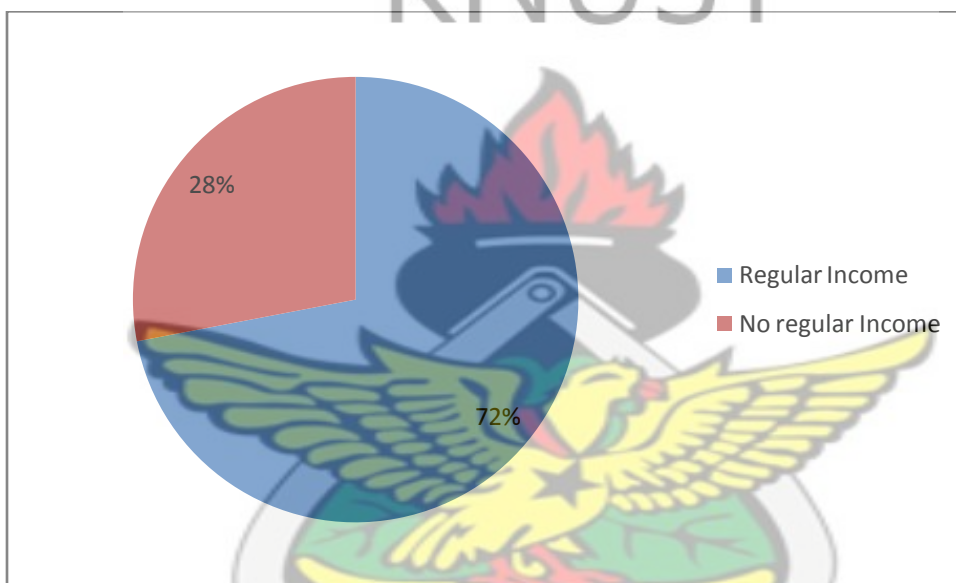
Source: Field survey, July 2010

Fig: 4.2 Percentage distribution of Respondents by Occupation



Source: Field survey, July 2010

Fig: 4.3 Percentage distribution of Respondents by income



Source: Field survey, July 2010

Table 4.1: Percentage distribution of Respondents by Educational Level and Source of Water used

Educational Level	Source of Water				Total
	River/Stream	Well/Borehole	Rain	Standpipe	
No formal Education	17.6%	11.8%	5.9%	64.7%	100%
Basic	41.5%	4.9%	2.4%	51.2%	100%
Secondary	38.1%	8.4%	7.1%	46.4%	100%
Post-secondary	30.8%	5.1%	2.6%	61.5%	100%
Tertiary	15.8%	2.6%	2.6%	79.0%	100%
Other	41.7%	8.3%	8.3%	41.7%	100%

Source: Field survey, July 2010

From table 4.1, a total of seventeen respondents were considered under people with no formal education. Out of 17 respondents, 17.6% used water from the river/stream, 11.8% used well/borehole, 5.9% used water from rain and 64.7% used water from stand-pipe.

Considering people with basic level education, 41.5% used water from river/stream, 4.9% used well /borehole, 2.4% used rain water and 51.2% responded in favour of water from stand-pipe.

For secondary education level category, 38.1% used water from river/stream, 8.4% responded for water from well/borehole, 7.1% used water from rain and 46.4% used water from stand pipe.

On post secondary category, 30.8% used water from river/stream, 5.1% used well/borehole, 2.6% used water from rain and 61.5% used water from stand pipe.

Also from a category of people with tertiary educational background, 15.8% used water from river/stream, 2.6% used well/borehole, 2.6% used water from rain and 79% used water from stand-pipe.

Finally on people from other education background, 41.7% used water from river/stream, 8.3% used water from well/borehole, 8.3% used water from rain and 41.7% used water from stand-pipe. It has been finally deduced that at each level of education the respondents prefer using standpipe to any other source of water.

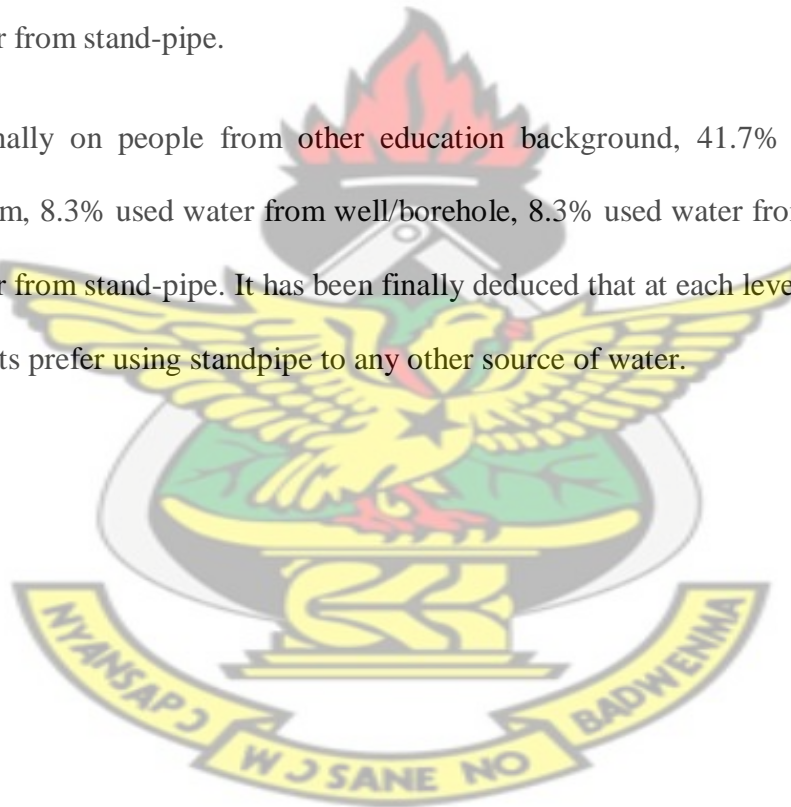


Table 4.2: Percentage distribution of Respondents by Occupation and the Source of

Water used

Occupation	Source of Water				Total
	River/Stream	Well/Borehole	Rain	Standpipe	
Teaching	13.1%	6.5%	3.3%	77.1%	100%
Nursing	7.7%	7.7%	3.8%	80.8%	100%
Trading	47.8%	9.0%	7.4%	35.8%	100%
Farming	61.3%	3.2%	6.5%	29.0%	100%
Others	66.7%	-	-	33.3%	100%

Source: Field survey, July 2010

The result in table 4.2 represents data collected on occupation of people vis-à-vis the source of water used. In all there were five occupations considered. Namely: Teaching, Nursing, Trading, Farming and others. The following were the outcome within each category.

On the part of teachers, 13.1% used water from river/stream, 6.5% used well/borehole, 3.3% used water from rain and 77.1% used water from the stand-pipe.

Also on nursingcategory, 7.7% used water from river/stream,7.7% used water from well/borehole, 3.8% used water from rain and 80.8% used water from stand-pipe.

Concerning trading, 47.8% used water from river/stream, 9.0% used water from well/borehole, 7.4% responded in favour of the use of water from rain and 35.8% used water from stand-pipe.

For farming occupation, 61.3% used water from river/stream, 3.2% used water from well/borehole, 6.5% used water from rain and 29.0% used water from stand-pipe.

Finally for other occupation, 66.7% used water from river/stream and 33.3% used water from stand-pipe. There were no records for people who used water from well/borehole and rain. It has been observed that at each level of occupation the respondents preferred pipe-borne water to any other source of water.

Table 4.3. Percentage distribution of Respondents by income and the source of water used

Income	Source of Water				Total
	River/Stream	Well/Borehole	Rain	Standpipe	
Regular Income	32.9%	7.2%	5.4%	54.5%	100%
No Regular Income	31.3%	4.7%	3.1%	60.95	100%

Source: Field survey, July 2010.

From table 4.3, 32.9% of people with regular income used water from river/stream, 7.2% used water from well/borehole, 5.4% used water from rain and 54.5% used water from stand –pipe.

For people without regular income, 31.3% used water from river/stream, 4.7% used water from well/borehole, 3.1% used water from rain and 60.9% utilized water from stand-pipe.

4.3.SPATIAL DISTRIBUTION OF SOURCES OF WATER.

The main sources of water in the district are; river/stream, well/borehole, rain and standpipe. Their spatial distribution are represented in Table 4.4 below

Table 4.4: Percentage distribution of potable water supply in the South Tongu District

Area Councils	Percentage of Water Coverage
Sogakope	36.1
Agave Dabala	37.3
Agave Larve	15.3
Agave Afedume	11.3
Total	100.0

Source: DWST, South Tongu District, 2009

From Table 4.4, Agave Dabala area council has the greatest supply of potable water followed by Sogakope area council. Agave Larve and Agave Afedume are the least in terms of potable water supply.

4.4. WATER FETCHING TIME AND ITS EFFECTS

Hours spent fetching water in and out from the source has been analyzed. This is done to see whether the respondents spend more time in fetching water from the source which may in one way or the other affect their socio-economic activities.

Table 4.5 Percentage distribution of Respondents and their water fetching time from source

Time spent (in mins)	No. of Respondents	Percentages
0 – 20	36	15.6
21 – 30	29	12.6
31 – 40	46	19.9
41 – 50	11	4.8
60 and above	109	47.2
Total	231	100.0

Source: Field survey, July 2010

From Table 4.5, a total of 231 respondents were interviewed. Out of this, 15.6% used 0-20mins as their water fetching time. 12.6% used (21 -30mins) as their water fetching time. Also 19.9% used 31-40mins as their water fetching time. In addition, 4.8% used 41-50mins as the fetching time. Finally, 47.2% used 60mins and above for fetching water. It is therefore inferred that majority of the respondents spend more time in fetching water in and out from the source.

It has been established from the survey that majority of the respondents do spend more time in fetching water which has negative impact on their socio – economic activities such as farming, fishing, schooling, trading and other social gatherings. This is illustrated in the table 4.6.

Table 4.6 Percentage distribution of the effects of water fetching time

Response	No. of Respondents	Percentages
Yes	135	58.4
No	96	41.6
Total	231	100.0

Source: Field survey, July 2010

It is inferred from Table 4.6 that out 231 respondents interviewed based on the effect of fetching time, 135 respondents representing 58.4% confirmed that the fetching time affects their socio-economic activities. Whereas 96 respondents representing 41.6% said that the fetching time does not affect their socio-economic activities. School children and women are affected most, because they do fetch water mostly in their homes. Culturally women are obliged to provide the household with water, and also carry most of the domestic burdens. Even among the school children, girls bear the domestic burden, apart from water fetching; they sweep, scrub, wash dishes and clothing and prepare food. All kinds of businesses are likely to be affected because of long hours spent in fetching water in and out from the source.

4.5. THE HEALTH EFFECTS OF RURAL WATER SUPPLY IN THE SOUTH TONGU DISTRICT.

It has been realized from the survey that there are health effects of the rural water supply in the South Tongu District. From the survey it is revealed that rural water supply has health implications on the people.

Table 4.7: Percentage distribution of the health effects of rural water supply in the South Tongu District.

Health effects of Rural Water Supply	Number of Respondents	Percentages
Body Itching	30	13.0
Urinating Blood	94	40.7
Stomach ache	19	8.2
Others	88	38.1
Total	231	100.0

Source: Field survey, July 2010

From Table 4.7, out of the total 231 respondents, 30 respondents representing 13.0% experience skin itching, 94 respondents which represent 40.7% urinate blood, 19 respondents representing 8.2% suffer stomach ache and finally 88 respondents representing 38.1% do suffer from other health related problems. This is also supported by the data collected from the South Tongu District health administration showing the top ten diseases as shown in the Table 4.8.

Table 4.8 Top ten diseases in South Tongu District

Diseases	2006	2007	2008	2009
Malaria	15.5%	17.2%	27.8%	39.5%
Schistosomiasis	7.8%	9.1%	9.5%	73.6%
Skin diseases	9.0%	10.8%	15.3%	64.9%
Typhoid	12.5%	50.5%	14.6%	22.4%
Intestinal worms	10.5%	23.5%	29.5%	36.5%
Eye infection	10.6%	17.7%	21.8%	49.9%
Hypertension	7.0%	8.8%	38.2%	46.0%
ARI	2.3%	9.0%	43.3%	45.4%
Diarrhoea diseases	11.0%	16.5%	18.9%	53.6%
Dental caries	2.9%	9.2%	64.6%	23.3%

Source: District Health Administration, South Tongu, 2009

Furthermore, a research conducted by PPAG in some of the villages that use river water revealed that there are cases of bilharzias. Table 4.9 shows the number of cases of bilharzias.

Table 4.9 Cases of Bilharzias

Communities	Number of Cases	Percentages
Agordomi	337	3.8
Fievie	559	6.3
Agorta	387	4.4
Sokpoe	1168	13.1
Asidowui	618	6.9
Tadze	385	4.3
Dordorkofe	494	5.6
Kpotame	1230	13.8
Larve	382	4.3
Agbakofe	1330	15.0
Tefle	1445	16.2
Awuyakofe	230	2.6
Dendo	333	3.7
Total	8898	100.0

Source: PPAG, July 2010

These and other health related cases have not been reported at the clinics or hospitals for treatment. From the survey, reasons were given by the respondents for not reporting at the clinics or hospitals for treatment. This is illustrated in table 4.10.

Table 4.10: Percentage distribution of reasons for not reporting for treatment at the clinics by Respondents.

Reasons	No. of Respondents	Percentages
No Money	126	54.5
Not willing to go to Hospital	62	26.8
Use Herbal Medicine	42	18.2
None	1	0.4
Total	231	100.0

Source: Field survey, July 2010

From Table 4.10, out of 231 respondents, 126 representing 54.5% said that they do not have money to go to hospital for treatment 62 respondents which represent 26.8% said that, they are not willing to go to hospital for treatment 42 respondents representing 18.2% use herbal medicine for the treatment and only one respondent represented none.

The survey has shown that rural water supply has effects on health of the people in the South Tongu district. It has been realised from the field that the people suffer from diseases such as skin itching, urinating blood, stomach ache and others after using the water, this is also supported by the data collected from the District Health Administration

on top ten diseases. From the survey data, water-related diseases are leading in the district. To add to this, research conducted by PPAG in some of the towns and villages revealed that there are high cases of bilharzias. And all these cases have not been reported at clinics or hospitals for treatment.

It has been revealed from the field that about 55% out of the people interviewed complained of not having money to access health facilities. It implies that they did not even register for the National Health Insurance. It is therefore concluded that the poverty level is high in the district. The people that are affected are those people who are engaged in economic activities that do not give them any regular income, especially primary economic activities such as farming and fishing.

4.6 INSTITUTIONAL INTERVENTIONS

To address the effects of rural water supply in the south Tongu District the following institutional intervention were made. It has been realized from the field that the district has benefited from some donor agencies, churches and other institutions for the supply of water. This is illustrated in Table 4.11.

Table 4.11: Provision of potable water by donor agencies and institutions.

Programme	Water System	No. of Communities served in Percentages
VRCWSP (DANIDA)	Borehole	12.8
	Pipe Scheme	30.3
	Ferro cement table	5.5
South Eastern Water Supply Programme (DFID)	Pipe borne	29.4
Church of Christ	Borehole	2.8
DSDA 11	Pipe	4.6
Quality Grain Company	Borehole	0.9
EU/DA	Pipe	1.8
	Borehole	1.8
HIPC	Pipe	4.6
MP/DA	Pipe	2.8
Self Help Project	Pipe	1.8
R. C. Missionary/Manos Unidas	Pipe	0.9
Total		100.0

Source: DWST- South Tongu District, 2009.

There have been institutional interventions to address the effects of rural water supply in the South Tongu district. The district has benefited from some donor agencies, churches and other institutions for the supply of water.

Also, some recommendations were made by the respondents. They recommended that the government should provide the people with potable water. Another recommendation was made that the NGO'S, the community and the District Assembly must also help in the provision of potable water.

The hypotheses used for the study were tested.

Table 4.12: Correlation between Water Source and Health Hazard

		Water SOURCE	Health Hazard
Water SOURCE	Pearson Correlation	1	0.122
	Sig. (2-tailed)		0.065
	N	231	231
Health Hazard	Pearson Correlation	0.122	1
	Sig. (2-tailed)	0.065	
	N	231	231

Source: Field survey, July 2010

H_1 : There is health hazard after use

H_0 : There is no health hazard after use

From the analysis the probability of water source against health hazards of 10% significant level was found to be 0.065 (calculated value). Since the probability $0.065 < 0.1$, we reject H_0 and conclude that there is a relationship between water source and health hazard.

KNUST

Table 4.13: Correlation between Water Source and Income

		Water SOURCE	INCOME
Water SOURCE	Pearson Correlation	1	0.045
	Sig. (2-tailed)		0.501
	N	231	231
INCOME	Pearson Correlation	0.045	1
	Sig. (2-tailed)	0.501	
	N	231	231

Source: Field survey, July 2010

H_1 : There is relationship between water source and income.

H_0 : There is no relationship between water source and income.

From the analysis the probability of water source against income of 5% significant level was found to be 0.501 (calculated value). Since the probability $0.501 > 0.05$, we reject H_1 and accept H_0 . The conclusion is that there is no relationship between water source and income.

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CHAPTER FIVE

5.0. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE STUDY

The research was about the health effects of rural water supply and utilization in the South Tongu District. The purpose of the study is to assess the health effects of rural water supply, identify the various sources of drinking water and their spatial distribution and the institutional interventions that have taken place in the district.

A sample of 249 was selected through systematic and purposive sampling from a cross section of the population. The study also made use of primary and secondary sources of data. Primary source such as questionnaire, interview and observation were used to collect data. Secondary sources such as books, journals, magazines, newspaper and the internet were also accessed. A cross tabulation and simple descriptive statistics were used for the analysis of the data.

5.1.1 Summary of Main Findings:

1. The main sources of water in the district are river/stream, well/borehole, rain and standpipe.
2. There is high salinity of the underground water. Because of this most of the boreholes and wells were abandoned.
3. More time is spent in fetching water by the majority of the people in the district and this goes a long way to affect their socio-economic activities.

4. There is high prevalence rate of water-related diseases, such as malaria, schistosomiasis, typhoid, diarrhoea, intestinal worms, eye infection, and bilharzias in the district which has health implications on the people.
5. The district has benefited from some donor agencies, churches and other institutions for the supply of water.

The hypotheses tested were, that there is relationship between water supply and health hazards was validated and that there is relationship between income and water source was invalidated.

5.2 CONCLUSION

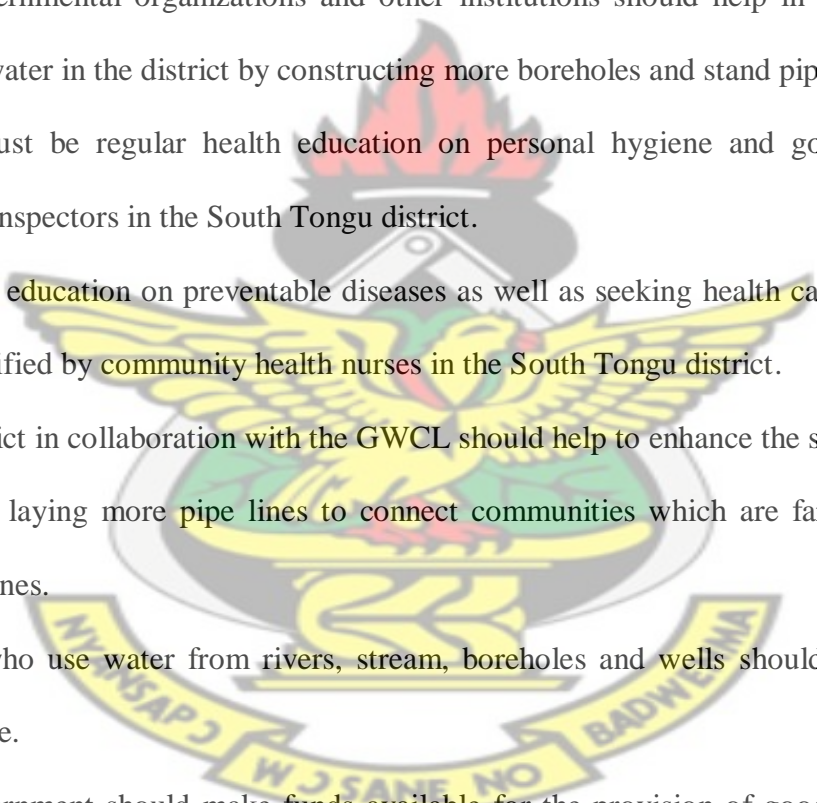
The study examined the health effects of rural water supply and utilization in the South Tongu District. It is evident that there is high prevalence rate of water-related diseases which is attributed to low level of potable water supply in the district. The supply of potable water is very low and this compels the people to use water from rivers, streams, wells and boreholes which are not treated.

Also, it has been established that water fetching consumes more time hence socio-economic activities are affected.

Furthermore, there have been assistance from donor agencies, churches and other institutions in the supply of potable water in the district but still there is more to be done.

5.3 RECOMMENDATIONS

To ensure effective supply of potable water and reduce the high prevalence rate of water-related diseases in the district the following recommendations have been made:

- 
- The logo of the Water and Sanitation Agency (WSA) is a watermark in the background. It features a central shield with a yellow eagle with spread wings, a red sun with rays, and a green base. Above the shield is a red flame. Below the shield is a yellow banner with the text 'WASSANE NO BADWEMA' in black. The shield itself has the text 'WASSANE NO' on the left and 'BADWEMA' on the right.
- a. There must be intensification of rainwater harvesting by the water and sanitation agency in the South Tongu District. Rain water is said to be valued for its neutral PH and is free from chemical disinfectants, salts, minerals and other natural and man-made contaminants.
 - b. Government must subsidise or grant tax exemptions to manufacturers of rain-water harvesting devices like roof gutters, corrugated roofing sheet and regulations on rainwater harvesting must be enforced in the South Tongu district.
 - c. Non-governmental organizations and other institutions should help in the provision of potable water in the district by constructing more boreholes and stand pipes.
 - d. There must be regular health education on personal hygiene and good nutrition by sanitary inspectors in the South Tongu district.
 - e. Effective education on preventable diseases as well as seeking health care delivery must be intensified by community health nurses in the South Tongu district.
 - f. The district in collaboration with the GWCL should help to enhance the supply of potable water by laying more pipe lines to connect communities which are far from the main GWCL lines.
 - g. People who use water from rivers, stream, boreholes and wells should treat the water before use.
 - h. The government should make funds available for the provision of good drinking water and sanitation facilities in the district.

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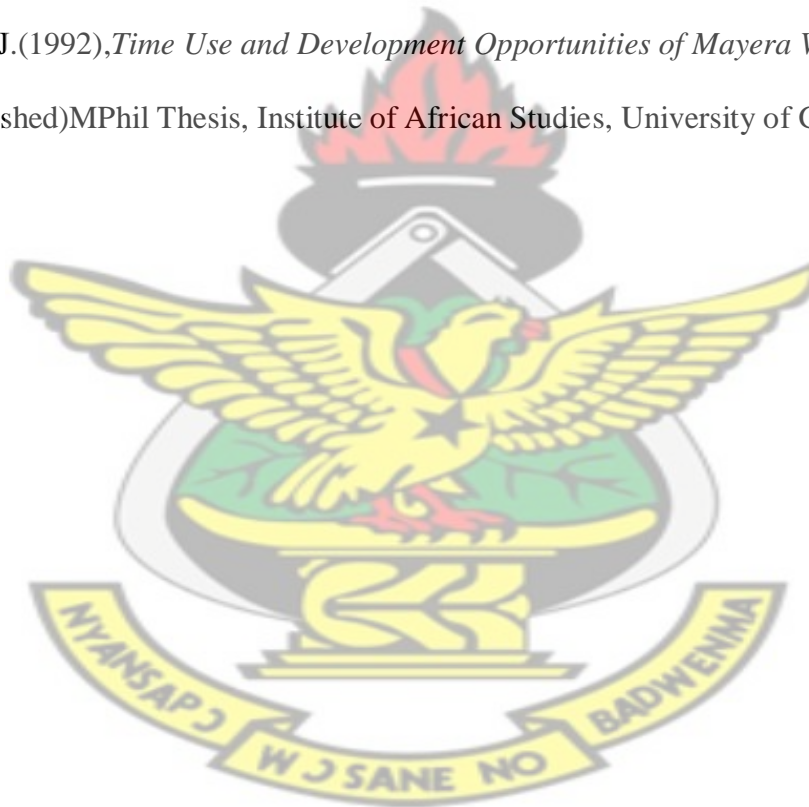
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APPENDICES

APPENDIX I: QUESTIONNAIRES FOR RESPONDENTS

Questionnaire: The health effects of rural water supply in the South Tongu District.

Please understand that this exercise is purely academic.

Any information gathered is solely intended for the purpose of data analysis and will be kept absolutely confidential.

SECTION A: **BACKGROUND INFORMATION**

1. Sex

M

☐

F

☐

2. Age

18-59 yrs

☐

60+yrs

☐

3. Marital Status

Single

Married ☐

Divorced ☐

4. How many children do you have?

5. Educational Background

No Formal Education ☐

Basic Education ☐

Secondary Education ☐

Post Secondary ☐

University ☐

Others (specify) ☐

6. What is your occupation?.....

7. Do you have regular source of income?

YES ☐

NO ☐

8. If yes, how much do you earn a month?.....

SECTION B: RESPONDENT'S WATER UTILIZATION SOURCES

9. What is the main source of Water Supply for your household / organizations?

- (i) River (ii) Well/Borehole (iii) Rain (iv) Stand Pipe
(v) Stream (vi) Others (specify)

10. Do you pay any money for using this type of water? (i) YES (ii) NO

11. If yes, how much do you pay per (i) 34 size bucket (ii) Tanker Delivery

12. How much water do you fetch in a day?.....

13. How long does it take you to fetch the water (including the waiting time?)

14. What is the taste of the water? (I) Good (II) Bad

15. Do you get water supply each day, certain days or very rarely?

- (I) Supply nearly everyday
(II) Supply on certain days only
(III) No Supply/ Very rare

16. If you get some water each day, how many hours per day is does the water flow from the tap?

17. If you don't get supply, why?

18. Do you have water storage facility? 1. Yes 2. No

19. (I) If yes, how much capacity?.....

20. If no, give reasons.....

21. How much do you pay for quantity of water a month?.....

Score The Problems According To The Severity Of The Problem, Ranging From 10, The Highest To 0, The Lowest

22. The water pressure is low in the tap.....

23. The Water from the tap contains dirt.....

24. Repairs not done out quickly

25. We have to pay for repairs

26. Others (specify).....

27. Do you routinely buy water? (I) Yes-Standpipe (II) Yes-Commercial Water Seller
(III) Yes-Other (specify) (IV) No

28. Does someone from your household/ organization have to fetch this water? (I) Yes
(II) No

29. If yes, how long does it take to fetch water in and out including waiting time?

30. If no, how do you get your water supply

31. Can you get enough water to buy? Explain your answer.

32. Is the water supply reliable? Explain your answer.

33. Would you be willing in principle to pay a little more money for improved service?

(I) Yes (II) No

34. If no, why not?

35. If yes, indicate the level of improved service you are interested in.

(I) Standpipe (Public) (II) Yard tap (private) (III) In-house connection (Private)

36. State the toilet facilities you have in the household/organization. (I) W.C. (II) KVIP

(III) Pit Latrine (IV) Free Range

37. . Is there any toilet facility near your drinking water source? (I)Yes (II) No

38. If yes, explain the nature of the water in terms of odour and taste

39. Do you get water from the river, borehole, well, or streams throughout the year?1.

Yes 2. No

40. If no, give reasons

41. Do you get water supply regularly in the day?

42. What happens to the supply of water in the rainy season?

43. How long does it take you to fetch water in and out from the source?

44. Does it affect your schooling, business or farming activities? Explain your answer

45. Do you use this source of water for bathing and washing only? Explain you answer

46. Which source do you use for drinking?

47. State the toilet facility you have in your household. 1. WC 2. KVIP 3. Pit latrine

4. Free range

48. Is there any toilet facility near your drinking water source?
49. If yes, explain the nature of water in terms of odour and taste.
50. Do you fall sick whenever you take this source of water? 1. Yes 2. No
51. Do you have skin itching at any time you take this source of water? 1. Yes 2. No
52. Do you experience any other health problems whenever you this source of water 1.
Yes 2. No
53. If yes, what is the nature of the problem?
54. Have you ever reported for treatment at the hospital or clinic? 1. Yes 2. No
55. If no, give reasons.
56. In your opinion how do you think this water problem can be solved?
57. Do you think supply of potable can solve this problem? Explain your answer
58. What is your perception about the supply of potable water in your community?
59. What does the community intends to do with regards to quantity and quality of water being supplied not adequate?
60. Do you rely on government to provide you improved water supply? Explain your answer.
61. Do you think non-governmental organizations can also help in solving your water problem?
- Explain your answer.

62. What do you recommend to be done to help improve water supply in the community?

Questionnaire: Health effects of rural water supply in the South Tongu District.

Please understand that this exercise is a purely academic one.

Any information gathered is solely intended for the purpose of data analysis and will be kept absolutely confidential.

INTERVIEW QUESTIONNAIRES

BACKGROUND INFORMATION

1. Sex

M

☐

F

☐

2. Age

18-59 yrs

☐

60+yrs

☐

3. Marital Status

Single

☐

Married

☐

Divorced

☐

4. How many children do you have?

5. Educational Background

No Formal Education

☐

Basic Education

☐

Secondary Education

☐

Post Secondary

☐

University

☐

Other(specify)

☐

6. What is your occupation?.....

7. Do you have regular source of income?

YES

☐

NO

☐

8. If yes, how much do you earn a month?.....

9. What is the main source of water supply?

10. Do you pay any money for using this type of water?

(I) Yes

(II) No

11. If yes, how much do you pay per

(I) size 34 bucket

(II) Tanker Delivery

12. How much water do you fetch a day?

13. How long does it take you to fetch the water (including the waiting time?)

14. What is the taste of the water? (I) good (II) bad
15. Do you think the district has been well served with potable water? (I) Yes
(II) No Explain your answer
16. Do you get water from the river, borehole, well, or streams throughout the year? 1.
Yes 2. No
17. If no, give reasons
18. Do you get water supply regularly in the day?
19. What happens to the supply of water in the rainy season?
20. How long does it take you to fetch water in and out from the source?
21. Does it affect your schooling, business or farming activities? Explain your answer
22. Do you use this source of water for bathing and washing only? Explain your answer
23. Which source do you use for drinking?
24. State the toilet facility you have in your household 1. WC 2. KVIP 3. Pit latrine 4.
Free range
25. Is there any toilet facility near your drinking water source?
26. If yes, explain the nature of water in terms of odour and taste.
27. Do you fall sick whenever you take this source of water? 1. Yes 2. No
28. Do you have skin itching at any time you take this source of water? 1. Yes 2. No

29. Do you experience any other health problems whenever you this source of water

1. Yes 2. No

30. If yes, what is the nature of the problem?

31. Have you ever reported for treatment at the hospital or clinic? 1. Yes 2. No

32. If no, give reasons.

33. In your opinion how do you think this water problem can be solved?

34. Do you think supply of potable can solve this problem? Explain your answer

35. What is your perception about the supply of potable water in your community?

36. What does the community intends to do with regards to quantity and quality of water being supplied not adequate?

37. Do you rely on government to provide you improved water supply? Explain your answer.

39. Do you think non-governmental organizations can also help in solving your water problem? Explain your answer.

40. What do you recommend to be done to help improve water supply in the community?

Questionnaire: Health effects of rural water supply in the South Tongu District.

Please understand that this exercise is a purely academic one.

Any information gathered is solely intended for the purpose of data analysis and will be kept absolutely confidential.

QUESTIONNAIRES FOR HEALTH WORKERS

BACKGROUND INFORMATION

1. Sex

M

☐

F

☐

2. Age

18-59 yrs

☐

60+yrs

☐

3. Marital Status

Single

☐

Married

☐

Divorced

☐

4. How many children do you have?

5. Educational Background

No Formal Education

☐

Basic Education

☐

Secondary Education ☐

Post Secondary ☐

University ☐

Others (specify) ☐

6. What is your occupation?.....

7. Do you have regular source of income? 1. YES 2. NO

8. If yes, how much do you earn a month?.....

9. What is the main source of water supply for your household?

1. Own private connection 2. Commercial water sellers 3. Neighbours source
4. Stand pipe 5. Boreholes/wells 6. River 7. Other, specify

10. Do you get some water supply?

- 1 everyday 2 certain days 3 very rarely 4 no supply

11. If you get some water supply every day, how many hours per day does water flow from your tap?

12. If you don't get water supply, why?

13. Do you have water storage facility? 1. YES 2. NO

14. If yes, how many capacities?-Litres

15. If no, give reason

17. Do you pay any money for using this type of water? 1. YES 2. NO

18. If no, give reason

19. If yes, how much do you pay per day? 1. 34 size-bucket 2. Tanker delivery

20. How much water do you fetch in a day?

21. How much do you normally spend on water each month?

22. Does it affect your income? Explain your answer

23. How long does it take you to fetch water, in and out(including the waiting time)

24. Does it have influence on your work? Explain your answer

25. What is your perception about the quality of water supplied? 1. Good 2. Fair 3. Bad

26. Do you think inadequate water supply affects personal hygiene? Explain your answer

27. What other health related problem do you think are associated with inadequate water supply?

28. Apart from the health related problems, are there any problem associated with inadequate water supply? Explain your answer

29. What is your perception about the number of cases of water-borne disease reported at the clinic/hospital

30. Do you have any case of water-borne disease every day? 1. YES 2. NO

31. If yes, averagely how many cases are reported every day?

32. In your opinion do you think improved water can help enhance people's health status? Explain your answer

33. Apart from the improved water supply, are there any other factors that can help improve people's health status? Explain your answer

34 What do you recommend to be done in order to improve water in the district?

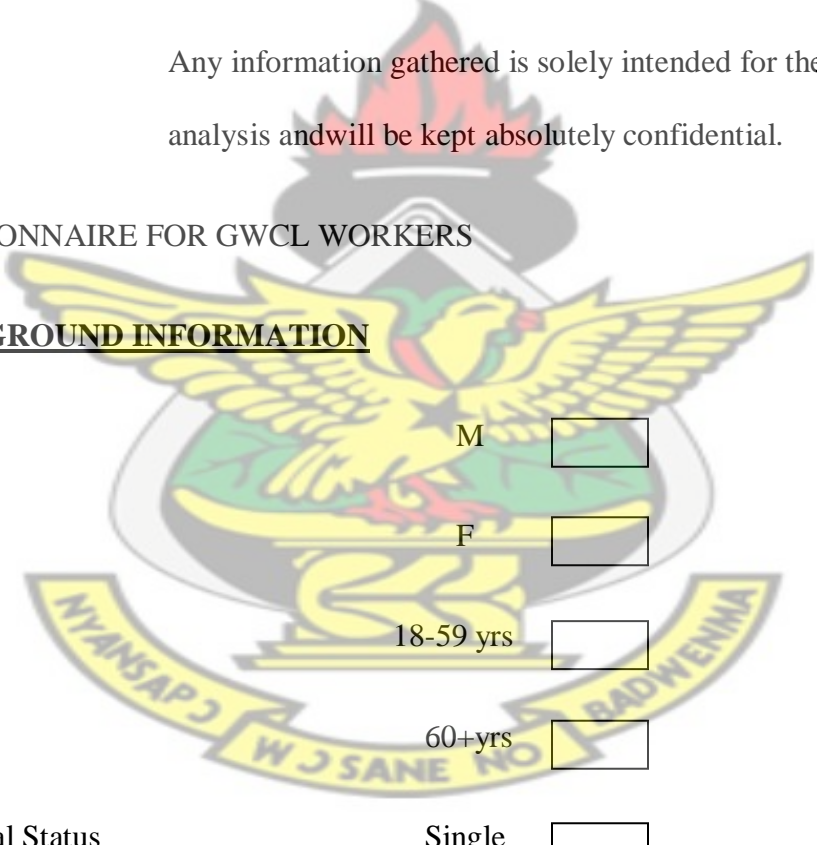
Questionnaire: Health effects of rural water supply in the South Tongu District.

Please understand that this exercise is a purely academic one.

Any information gathered is solely intended for the purpose of data analysis and will be kept absolutely confidential.

QUESTIONNAIRE FOR GWCL WORKERS

BACKGROUND INFORMATION



1. Sex	M	<input type="checkbox"/>
	F	<input type="checkbox"/>
2. Age	18-59 yrs	<input type="checkbox"/>
	60+yrs	<input type="checkbox"/>
3. Marital Status	Single	<input type="checkbox"/>
	Married	<input type="checkbox"/>
	Divorced	<input type="checkbox"/>

4. How many children do you have?

5. Educational Background

No Formal Education

☐

Basic Education

☐

Secondary Education

☐

Post Secondary

☐

University

☐

Others (specify)

☐

6. What is your occupation?.....

7. Do you have regular source of income?

YES

☐

NO

☐

8. If yes, how much do you earn a month?.....

9. What source of water do you supply to people? 1. River 2. Stream 3. Pond 4.

Borehole

10. Is the water treated with chemical before supplied to the people? 1.YES 2. NO

11. If yes, how is the treatment done?

12. If no, give reason

13. Do you have pumping station?

1. Yes

2. No

14.If yes, how many pumping stations do you have?

15.If no why?

16.Do you think the pumping station that you have can supply water to the whole district?

Explain your answer

17. Do you have reservoir to store to the water? 1. Yes 2. NO

18. If yes, what is its capacity?

19. If no, why?

20. Can the reservoirs store water for one month? Explain your answer

21. Do you supply people with water daily? Explain your answer

22. Do you encounter any problem in terms of supplying water to the people? 1. Yes 2. No

23. If yes, what sort of problem do you face?

24. How do you solve the problems?

25. During these periods, how do you supply people with water?

26. What are the reactions from the people?

27. How many litres of water do supply to the people daily

28. Do you think this is enough for them? Explain your answer

29. Are all the towns and villages in the district connected to GWCL lines? Give reasons

30. What percentage of towns and villages that are having pipe borne water
31. Those that do not have access to pipe-borne water what sources of water do they use?
32. What can be done about the towns and villages that do not have access to pipe-borne water?
33. Do you envisage any health implications of using pipe-borne water? Give reasons
34. What are the health implications of using untreated water?
35. What is opinion about the supply of potable water in the district?
36. What do you think should be done about it?
37. In your opinion, do you think improved water supply can enhance people's Health Status?
- Explain your answer
38. Apart from the improved water supply, are there any other factors that can help improve people's Health Status explain your answer
39. What do you recommend to be done in order to improve water supply in the district?

APPENDIX II: CALCULATION OF SAMPLE SIZE

Total Communities = 331

Sample size = 83

Therefore, sample fraction = $83 \div 331$

= 0.2507553 or 0.25%

KNUST

Sample from each community = 3 respondents

Number of communities sampled = 83

Total respondents sampled = 3×83

= 249

