PRESBYTERIAN UNIVERSITY COLLEGE, GHANA

FACULTY OF DEVELOPMENT STUDIES

A STUDY OF WATER MANAGEMENT PRACTICES, CHALLENGES AND SUSTAINABLE SOLUTIONS IN THE SEKYERE SOUTH DISTRICT

AGUDETSE ERNEST MAWUNYO KWAMI

2019

PRESBYTERIAN UNIVERSITY COLLEGE, GHANA

FACULTY OF DEVELOPMENT STUDIES

A STUDY OF WATER MANAGEMENT PRACTICES, CHALLENGES AND SUSTAINABLE SOLUTIONS IN THE SEKYERE SOUTH DISTRICT

BY

AGUDETSE ERNEST MAWUNYO KWAMI

Dissertation submitted to the Department of Social Studies of the Faculty of Education, Presbyterian University College, Ghana, in partial fulfilment of the requirements for award of Master of Education Degree in Educational Studies

SEPTEMBER, 2019

DECLARATION

Candidate's Declaration

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

Candidate's Name: ……

Signature: …… Date: ……..……

Supervisor's Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with guidelines on supervision of thesis laid down by the Presbyterian University College, Ghana.

Supervisor's Name: ……

Signature: ……..…….... Date: ……

ABSTRACT

Water is life and especially potable water is essential for life and health. So, access to drinking water, improves overall socio-economic and environmental existence. Since water is essential for the survival of humans, there is the need to examine how water resources are managed, especially in rural communities. Against this backdrop, this study sought to examine the water management practices of selected communities in Sekyere South district of the Ashanti Region of Ghana. The purpose was to determine the level of participation of the community in the water management, the challenges associated with the water management practices, and the sustainable solutions to deal with the challenges. To achieve these objectives, questionnaires and interview guide were developed to collect data from respondents and water committee members respectively. A Total of 100 questionnaires were administered to households of two communities within the Sekyere South District. Six water committee members were purposively selected and interviewed on wide range of issues regarding the subject under consideration. The result of the study revealed that even though the level of participation of households and water committee members in the initiation and maintenance of water facilities are high, the water supply within the selected communities leaves much to be desired. It was observed that financial, technical, institutional and environmental challenges are affecting quality water delivery within the district. Also, the participants of the study indicated that for adequate management of water resources, enough water systems should be developed, while giving water committee members adequate training to manage the water resources. The study recommends, among others, that rural communities should be empowered to initiate and maintain water facilities through financial and technical support.

ACKNOWLEDGEMENTS

My sincere thanks and appreciation go to the Almighty God for life, His protection and guidance throughout my studies. My profound gratitude to my supervisor Mad. Doris Fiasorgbor without whose input this work would not have been possible. Her guidance, corrections and superb supervision is very much appreciated.

My appreciation also goes to Mr. Thomas Appiah, who guided me and read through the different phases of this work and made valid contributions to the work. I also wish to show appreciation to my friend Mr. Emmanuel AtoQuansah who gave me moral and financial support. Again, appreciation goes to the Chief Executive,Ing. WorlanyoSiabi;Director, Admin & Human Resource, Mr. Atsu O. Dartey; Ashanti Regional Director, Ing. Francis KwasiEnu and Management of Community Water and Sanitation Agency (CWSA) for giving me the opportunity to pursue this course and also to do this research.

DEDICATION

This thesis is dedicated to my beloved wife Miss Cecilia AmaObuobi, for her love, support, prayers and care throughout this course and project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

IWRM	Integrated Water resource Management
SDGs	Sustainable Development goals
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WHO	World Health Organisation
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Cooperation and Development.
MWRWH	Ministry of Water Resources Works and Housing
WRC	Water Resource Commission
WD	Water Directorate
EPA	Environmental Protection Agency
GWCL	Ghana Water Company Limited
CWSA	Community Water and Sanitation Agency
PURC	Public Utilities Regulatory Commission
PNDC	Provisional National Defence Committee
PHC	Primary Health Care
DA	District Assembly
SPSS	Statistical Package for Social Scientists

CHAPTER ONE

INTRODUCTION

Background to the Study

Water is life and especially potable water is essential for life and health. So, access to drinking water, improves overall socio-economic and environmental existence (Gebrehiwot, 2006).Against this backdrop, various effort have been made by governments, local and international agencies to ensure that there is sustainable access to water in almost every part of the world. For instance, the Sustainable Development Goals (SDGs) seven (7) seeks, among other things, to halve by 2015, the proportion of the population without sustainable access to drinking water and basic sanitation. In developing countries like Ghana, there are still inadequate supply of safe and affordable water for domestic, agricultural and industrial purposes. The reasons for this phenomenon are many and diverse. Lack of water resource infrastructure, poor management of water resources, and lack of investment in the water sector are some of the factors militating against the supply of safe water in developing countries, especially in rural areas. Among these factors, the management of water resources has been identified as a major challenge affecting water delivery in rural areas. According to the United Nations Development Program (UNDP) (2013), the management and governance of available drinking water resource is a key part of achieving water security at local, national and international levels. Rogers and Hall (2003) further opined that water management in many places of the world is undermined, to a large extent, by poor management, lack of appropriate institutions, bureaucracy, corruption, and lack of investment. The USAID has also indicated that water management and its governance is key to solving the access of water

challenges and has therefore advocated for sound management and protection of freshwater resources and the strengthening of water sector governance, financing and institutions.

According to the World Health Organization (2018), safe and readily available water is important for public health, whether it is used for drinking, domestic use, food production or recreational purposes. Improved water supply and better management of water resources, can boost countries' economic growth and can contribute greatly to poverty reduction. Unfortunately, in spite of the designation of water as an essential commodity, the World Health Organization (WHO) estimates that over 844 million people lack basic drinking water, and 159 million people are dependent on surface water. It is further estimated by WHO that 2 billion people worldwide use water sources contaminated with fecal matter

The efficient management and utilization of water is becoming important given the fact that the world faces water crises which could hold back human development. Whiles significant effort have been made to improve water delivery and management in urban areas, many rural areas, especially those in developing countries, are severely underprivileged when it comes to access to safe drinking water. In most developing countries, the major source of water includes ponds, unprotected springs, hand dug wells and rivers. Such sources of water may be exposed to contamination caused by humans, livestock, wildlife and uncontrolled flooding. In some developing countries like Ghana, the safety of water is further jeopardized by open defecation due to lack of access to decent places of convenience (WHO, 2008)

Despite the concerted effort from NGOs, local authorities and the government to improve water delivery and management in rural areas, many rural areas are still struggling to access safe water (WHO, 2008). The main reasons for this very low level of performance in the supply of safe drinking water, and the quandary for not efficiently utilizing the water resources potential of the country towards realizing sustainable water supply, is attributed to lack of articulate and holistic water policy and insufficient in- vestment for safe drinking water supply . In addition, the lack of capacity on the part of communities to manage water supply schemes has been identified as a major challenge militating against access to safe drinking water. Such problems calls for a comprehensive research to determine the best strategies that can be developed to ensure sustainable water delivery in rural areas

In Sekyere South of the Ashanti region, access to portable water remains a challenge. For instance, according to Ewusi and Seidu (2018), the area could experience water crisis in the near future if concrete effort is not made to ensure effective and efficient management of water. While water resource management has been identified as key to ensuring sustainable safe water delivery, the management of water resources in the area still leaves much to be desired. Water resources are still poorly managed leading to avoidable water shortages. In view of this, the current study examines the management water within the district by focusing on water management practices, attitude towards water safety, the role of the community in managing water, the challenges associated with the management of water within the area, and how water management practices can be improved to achieve sustainable water delivery.

Statement of the Problem

The problem of inadequate supply of safe water is partly attributed to poor governance and management (Harris and Morinvi, 2013). While the government, Non-Governmental Organisations (NGOs) and some corporate organizations have provided water infrastructure for rural communities, these resources are poorly managed leading to poor supply of water for domestic, agricultural and commercial use. In Sekyere South District of Ashanti Region, the availability of portable drinking water has become a challenge in recent years. According to Ewusi and Seidu (2018), communities in the district are experiencing shortage of water supply as a result inadequate rainfall which feeds various water sources. As a result, majority of the communities rely mainly on boreholes fitted with hand pumps. The inadequate number of boreholes in the communities means that the few boreholes are always crowded during peak hours in the morning (from 6:00am to 7:30am) Again, illegal human activities, and improper farming practices are affecting the sources of water within the district. The problem is further compounded by the fact that few of the boreholes available are poorly managed leading to their constant breakdowns (Ewusi and Seidu, 2018). Furthermore, the lack of effective management of water resources in the area is making the provision of sustainable water within the district difficult. The current study therefore investigate into the water management practices of rural communities in Sekyere South District and examine how these practices can be enhanced to improve water delivery.

Purpose of the Study

Broadly, the purpose of this study is to investigate into water management practices within Sekyere East District. The aim is to identify best practices to be adopted and the challenges associated with the management of water to guide key stakeholders.

Research Objectives

1. To identify the role and level of participation of the key actors in the management of water resources within the Sekyere South District
2. To examine water resource management practices within theSekyere South District
3. To ascertain the main challenges associated with sustainable water supply within the District
4. To identify sustainable solutions to the water management challenges within Sekyere South District

Research Questions

1. What is the role played by key actors in the management of water resources within Sekyere South District?
2. How are water resources in the Sekyere South District managed to improve water delivery?
3. What are the main challenges associated with sustainable water supply within the Sekyere South District?

4. What are the sustainable ways of managing water resources within Sekyere South District?

Significance of the Study

Many of the challenges faced by developing countries are attributed to lack of financial capacity and inadequate physical structures. However, the issue of management matter most in having quality water services. Thus, the study result will play great role in finding alternative solutions for the improvement of water management in the study area. The study will also benefit the community of the study area in identifying those problems that hinder the efficiency and sustainability of water program. The finding can also be used as additional reference for government officials and NGOs that are working on water program in providing them additional knowledge about potable water management. With regards to academia, the study provides a reference material for other researchers and contributes to existing knowledge in the areas of water management. The study makes a modest contribution to the management of water resources in rural areas of Ghana. In addition, the study makes some recommendations for future studies based on the findings and limitations encountered.

Delimitations

The current study mainly focuses on water management practices within the Sekyere south district in the Ashanti region. Thus, all other districts within the Ashanti region are excluded from analysis. Within the Sekyere South district, only communities with established water systems are examined. Also, even though water management is a broad

concept, the current study will mainly focus on understanding challenges associated with water management and how such challenges can be addressed. The study is a cross-sectional design which means that data will be collected within a specific period of time. Specifically, data is expected to be collected within one month period, from December to January, 2019/20.

Limitations

As with many researches, this study was not without limitations. As a result of research constraint, not all areas within the selected district was considered. Again, non-response to the questionnaires affected the number of respondents expected. The study also employed cross-sectional design which required that data is collected within a specific point in time. However, the use of longitudinal data would have provided a more robust results since longitudinal design collects data over different periods of time.

Organization of the Study

The study is organized into five main chapters. The first chapter (chapter one) provides a general introduction of the topic with specific emphasis on the problem statement, purpose of the study, research objectives and questions, significance of the study, delimitations and limitations, as well as definition of key terms. Chapter two provides a comprehensive review of related literature by exploring the theories and concepts around which the study is built. Chapter three focuses on the research methodology. Specific areas to be examined under this chapter includes the research design, study area, population of the study, sampling procedure, data collection instrument, data collection

procedures and data processing and analysis techniques. Chapter four of the study focuses on the result and discussion. Specifically, this chapter will analyse the raw data gathered from the field and interpret the result based on the findings. The final chapter (Chapter 5) provides a summary of the key findings as well as conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

In chapter one of this study, the topic under consideration was introduced, focusing on the problem statement, objectives, and significant of the study. This chapter is designed to provide a comprehensive review of literature. The literature review is categorized into theoretical, conceptual and empirical review. The theoretical review focuses on some important the topic under consideration. The conceptual literature examines some theories and concepts related to the topic under investigation. The empirical literature review will examine some empirical studies and examine how such studies relate to the current study.

Theoretical Literature Review

Two major theories are applied in this study. These include the public good theory and the demand driven model (theory). These theories are discussed as follows:

The public good theory

In economics, a good is described as a public good if that good, once produced, can be consumed by additional consumer at no additional cost. Also, Holcombe (1997) explain that nobody can be excluded from consuming a public good. This is in contrast with a private good which is consumed exclusively by some individuals or groups of persons. There are two distinguishing characteristics that of public good. According to Holcombe (1997), as far as a public good is concerned, several individuals can consume the same

good without necessarily diminishing its value. Such goods are often referred to as non-rival consumption goods or collection consumption goods. Another important feature of public good is non-excludability. Non-excludability implies that no individual or group of individuals can be prevented from consuming such good. Put differently, once a public good is produced, it is extremely difficult, if not impossible to exclude some individuals from consuming it. Public goods are essential goods needed for the survival and daily functioning of each person and therefore it is available to all. In the context of the current study, water resource is seen as a public good since once constructed, is available to all. Given that water is an essential public good, its management is important in order to ensure its sustainability.

The Demand – Driven Model

Another important theory underpinning the current study is the demand driven model or theory. The model is built around the premise that putting communities and cities in the driver's seat when it comes to project initiation and implementation helps to ensure the project succeed and generate the needed impact for the people. The model requires communities and cities to take the lead in project initiation and development in order to improve the well-being of members. Even though the components of the demand-driven model differ depending on context, there is a general agreement that when it comes to its applicability in community project management, it should involve households in deciding the choice of technology, institution, and governance arrangements. It should give women a greater role as far as decision making is concerned. Furthermore, it requires households to take steps to pay all the operational and maintenance cost of the project

once it is initiated (Whittington et al 2008). The reason why household involvement in the choice of technology and governance structure is important is to ensure that the initiated project is responsive to the needs of the community. Households are also expected to pay realistic fees to enhance revenue mobilization in order to sustain and maintain the project. In the context of this study, the demand-driven model will be helpful in explaining the level of community involvement in the provision of water resources in Sekyere South district. The extent to which the model applies in the selected community will also be tested.

Conceptual Literature Review

This section reviews literature on water resource management, sustainable water resource management, integrated water resource management, challenges of water resource management, and strategies for improving water resources.

Water Resource Management

Water is one of the most essential part of human existence. For life to be sustained, sufficient quality and quantity of water is required. Given the fact that the world's populating in increasing at an alarming rate, more water resources in required to sustain the growing population. This makes the management of water resources an important endeavor. However, there is still inadequate supply of water in many parts of the world, especially in rural areas of developing countries (WHO, 2018).The problem of inadequate supply of safe water is partly attributed to poor management of water resources (Harris and Morinvi, 2013). While the government, Non-Governmental

Organisations (NGOs) and some corporate organizations have provided water infrastructure for rural communities, these resources are poorly managed leading to poor supply of water for domestic, agricultural and commercial use. According to the UNDP (2013), failure to effectively manage water resource could pose serious threat to water security in various part of the world in the near future. Thus, water resource management is important for the sustainable development. Potable Water management is the activity of planning, developing, distributing and managing the optimum use of drinking water resources.

Water management and its governance has been identified by policy makers and scholars as an important part of enhancing water security and availability (OECD, 2011; Araral and Wang, 2013). Though the management of water takes different forms, it has been recognized over the years that the most effective and sustainable way of managing water resources is the adoption of participatory approach, where various stakeholders are brought on board to manage water production and delivery. According to the USAID (2009)the involvement of community members directly in all key decisions, development of asense of communal ownership of the water project, and the use of appropriate technology that canbe maintained at the village level is key to effective water management. The current study examines the management of water resources at the local level by investigating how the community, local government, and other relevant bodies collaborate to manage water resources in selected communities within the Sekyere South District. In addition, challenges associated with the management of water resources are examined.

Water Resource Management in Ghana

To enhance water resource management, various agencies and institutions have been established. These include the ministry of water resources works and housing (MWRWH), the water resource commission (WRC), the water directorate (WD), the environmental protection agency(EPA) Ghana water company limited (GWCL), Community Water and Sanitation Agency (CWSA), and the Public Utilities and Regulatory authority (PURC). The ministry of water resources works and housing is a parent body responsible for the formulation of policy within the water sector. The water resource commission (WRC) is involved the management of water resources in collaboration with other important agencies. The EPA is responsible for the protection of water bodies by ensure that these bodies are safe from pollution and illegal usage. The CWSA is mainly responsibly in managing water resources in rural communities such as small towns and villages. The PURC is also responsibility for reviewing and establishing tariffs and monitoring drinking water quality. All these bodies are expected to work in tandem to ensure that water resources are available for various uses. Over the years, these bodies have worked to improve water delivery in both rural and urban areas, albeit with some resource challenges. These bodies have helped in awareness creation in the form of training, education of stakeholders using radio, television and the print media. The use of community durbars have also been used as ways of creating awareness on good water resource practices. Another important role of the bodies and institutions enumerated above is to protect water resources from human activities that pollute water bodies. Since pollution accounts for significant part of water resource degradation, effort aimed at controlling pollution is intended to preserve water bodies. Again these bodies are

responsible for controlling illegal mining. Furthermore,running ecological and water quality monitoring is done by these bodies to minimize water resource degradation (WRC Ghana, 2011). However, despite the concerted effort by the various agencies to improve water delivery, especially in rural areas, there is still significant challenges when it comes to water resources management. Many rural areas are still struggling to have access to portable drinking water while those with portable drinking water are struggling to sustain same. This study will therefore unravel these challenges and suggest appropriate ways of dealing with them

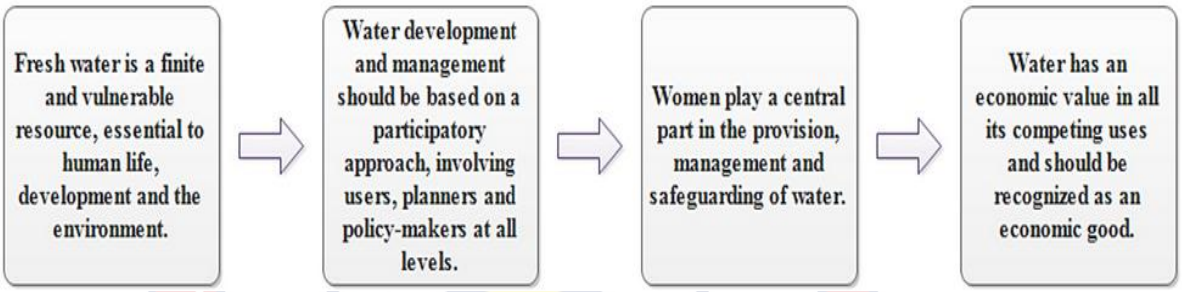
Integrated Water Resources Management (IWRM)

Integrated Water Resource Management (IWRM) is one of the best strategies aimed at ensuring holistic management of water resources. According to Giordano and Sha (2014), IWRM is an idea to consider water holistically, to manage it across sectors, and to ensure a broader participation in decision making. The aim of IWRM is to ensure that fragmented approaches to water resources management is eradicated and replaced by participatory approaches. According to Anokye and Gupta (2012), the key elements of the IWRM include a holistic, integrated approach and the main principles of public participation, the role of gender and the notion of recognizing the economic value of water. The principles espoused by IWRM are frequently applied in the management of water resources in both developed and developing countries. The IWRM was given a major boost during the Dublin conference (1992), which among other things endorsed the IWRM principles by creating a framework for its implementation. The international community through the Dublin principles (1992) have highlighted the need to ensure

participatory water management. The Dublin conference agreed that governance policies relating to water use and access should be developed on the basis of consultation with local residents, including direct engagement with the poor on their water priorities and needs (Goldin, 2013). It is argued, for instance, that participation will improve outcomes by taking into account local knowledge and will lead to more effective monitoring when communities are directly involved (Ostrom, 1990).

The IWRM through the Dublin conference has provided a framework/model for understanding the various parts of water resource management and this is captured in Figure 1

Figure 1: **Principles of IWRM.**



According to the model, fresh water is a finite and vulnerable resource which is essential to human life, development and the environment. As a result, water development and management should be based on a participatory approach involving users, planners, and policy makers at all levels. The model further underscored the important role played by women in the provision, management and safeguarding of water bodies. The model further indicates that water has an economic value in all its competing uses and should be recognized as an economic good. While participation is likely to be beneficial on many levels,there is a need for caution. When not coupled with capacityor resources, for

instance, participation can represent a downloading of responsibility to communities or certain segments of the population, such as women or the poor(Harris, 2009).

Sustainable Water Supply

The concept of sustainability has taken its root from the debate on sustainable development during the early 70s. It is a concept that is difficult to define due to its multifaceted nature (Pretty, 1995). According to the United Nations document labelled "Our Common Future" (1987), sustainable development is defined as "development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs." This definition has been applied in different areas including water supply and management. However, a more befitting definition has been provided to explain what constitutes sustainable water supply. According to Abrams(1998), "Sustainability is about whether or not water and sanitation services and good hygiene practices continue to work over time". Thus, the definition indicates that sustainable water supply encompasses the enduring water supply over a long period of time.

In recent years, various models and conceptual frameworks have been developed to explain sustainable water supply in both rural and urban areas. Among those developed conceptualization frameworks, the one that has been shared by many researchers has five key dimensions (Perry-Jones, et al. 2001): institutional (organizational), social, environmental, technical, and financial. It is well noted that the success of lasting sustainable water supply services is dependent on the interaction of a combination of factors that give due emphasis for community participation, external collaboration and

technical support in order to ensure operation and maintenance of the system (Abrams, 1998). These five pillars have been identified as important aspects of efficient water supply management practices.

For sustainability of water resources to become a reality, all important stakeholders including, Non-Governmental Organizations (NGO), community members, and government, and private sector must play their roles (Harvey, et al. 2002). In this case community members are called for to make informed choices regarding participation in the project, willingness to share project cost and commitment to bear associated contribution. The role of community involvement in water management is vital. This is because full community involvement promotes a proactive process in which the beneficiaries influence the development and management of development projects rather than merely receiving a share of project benefits. Community participation creates an enabling environment for sustainability by allowing users, as a group, to select the level of services for which they are willing to pay, to guide key investment and management decisions, and also to make choices and commit resources in support of these choices (Sara, et al. 1997). The kind of technology that cannot serve the best interest of the beneficiary in terms of the quality of installation and cause further problem for maintenance could negatively impact the sustainability of water supply projects. Technology that fits for purpose of the project and chosen by users' needs to be in place.

Challenges of Water Resource management in Ghana

In spite of the importance of water to the survival of the human race, degradation of water resources over the years has become a major concern to all (Karr, 1991). While

some effort is being made to improve water deliver in both rural and urban communities, there are some challenges that hinder the effective management of water resources in Ghana. This section discusses some of these challenges and how they affect the water delivery system.

Poor Monitoring

Poor water monitoring has been identified as a major challenges militating against the effective management of water resources. In rural areas, water system are created and left with little or no monitoring, leading to the destruction of these water bodies in no time. Again, there are no benchmarks and indicators to investigate and monitor water usage in rural and urban areas. While there are various agencies and bodies mandated to ensure adequate monitoring of water resources, these agencies are poorly resourced, making it difficult to undertake their monitoring mandate (WRC, 2012)

Poor water administration

Poor water administration or governance has also been identified as a major challenge affecting the management of water resources in Ghana. Though various bodies are in charge of the management of water resources, more often than not, they fail to effectively manage water resources. This has been attributed to the low community participation in the initiation and implementation of water projects in the local community. According to Goldin (2013),lack of involvement of local communities in the management of water resources is likely to affect regular and uninterrupted water supply.

Lack of long-term funding for water management

To effectively manage water resources for sustainability, there is the need for massive investment in that regard. Investment in human capital and equipment help sustain water resources in the foreseeable future. Sadly, there is inadequate funding to effectively management water resources and maintain same. This is a manager challenge which threatens the sustainability of water resources in rural communities across the world.

Illegal Mining Activities.

Another major challenge militating against efficient water resource management is as a result of human intervention of the environment over the years. Ghana as a country has a long history with small scale mining of gold, which has existed since the eight century. Small scale mining in the country has been legalized based on the small scale mining law (PNDCL 218). Since receiving legal backing, the small scale industry has become an important contributor to the production of gold, especially in the rural areas where sophisticated mining cannot be undertaken. However, the activities of some of these small scale miners are detrimental to water bodies in the areas they operate. The activities of the small scale miners pollute the water bodies and make them unsafe for human and animal consumption. All the chemicals, especially mercury that is from the mercury-gold amalgamation process is dumped back into the river bodies as well as the washing of their gold dust and oils from the generators used for drilling. According to Kessey and Arko (2013), small scale mining, popularly called Galamsey in Ghana, is the second largest pollution of water bodies in Ghana after bad farming practices. For instance the Pra River, which supplies water to about estimated 4 million period has been polluted by

the activities of small scale miners and this threatens the water security of the communities along the PraRiver.A cursory look at the PraRiver before small scale mining pollution and the river after the pollution clearly shows that it is almost destroyed by mining activies (See figure 2)

Figure 2: Pollution of the Pra River through illegal mining.

Illegal winning of sand, which is also part of illegal mining is also another challenge to the management of water resources in Ghana. Illegal winning of sand around water bodies pollute such water bodies and are made unsafe for human and animal consumption (GNA, 2015)

Figure 3: Illegal winning of sand around water bodies

Improper agricultural activities

In Ghana, one of the major challenges affecting water resource management is improper agricultural activities. In most rural areas, crop production and peasant farming are the major economic activities. Most of the occupation of the rural communities are crop production or livestock raring and most of Ghana's water resources are located in these rural areas and the improper activities such as improper application of fertilizers, livestock's going out to graze and drink by themselves in water bodies, chemical such as DDT used for fishing, high intensity lights for fishing and the cultivation crops along river banks ends up polluting these bodies. As indicated by Karikari and AnsaAsare (2006), farming activities along water bodies contaminates such water bodies and make them unsafe for human consumption.

Climate change

Climate change and its effect on the environment and livelihood has attracted attention in both developed and developing countries. It is caused be emission of carbon dioxide and other greenhouse gases into the atmosphere. This leads to increase in temperatures and erratic rainfall patterns (Asumadu-Sarkodie & Owusu, 2016b, 2016c, 2016f). Ghana, it is becoming amply clear that climate change has significantly affected the weather pattern. There is evidence to the effect that there is increased evaporation, decreased and highly variable rainfall pattern, and frequent pronounced flood and drought situations (Asumadu-Sarkodie, Owusu, & Jayaweera, 2015).Aside the climate change which threatens the sustenance of water bodies, a research conducted by the Water Research Institute shows that Ghana is likely to become a water stress country by 2025 if action is not taken to address challenges in the sector. In the aspect of increases in the frequency and severity of extreme weather events, it is most likely that the climate change scenario will worsen future water scarcity in many places in the country (Asumadu-Sarkodie, Owusu, & Rufangura, 2015).

Strategies for Managing Water Resources

Given the importance of water resources to the survival of humanity, various strategies and policies have been outlined to ensure its management. These strategies recognize that water resources are at the heart of sustainable economic and social development and as such must be well-initiated to yield the needed outcome. Some of these strategies includes incorporating customs in water management, increasing awareness of the

dangers of illegal mining, renewable energy sources to minimize climate change, stakeholder responsibility, and investment in water management.

Incorporating customary water management

Traditionally, local communities and villages have managed their water resources through the use of various customs and taboos. These customers and taboos are intended to protect such water resources from wanton abuse. Some examples of taboos/totems are: in some communities' water bodies are not to be visited or, so to speak disturbed on a particular day within a week, because water bodies are termed to be "spirits"; also livestock are not to be found around or graze along streams and river bodies; No cutting of trees along the river banks as well as the pollution of river bodies; Fishing activities were not allowed in any river bodies, etc. These customary strategies are intended to minimize soil erosion, deforestation, and also to allow the ecosystem to replenish itself (Atampugre, Botchway, Esia-Donkoh, &Kendie, 2015). The good aspects of these customs and taboos which are aimed at protecting the water bodies should be encouraged by all stakeholders, especially the agencies mandated to protect water bodies. This will go a long way to support the effort of local and central government in their quest to protect water bodies for sustainable development.

Increasing awareness of the dangers of illegal mining and education

In its attempt to address illegal mining activities which are destroying water resources in the country, the government of Ghana has initiated a taskforce with the mandate of ensuring that illegal miners are arrested and dealt with according to the laws of the land.

While such initiates are yielding some benefits, there is a long way to go as far as the desire to deal with illegal mining activities are concerned. Creating awareness about the dangers of illegal mining of gold and sand around water bodies has been suggested as important step in protecting water bodies (Ewusi and Seidu, 2018).An increased awareness of the dangers of illegal mining to these miners and also to their environment in relation to the future of generations yet to be born may go a long way to minimize the activities of illegal miners. Also, to ensure that those who possess legitimate small scale mining license conduct their mining activities in an environmentally friendly manner, education on the license being given for small scale mining should be intensified and after giving the miners the license, they should be educated on how cover their pits to avoid dangers posed to their lives as well as others and also how it should be away from water bodies and they not destroy these bodies. (Asumadu-Sakodie & Owusu, 2016).

Community Sensitization and participation

One important strategy that can be adopted to protect water resources is the involvement of community members in the initiation and implementation of water projects. In most rural areas, the water projects are done with little participation form the community. Assigning specific duties to stakeholders of small communities as to how they can help protect and restore their water resources and its related ecosystems by these roles, as well as equipping them with the adequate materials needed to do so. In addition to this, improving sanitation in communities would also help protect water resources, which should also be added to their responsibilities.

Investment in Water Resource Management

In order to ensure sustainable water supply significant investment needs to be made in that sector. More importantly, investment in the maintenance of existing water resources is key to ensuring sustainable water delivery in both rural and urban communities (Gyampo, 2012). Investment in educating and empowering communities to take responsibility for the management of their water resources can be a panacea for solving most of the water delivery problems faced by people in rural areas.

Empirical Literature Review

A number of empirical studies have been conducted to examine the management and challenges of water resource in rural and urban areas. For instance Kelly et al. (2018) investigated into seasonality, water use and community management of water systems in rural settings in Ghana, Kenya and Zambia. The focus of the study was to determine how seasonality impact water management. The study used qualitative design based on 320 interviews and focus group discussion. The respondents were sampled from rural communities of the selected countries. The findings of the study revealed that seasonality has impact on the availability of water, breakdown of water systems, committee activity, resource mobilization, and external support availability. The study found that in the raining season, little is spent by community members in acceding water than the dry season as a result of rain water. The study further revealed that water committees, which are integral part of the water management process has less money, time and other resources to undertake effective management of water bodies. The study further found that cultural and economic pattern of rural communities are important in water delivery

and therefore stakeholders should adopt a targeting approach. The study recommended water committees should be well-resourced to undertake their mandate in a more meaningful manner. The current study taps into the ideas and methodology applied by these researchers in achieving their objectives.

Kativhu et al. (2018) also examined the implementation of community based management of rural water systems in Zimbabwe. The focus was to determine the challenges associated with water resource management and how such challenges can be sustainably addressed. The study also sought to investigate how community based water management is undertaken in that country. Data for the study was gathered through a focus group discussion and questionnaires. Both qualitative and quantitative techniques were adopted in analyzing the data. Quantitative techniques such Pearson Chi Square test was employed to establish association among the study variables. The result shows that the key stakeholders were not performing their roles as expected due to poor capacity building. The study further found that there is a strong association between capacity building and sustainability of water systems.

Owusu, et al. (2016) reviewed the Ghana water resource management and its future prospects. The focus of the study was to understand the challenges and prospects of water management within rural and urban communities in Ghana. The review shows that the major challenges affecting water resource management in Ghana include illegal mining, water pollution, improper agricultural practices, and climate change. The authors suggested that community involvement in water management and investment in water systems can go a long way to enhance sustainable water delivery in both rural and urban areas of the country.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter focuses on the methodology employed in collecting and analyzing data. The main areas to be considered in this chapter include the research design, study population and sample size, sources of data, validity and reliability of the research process, and data collection method.

Research Design

According to Saunders et al. (2009), a research design involves the procedures and method employed in collecting and analyzing data in a given research. It also includes the measurement of the variables and data analysis techniques. Generally, a research design can be exploratory, explanatory, or descriptive. An exploratory research design seeks to gain more insight into a given phenomenon by investigating issues or problems that is has little or no prior studies (Collins and Husseey, 2003). This if often done using qualitative techniques to build theory from a given data. Descriptive research focuses on providing description of a given phenomenon with the view to portraying accurate profile about that situation. In explanatory research design, the researcher seeks to establish cause-and-effect relationship among study variables, by designating some variables and dependent and others as independent (Saunders et al. 2009). The current study adopts a descriptive research design in order to provide a vivid explanation of the water management practices of the selected communities. This is achieved by applying descriptive statistics techniques in the form of percentages, means, and standard deviations, among others to

explain a given phenomenon. The current study will apply both qualitative and quantitative techniques in analyzing the data. This use of both quantitative and qualitative techniques in a single research is often descried as mixed method design. This technique will be chosen because both qualitative and quantitative data will be collected during the data collection process. Questionnaires will be used to generate quantitative data while interview guide will generate the qualitative data.

Study Area

Sekyere South District is one of the 30 Districts of the Ashanti region of Ghana. The population of Sekyere South District, according to the 2010 Population and Housing Census, is 94,009 representing 2 percent of the Ashanti Regional population. Males constitute 47.5 percent and females represent 52.5 percent. About 47 percent of the population live in rural. The district has a sex ratio of 91. The population of the district is youthful (40.5%) depicting a broad base population pyramid which tapers off with a small number of elderly persons. The district has a household population of 91,819 with a total number of 19,445 households. The average household size in the district is 4.7 persons per household. Children constitute the largest proportion of the household structure accounting for 42 percent. Spouses form 8.1 percent. Nuclear households (head, spouse(s) and children) constitute 22.5 percent of the total number of households in the district.As high as 67.3 percent of households in the district are engage in agriculture. In the rural localities, seven out of ten households (77.8%) are agricultural households while in the urban localities, 58.8 percent of households are into agriculture (Population and Housing census, 2010).

Location

The Sekyere South District is located in the north eastern part of the Ashanti Region. Agona Ashanti which is the administrative capital, is located 37 kilometers from Kumasi, along the Kumasi - Mampong trunk road. The District shares common borders with Ejura Sekyedumasi to the north, Mampong Municipal and Sekyere East to the east, Kwabre East to the south and Offinso Municipal to the west. The District has a total land area of 416.8 square kilometers representing about 1.7 percent of the total land size of the Region of 24,389 square kilometers. The District has a density of 226 persons per square Km. The District lies between latitude 6o 50'N and 70 10'N and Longitude 10 40'W and 10 25' W (See Figure 4)

Source: Ghana Statistical Service, 2010 Population and Housing Census

Major Economic Activities

The economy of the District is mainly agrarian and it engages about 78.7 percent of the active population. The Industrial sector employs 7.0 percent while the Service sector engages 3.2 percent. Trade and Commerce take place in the major towns. Income

generation in the District is generally low. About 35 percent of people who are gainfully employed as well as those property owners, pay taxes, rates, fees, fines and licenses to the Assembly. The Assembly also has few sources of revenue. The District has large tracts of fertile agricultural land (4,587 Hectares) and vast forest reserves. Major cash and food crops like cassava, oil palm, maize, cocoa, kola nut, plantain, etc are largely cultivated on about 3,062 hectares (*Revised report by MOFA, Sekyere South, Agona, 2010).*

Water Resources

Sekyere South District located on a gentle hill is bounded to the north and south by two river valleys and is drained mainly by the Offin River to the west. Other streams which are tributaries to the Offin River such as Awyon and Bentiko are located in the northern and southern parts of Agona. The Kunkum stream flow from the east towards the west. Generally, three main sources of water in the district are borehole, public tap and pipe borne water and river/stream. More than forty percent of households in the district drink water from boreholes.

Study Population

According to Moore et al. (2009, p. 178), "*the population in a statistical study is the entire group of individuals about which we want information*". As far as this study is concerned, the population will consist ofall households, community leaders, and water committee members of the Sekyere South District. All these groups will be included as

study participants in order to obtain a balanced understanding of how water resources are managed in the selected communities.

Sampling Procedure

It is often impossible to collect data from the entire population due to time, human research and financial constrain. As a result, a sample is usually chosen from the population. A sample according to Moore et al. (2009, p.178)"*is the part of the population from which we actually collect information used to draw conclusions about the whole*". The current study will apply two sampling techniques in selecting communities and households. Purposive sampling will be used to select the communities to be included in the study while simple random sampling will be applied to choose households. Saunders et al. (2009) describe a purposive sampling technique as a non-probability sampling approach where respondents/objects/cities are chosen based on their ability to provide the needed information/data. Two main communities (cities/villages) will be selected for investigation. These cities are selected based on availability of water systems and water committee. A simple random sampling technique based on the lottery approach will be used to sample households for the study. Fifty (50) households are expected to be sampled from each of the two communities. Thus, a total of 100 households are expected to be sampled.

	Community 1		**Community 2**	
	Population	Sample	Population	Sample
Households	875	50	900	50
Water committee	8	3	7	3
Total		**53**		**53**

Data Collection Instruments

Two main data collection instruments will be developed to gather relevant data from respondents. These include structured questionnaires and interview guide. The questionnaires will be distributed to households to gauge their understanding on how water is managed within the community and their suggestions for improvement. The interview guide will be design to gather in-depth understand of the water management practices of the selected communities and the challenges associated with such practices. The items/questions to be included in the questionnaires and interview guide will be informed by existing and similar studies on the current subject. The questions will have three main sections. Section A will collect the demographic characteristics of respondents. Section B will contain questions regard the perception of respondent regarding the management of water resources in their localities. Section C will contain questions that will seek their opinions regarding the challenges associated with water management and how such challenges could be addressed. To ensure content and construct validity, a number of steps will be taken. First the items in the questionnaires/interview guide will be selected based on existing approach. Reliability of the instrument will be ascertained using reliability analysis such as Cronbach's Alpha. The use of questionnaire and interview guide in a single study will provide the benefit of obtaining adequate data from all different categories of people. There are generally two main sources of data for researchers. These are primary and secondary sources (Saunders et al. 2009). As far as this study is concerned, both primary and secondary sources of data will be used. Primary data will be sourced from interview and questionnaire

administration. Secondary in the form of existing literature. The data is expected to be collected between October and November, 2018.

Questionnaires and interview guide will be the two main instrument to collect data from research participants. The questionnaires are expected to contain structured questions which can be used to undertake quantitative analysis. The interview guide will contain semi-structured questions which will elicit elaborate responses from participants. In addition to the interview guided which will be used to collect qualitative data, field observations will be conducted to examine the functionality of the water systems. The questionnaires and interview guide will be designed using existing instruments and best practices.

Data Collection Procedure

The data collection process will begin immediately after the consent of the participants have been sought. The list of all households within the communities will be obtained by the researcher and this will serve as a sampling frame. The lottery approach will then be applied to select the households that will participate in the study. This approach is adopted to ensure that the sample fairly represents the population. Each of the selected households will be visited by the researcher to administer the questionnaires. The questionnaire will be distributed to the heads of the selected households. In the absence of the head, any member who can provide the needed information will be chosen. A total of 100 households are expected to respondent to the questionnaires. The households will be selected using a simple random sampling technique to ensure that all households

within the selected communities are fairly represented in the sample. This will go a long way to minimize sampling bias and errors.

With regards to the interview process, water committed members and other influential elders of the communities will be interviewed to solicit their views about the water projects in their areas and their level of involvement in its establishment and operation. They will also be asked to explain the challenges they encounter with the water systems within the community and how such challenges can be minimized. Four (4) participants from each of the sampled communities will be chosen for the interview exercise.

Ethical Consideration

Ethics is important aspect of every research and as such this study will take the issues of ethics seriously. The interviewees will be informed about the work and will be given the opportunity to either participate in it or not. The researcher will ensure no respondent is forced or coerced into participating in the study. In addition, all information gathered from the participants will be treated with utmost confidentiality. Participants will also be assured of anonymity.

Data Processing and Analysis

Two main types of data are expected to be obtained through the data collection process. These are quantitative and qualitative data. Quantitative data will be obtained through the administration of the questionnaires. The quantitative data was analysed using as statistical software known as Statistical Package for Social Scientists (SPSS v.22). The questionnaire data was coded and entered into the software for analysis. Before

subjecting the data into manipulation, the data was cleaned to remove outliers and other abnormal observations. Quantitative data analysis was conducted using simple descriptive statistic of frequency distribution. Descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. The qualitative data from the interview will be audio-recorded and transcribed. All transcription errors will be corrected to ensure clean data. The data will then be summarized and presented in a manner that is easy to interpret.

Chapter Summary

The chapter examined the methodology expected to be applied in answering the research questions. The study applied descriptive research design with the use of both quantitative and qualitative data analysis techniques. Two main data collection instruments were employed in gathering data. These include questionnaire and interview guide. The questionnaires gathered quantitative data from community members while the interview guide was used to collect qualitative data through interview from water committee member and other relevant stakeholders. The data collected is was analyzed using statistical techniques such as the mean, standard deviation, and frequencies. The qualitative data was analyzed by transcribing the responses and examining the patterns and trends in the responses. The major themes were then presented.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

In chapter three of this research, the methodology and the sources of data were outlined. The focus of this chapter is to present the data obtained and provide discussion on the key findings. The chapter is divided into a number of sections, including the demographic characteristics of the respondents, analysis of the quantitative data, analysis of the qualitative data, and the discussion of the results. The main focus of this research is to examine the water management practices of rural communities within the Sekyere South District. Out of this general aim, four specific objectives were stated. The first was to identify the role and level of participation of the key actors in the management of water resources within the chosen communities in the district. The second was to examine water resource management practices within the communities. The third was to ascertain the main challenges associated with sustainable water supply, whiles the final specific objective was to identify sustainable solutions to the water management challenges within the selected communities. Since the study adopted the mixed method approach, both quantitative and qualitative data is presented. The following sections presents the quantitative data obtained.

Quantitative Data Analysis and Presentation

The quantitative data was obtained through the use of questionnaires. Respondents from selected households were asked to respond to structured question and their responses are captured and presented as follows:

4.1.1 Socio-Economic Characteristics of Respondents

The focus of this study is to examine the perception of households and other stakeholders regarding the provision of water within selected communities within the Sekyere South District of the Ashanti Region. To achieve the objectives of the study, structured questionnaires and interview guide were developed to solicit the views of respondents.

Table 1: Background Characteristics of Respondents (N=78)

Variable	Classification	Frequency	Percent (%)
Gender	Male	302	74.6
	Female	103	25.4
Age	21 years and below	3	3.8
	22-35 Years	30	38.5
	36-45years	24	30.8
	46-55	13	16.7
	56-70	8	10.3
Education Levels	No formal Education	5	6.4
	Basic Education	19	24.4
	Secondary Education	30	38.5
	Tertiary Education	24	30.8
Income levels (GH¢)	200 and below	3	3.8
	201-600	24	30.8
	601-1000	29	37.2
	1001-1500	9	11.5
	Above 1500	13	16.7
Occupation	Agriculture	28	35.9
	Petty Trading	28	35.9
	Services	21	26.9
	Artisan	1	1.3
Household Size	1-3	18	23.1
	4-6	34	43.6
	7-10	23	29.5
	11-13	3	3.8

Source: Field Data, July, 2019

A total of 100 questionnaires were distributed to respondents from two towns in the selected district. Out of this, the researcher was able to retrieve 78 of these questionnaires, representing a response rate of 78%. The socio-economic characteristics of the respondents are captured in Table 4.1 above. To gain a general insight into the demographic characteristics of the respondents, a number of questions were asked to identify their sex, age, income levels, occupation, highest education attained, and household size. The frequency distribution of these socio-economic variables are presented as follows:

Sex of Respondents

Overall, a total of 78 respondents responded to questionnaires distributed. Out of this number, 37 representing 47.4% are males while the remaining 41 or 52.6% are females. Even though the focus of the study is on the head of the various households; it was not surprising to see more women respond to the questions since in most rural areas, the men tend to leave home very early and return very late. Majority of the women were therefore available to respond to the questionnaires.

Age categories of respondent

From the result presented in Table 4.1 above, it is observed that the modal age group of the respondents was 22-35 years, which represents 38.5% of the respondents. This was closely followed by the 36-45 year group which constitutes 30.8% of the respondents. 3.8% of the respondents are 21 years and below, while 16.7 % of the respondents are between the age 46-55. This result is consistent with the 2010 population census which

indicates that those between the ages of 20-35 constitutes the majority of most communities in Ghana.

Education Level of Respondents

Another important socio-economic variable that was examined is the educational level of respondents. From the result presented in Table 4.1above, it is observed that 38.5 percent of the respondents have attained secondary education in the form of SSCE, WASCE, O level, or A Level. 30.8% of the respondents have also had tertiary level qualifications in the form of degrees and HND. The result also shows that 24.4% of the respondents have had basic education. However, 6.4 percent of the respondents have had no form of formal education. The result is a fair presentation of the educational qualifications in rural cities.

Household Size

From the result captured in Table 4.1 above, it is observed that a number of people within the selected households ranges from 1 to 13. Out of this, it is observed that majority of the households (43.6%) that participated in this study had a family size of between 4 and 6. 23.1% of the households have between 1 to 3 family members, while those with 7 to 10 constitutes 29.5%. The average number of person in a household was also estimated to be 5.2 persons. This is lower than the national population and housing census of 2010 result which estimates the average persons per household to be around 6.5 persons.

Occupation of the Respondents

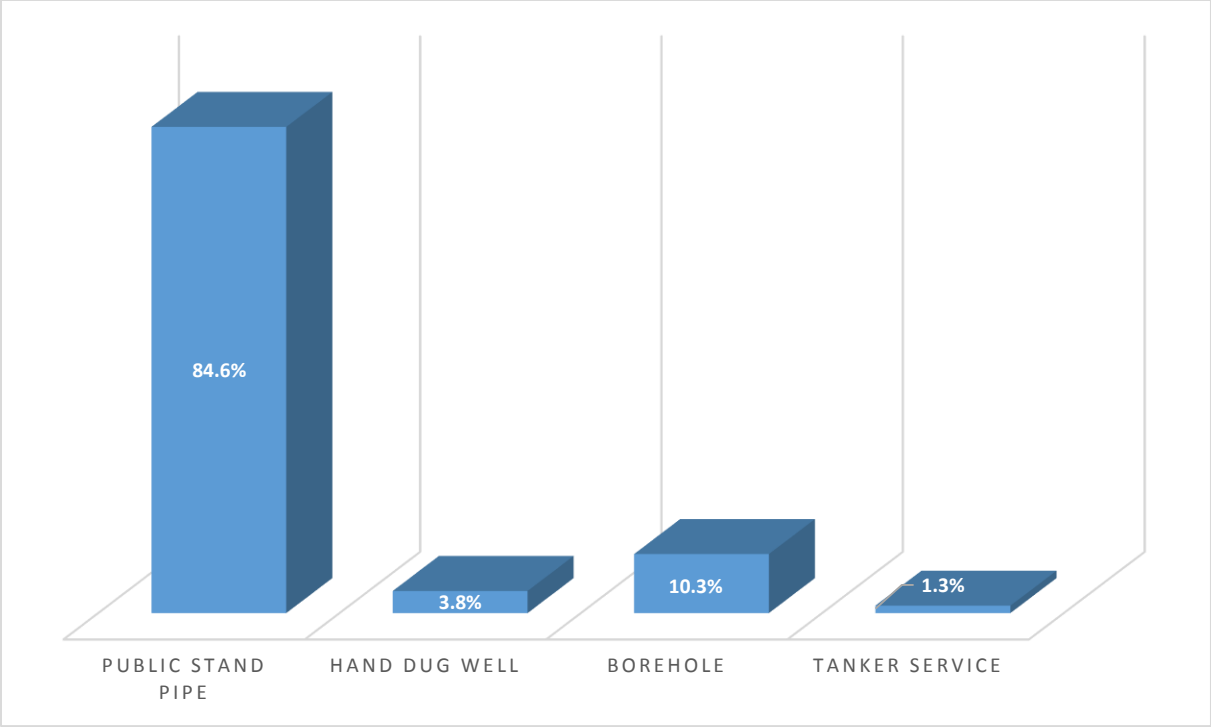
From the Table 4.1 above, it is observed that three dominant sources of livelihoods are available within the selected communities. These include agriculture, petty trading, and services. Agriculture and petty trading together provide employment for about 72% of the people within the communities. This result is not too surprising since agriculture and petty trading are the main occupations of rural dwellers in Ghana.

Income Levels of Respondents

The analysis of the income levels of respondents indicates the average income level for the respondents is Ghc650. The monthly incomes ranges from GHc200 to 2,000.00. Majority of the respondents (37.2%) earn between 600 and 1000 cedis monthly while 30.8% earn between 200 and 600 Ghana cedis. The low levels of salary among the respondents is not too surprising given that they are involved in petty trading and subsistence farming.

Source of water within the Selected Area

It is common knowledge that the water situation in most rural areas are not the best. Some rural communities share water sources with animals, which could have negative impact on the health of the community members. Against this backdrop, the study sought to examine the main sources of water for these communities. The result is depicted in the diagram below.



Source: Field Data, July 2019

Figure 4: Major Sources of water for the communities

From the result presented above, it is observed that the major source of water is public stand pipes. A total of 84.6% of the respondents indicated that public stand pipe is their main source of water, while 10.3% indicated that boreholes constitutes their main source of water supply. Also, those who rely on hand dug wells and tanker services constitutes 3.8% and 1.3% respectively.

Sources of water during dry season

In addition to understanding the main sources of water used by the households within the selected communities, the researcher also sought to examine the main sources of water utilized by households during the dry season. The responses provided by respondents are

captured in Table 4.2. The result shows that there is not much difference when it comes to the major sources of water for the community during dry seasons and non-dry seasons. Majority of the respondents, 64 (82.1%) of the respondent use public stand pipes during the dry season. The result however, indicates that more people rely on public stand pipes during the dry season compared to the wet seasons.

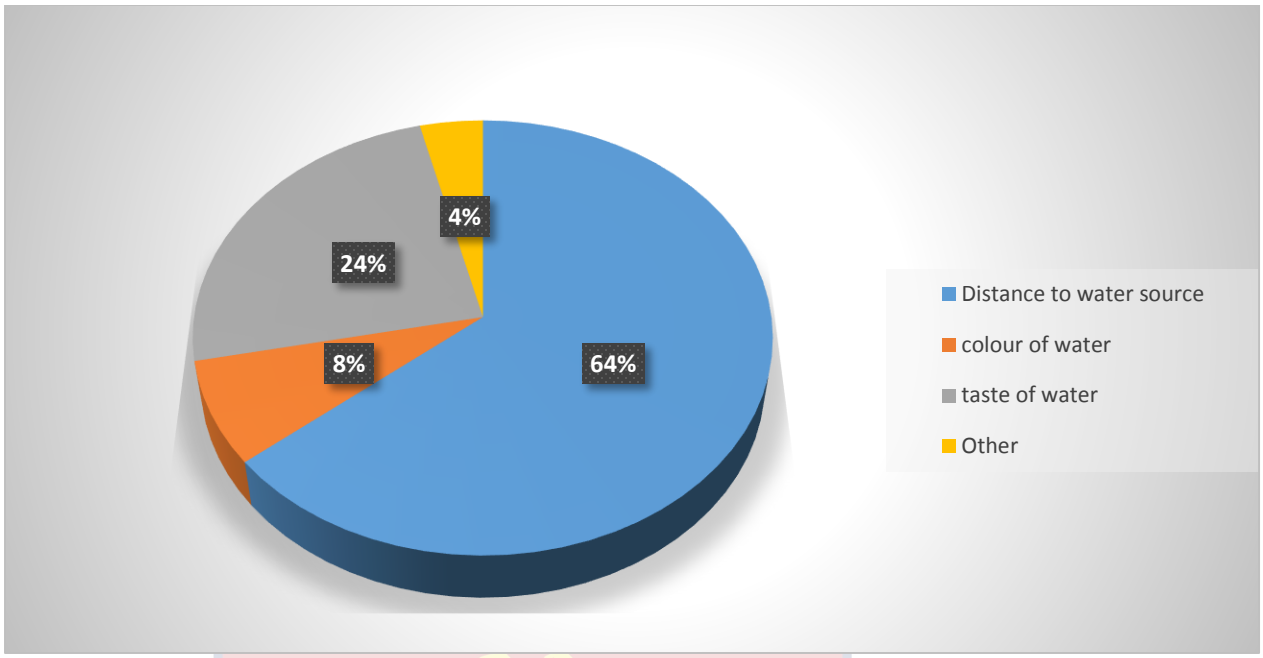
Table 2: Sources of water during dry seasons

Source	Frequency	Percentage
Public Pipe	64	82.1
Well	7	9.0
Tanker service	4	5.1
Others sources	3	3.8
Total	**78**	**100**

Source: Field Data, July, 2019

State of water sources and challenges

In majority of rural communities, it is not uncommon to find poor water sources for the communities. Many rural communities rely on contaminated streams, wells and stagnant water for drinking, cooking, washing, and for other household chores. As a result, the study focused on the state of water in the community and the challenges associated with same. The result is captured in Figure 4.2



Source: Field Data, July, 2019

Figure 5: Challenges of water supply from the perspective of respondents

From the result above, it is clear that majority of the respondents (64%) complain about the distances they have to cover to obtain water for consumption. This happens to be the major challenge confronting the households within the selected communities. In addition, another major challenge that was identified by the respondents is the taste of the water within the community. Under normal circumstances, water is supposed to be tasteless but some respondents complain that the taste of water is not pleasant. 8 percent of the respondents also complained about the color of the water. Some of these respondent indicated that the water is sometimes contaminated and therefore the color does not appear to be clear. The remaining 4% of the respondents also cited other challenges such as the cost of the water, constant breakdown of the stand pipes, and long queues as some of the challenges associated with water supply within the communities.

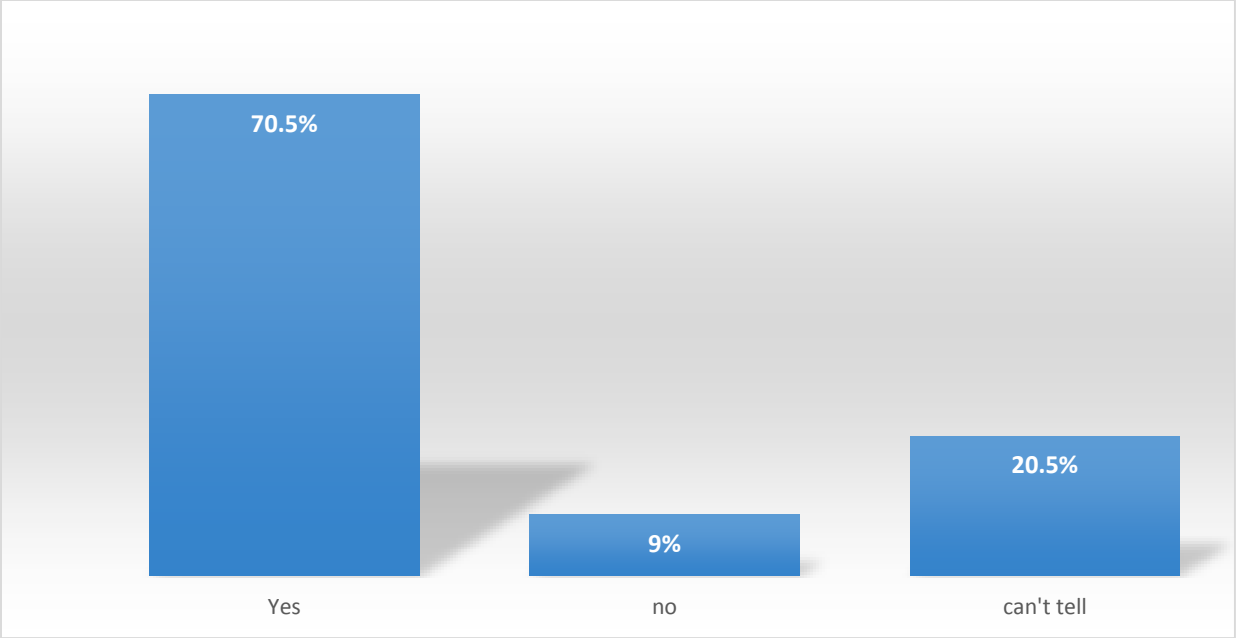
Participation of Community in the provision and management

One of the objectives of this study is to examine the level of participation of community involvement in the execution and management of water resources within the communities. According to Talbot and Varrinder (2005), the purpose of community participation is to ensure that all different stakeholders and opinion leaders are brought together in order to improve decision making. In essence, community participation makes it possible for the community to solve their own problems by providing the best alternatives. In view of this the study a number of questions were asked to elicit the opinion of community members regarding the main suppliers of their water facilities, whether they are consulted before water projects are undertaken, and whether they are involved in the management and maintenance of the water resources within their communities.

Table 3: Opinion on Who Provides Water Resources for the community

Source	Frequency	Percentage
Community	9	11.5
District Assembly	24	30.8
NGO	3	3.8
Others Private Organization	42	53.8
Total	78	100.0

Source: Field Data, July, 2019



Source: Field Data, July, 2019

Figure 6: Consultation with the community before water project

Table 4: Contribution to water projects and management within the community.

Contribution	Frequency	Percentage
Yes	55	70.5
No	23	29.5

Source: Field Data, July 2019

From the results presented above, it can be observed that majority of the respondents (70.5%) indicated that they are consulted before water projects are initiated within their communities. This consultation, they explained, comes in the form of community durbars and engagement to elicit the views of community members as far as the new project is concerned. Also, majority of the respondents indicated that they contribute towards the initiation and maintenance of water projects within their communities. The contributions,

which are mainly financial, is made in the form of water levies to support the water projects. Some of the respondents also indicated that fund raisings are sometimes organized to raise revenue to support such projects.

Qualitative Data Analysis

In addition to the questionnaires which were distributed to the various households of the selected communities to obtain their general opinions on the water situation within the selected communities, interview was conducted among the water committee members of the respective communities. The purpose was to examine their role in the management of water resources within the community, how water resources are effectively and efficiently managed, the challenges associated with sustainable water supply within the selected communities, and the sustainable ways through which water resources can be managed. To achieve these specific objectives, three water committee members from each of the selected communities were interviewed. The researcher purposively selected these respondents (interviewees) based on their involvement in the management of the water resources within the communities. In this section, the respective interview questions are presented followed by the responses.

Interview Process

The researcher personally interviewed the 6 water committee members within the selected communities. These members were given prior notice of the research and its intended purpose. They were asked to indicate the date they will be available for the interview. The interview questions were designed to meet the specific research questions.

In addition, some socio-economic data were elicited. The demographic characteristics of these respondents is captured in the Table below.

Socio-Economic Characteristics of Interviewees

The socio-economic characteristics of the responses such as their age, sex, educational level and family size were solicited. Some of these variables were necessary to guide the researcher as far as the interview process is concerned. From the responses obtained, the average age of the interviewees was 45.7. The result is not surprising given that these people are selected based on their experience and age. Also out of the 6 respondents, 5 were males and the remaining one being female. This result shows clearly that the water committee members of these communities is dominated by males. This is also not too surprising given that in most rural areas, men are preferred over women as far as leadership and management of resources are concerned. The educational level of water committee member was also examined. Out of the 6 members, 3 have had secondary education, 2 have had tertiary education, while the remaining 1 has had basic education. They result also shows that majority of the members are highly educated.

Water Committee Participation

One of the main objectives of the study was to ascertain the level of participation of the community as far as water resource management is concerned. In order to achieve this objective, a number of questions were asked. The first question was to ascertain the role played by the water committee members as far as water management within the communities are concerned.

Question: What role does the water committee play in the management of these water resources?

Response: Majority of the water committee members indicated that as part of their mandate as water committee members, their responsibilities with regards to water resource management are stipulated. They are responsible for initiating water projects in conjunction with the district assembly and other private entities that desire to provide water resources for the community. In addition to the initiation, they monitor and supervise the available water resources.

This is what one of the committee members has to say regarding their role in the water management:

> *"We ensure the day-to day running of the water by frequently visiting standpipes to access availability. In addition we participate in meeting and represent the community when the assembly is making any decision regarding water issues".*

The second question had to do with rating of the community's level of participating in the planning and implementation of water projects within the communities.

Question: How do you rate community participation in planning and implementation of the water supply project?

Majority of the respondents (5) out to the 6 indicated that the level of participation of the community as far as planning and implementation of water resources are concerned is very "encouraging". They indicated that because the water committee members are required to provide their input regarding the type of water system the community needs and the best approach to deliver such projects, they are always consulted on all matter.

Challenges associated with water management

One of the specific objectives of this study was to examine the main challenges associated with the management of water resources within the selected communities. To achieve this objectives, one of the interview questions sought to understand the main water management challenges within the communities. From the interview responses, it is observed that the challenges can be classified as financial, institutional, environmental and technical.

Financial and management challenges

Almost all the water committee members interviewed indicated that the lack the financial resources to adequately expand the water resources within the communities and maintain the existing facilities. This is in line with the assertion by Carter (2009) who observed that the failure of an existing water facilities is often due to weak financial and management arrangements for operation and maintenance. Some of the water committee member indicated that the sale of water does not generated enough revenue to maintain the water facilities and to initiate new projects. They also bemoaned the lack of financial support from the district assembly and community water unit within the district.

Institutional challenges

Another challenge that was unanimously indicated by the interviewees is the lack of effective institutional framework, policies and procedure to adequately manage water resources within the communities. The respondents asserted that the water committee instituted to help manage the water systems within the communities are not function

effectively as a result of lack of clear framework for managing the water resources. This observation is not surprising since according to Gleick (1998), water systems do not function effectively in many rural areas as a result of lapses institutional framework and policies at the local level to enhance effective water delivery

Environmental Challenges

Some of the respondents also indicated that due to poor farming practices, many of the water bodies that served as backup when the boreholes are not function have become polluted. This, they believe, has affected many of the alternative water supply within the communities. Again, illegal human activities, and improper farming practices are affecting the sources of water within the district.

Technical challenges

A cursory analysis of the responses provided by the respondents indicated that majority of them lack the technical skills and knowledge to effectively manage the water resources. While it was observe that they have been trained, the training is not adequate to effectively and efficiently manage these water resources. As indicated by Hunter et al (2010) the lack of skills and technical knowhow affect the ability of the local community to adequately manage their water resources.

Other challenges

In addition to the challenges explained above, the water committee members indicated that the long distances majority of the community members cover to fetch water poses a

challenge that needs to be solved. Also, they explained that during the dry seasons, some impurities are mixed with the water which changes its colour.

Suggested Solutions for Improving Water Delivery within the selected communities

After understanding the challenges faced by the community as far as the supply of portable water is concerned, respondents were asked to indicate how the provision of water resources and the water management practices can be improved to offer sustainable water delivery for the community. From the responses obtained, a number of solution were put forward by participants. Firsts, majority of the respondents (80%) suggested that there is the need for adequate training for water committee member to enhance their capacity as far as water management within the communities are concerned. Second, the respondents unanimously suggested that the communities should be supported financially by the district assembly and other governmental and non-governmental organization in order to expanding the existing water resources within the community. This, they believe, will reduce the distances covered by some households to obtained water for their domestic consumption. According to the respondents, the inadequate number of boreholes and stand pipes also create congestion on the available facilities during the dry seasons.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

In chapter four of this study, data gathered from the field were subjected to analysis and discussions. This chapter is designed to provide the summary of key findings from the data analysis. In addition, the chapter will provide conclusion of the entire study and provide some recommendations based on the findings of the study.

Summary of Key Findings

The general objective of the study was to examine the water management practices and challenges among selected communities within selected communities within the Sekyere South District of the Ashanti Region of Ghana. Based on this general objective, four specific objectives were derived. The first was to identify the role and level of participation of the key actors in the management of water resources within the study areas. The second was to examine water resource management practices within the study area. The third was to ascertain the main challenges associated with sustainable water supply, while the financial objective was to identify sustainable solutions to the water management challenges within the study areas. The main findings under each of the specific objectives are summary as follows:

Level of participation and role of key actors in the management of water resources

The focus of the first objective was to determine whether the community members and leaders are actively involved in the initiation and management of water resources within

the selected communities. From the result obtained, it was observed that right from the initiation of the water project, the community is informed through the water committee members. These members, on behalf of the community, determine the suitability of the project and advices the implementing agency on the best approach to adopt. The water committee is also involved in the in the day to day management of the water resources to ensure that there is continuous supply of the resource. From the analysis of the questionnaires, over 70 % of the community members agreed that there is some form of consultation during the initiation of water projects. In addition, they contribute in the form of labour and money to support such projects. The result of the study further revealed that the key members of the water committee which includes assembly members, unit committee members and other representatives of the communities are involved in the management of the water resources within the communities.

Water resource management practices within the study area

Water is an important resource for the survival and development of any community. As a results, its management is very crucial. Against this backdrop, the second objective of the study was to examine how the water resources at the disposal of the selected communities are managed. To achieve this objective, data was collected from both the community members and the water committee members. Questionnaires were distributed to the community member while the water committee members were interviewed. The result shows that a water committee members have been appointed to oversee the management of water resources within the selected communities. The committee ensure that revenue is

mobilized thought the sale of water to improve maintenance. In addition, technical people are employed to handle issues relating to maintenance.

Challenges of water resource management within the selected communities

It is an undisputable fact that many rural communities in Ghana face serious challenges when it comes to the provision of portable water for both domestic and industrial use. As a result, the third objective of this study sought to understand some of these challenges and how they affect the provision of portable water for consumption. Based on the responses provided by both the community members and water committee members, three main challenges were identified. First, it was observed that the water facilities within the community are inadequate and as a result many households will have to walks several minutes to have access to portable water. The time taken to get this water, the residents, believe, is a major challenge that needs to be addressed. Other challenges affecting the management of water resources includes financial, institutional, technical, and environmental.

Suggested Solutions for Improving Water Delivery within the selected communities

After understanding the challenges faced by the community as far as the supply of portable water is concerned, respondents were asked to indicate how the provision of water resources and the water management practices can be improved to offer sustainable water delivery for the community. From the responses obtained, a number of solution were put forward by participants. Firsts, majority of the respondents (80%) suggested that more water facilities should be constructed to reduce congestions in the morning and to

reduce the long distances communities members have to cover to fetch water. The water committee members also suggested that there is the need for adequate training in order to effectively manage water resources. Also, financial support from the government, they believe, will go a long way enhance regular maintenance of water facilities.

Conclusion

Water is life and especially potable water is essential for life and health. So, access to drinking water, improves overall socio-economic and environmental existence (Gebrehiwot, 2006). Fresh water is not only used for domestic consumption but also supports industrial and agricultural activities. Since water is essential for the survival of humans, there is the need to examine how water resources are managed, especially in rural communities. Against this backdrop, this study sought to examine the water management practices of selected communities in Sekyere South District of the Ashanti Region of Ghana. The purpose was to determine the level of participation of the community in the water management, the challenges associated with the water management practices, and the sustainable solutions to deal with the challenges. To achieve the objectives of the study, a thorough literature review was conducted to understanding how existing literature has examined water management and its challenges in rural settings. Based on the literature review, a comprehensive research design based on the research methodology was developed to guide the researcher achieve the objectives of the study

Two major communities within the Sekyere South District of the Ashanti Region were selected for the study. These communities were purposively selected due to their peculiar challenges as far as water management and delivery is concerned. Data was gathered from both community members and key stakeholders such as water committee member to gain in-depth understanding of the situation. The result of the study shows that even though the community in involved in the initiation and management of water resources, the water situation within the communities in the district are affected by a number of challenges such as poor maintenance, financial problems, inadequate training for smooth management of water resources, inadequate number of water facilities (boreholes and stand pipes) to adequately serve all communities members, and pollution of water bodies through unapproved farming methods. Based on the challenges, some sustainable ways of ensuring adequate supply of water were suggested. These include government and private support in the provision and maintenance of adequate water resources within the selected communities. Also, there is the need for adequate training to be given to the water committee members in order to effectively manage water resources within the communities

The current study has brought to the fore the major challenges faced by a typical rural community as far as water provision. There is the need for government agencies and institutions to examine these challenges and find sustainable solutions in order to improve water delivery within rural communities.

Recommendations

Based on the findings of the study, the following recommendations ae made:

First, the findings of the study shows that the water committee members are not adequately trained to effectively manage the water resources within the communities. The study therefore recommends that the government and Community Water and Sanitation Agency (CWSA) should conduct capacity building and refresher training in order to scale up the capacity of the water committees to manage the schemes properly. More importantly, CWSA and other water related agencies should organize regular training for committee members to equip them with relevant skills to help them handle certain technical issues regarding the management of the water schemes.

Second, it was observed that maintenance and the ability of water resources to be expanded is hampered by inadequate financial resources. The possibility for refresher training is unthinkable in most cases due to the budget constraint at the district level. Therefore, financial and technical support is required not only at community level but at district levels. Adequate budgetary allocations should be provided from the assembly's resources to enable the unit discharge its duties diligently.

The findings of the study also shows that the supply of safe water by the existing water schemes is insufficient. As a result, some community members will have to travel long distances before they can have access to portable water. The study therefore recommends that new schemes as well as expansion of the existing systems should be planned and implemented.

Suggestions for Further Research

The current study makes significant contribution to the existing literature on water supply challenges within rural communities in Ghana. However, based on the procedure adopted and the results obtained, the following are suggested for future researchers. First, the current study used cross-sectional data which meant that data is collected over just one period of time. However, a more comprehensive study can be conducted if a longitudinal study is conducted. This will make it possible for data to be collected from the communities over different periods of time and hence enhance the comparison of the result. Also, future studies may also examine the effect of unapproved farming practices and illegal mining on the supply of water within rural communities in Ghana.

REFERENCES

Abrams, L. (1998). Understanding Sustainability of Local Water Services,. http://www.africanwater.org/ sustainability.htm

Anokye, N. A., & Gupta, J. (2012). Reconciling IWRM and water delivery in Ghana – The potential and the challenges. *Physics and Chemistry of the Earth, Parts A/B/C,47–48,* 33 45. doi:10.1016/j.pce.2011.06.010[Crossref], [Web of Science ®], [Google Scholar]),

Araral E. and Wang, Y. (2013). Water Governance 2.0: A review and second Generation Research Agenda. Water Resource Management, 27(11), 3946-3957

WHO (2008) Guidelines for drinking-water quality [electronic resource]: incorporating 1st and 2nd addenda, Vol.1, Recommendations. – 3rd ed.

(ADF, 2005) The National Rural Water Supply and Sanitation Programme

Asumadu-Sarkodie, S., &Owusu, P. A. (2016b). Feasibility of biomass heating system in Middle East Technical University, Northern Cyprus Campus. *Cogent Engineering,3,* 1134304. doi:10.1080/23311916.2015.1134304

Asumadu-Sarkodie, S., &Owusu, P. A. (2016c). Multivariate co-integration analysis of the Kaya factors in Ghana. *Environmental Science and Pollution Research*. doi:10.1007/s11356-016-6245-9

Asumadu-Sarkodie, S., Owusu, P. A., &Jayaweera, H. M. (2015). Flood risk management in Ghana: A case study in Accra. *Advances in Applied Science Research,6,* 196–201. [Google Scholar]; Asumadu-Sarkodie,

Asumadu-Sarkodie, S., Owusu, P. A., &Rufangura, P. (2015). Impact analysis of flood in Accra, Ghana. *Advances in Applied Science Research,6*, 53–78. [Google Scholar]).

Ewusi, A. and Seidu, J., (2018). Hydrogeology of the Basin Granitoids in the Sekyere South District of Ashanti Region, Ghana. **Journal of Geoscience and Environment Protection, 2018, 6, 252-263**

Gebrehiwot M. (2006). An Assessment of Challenges of Sustainable Rural Water Supply: The Case of OflaWoreda in Tigray Region. Msc Thesis, Regional and Local Development Study (RLDS). A.A.U. Ethiopia.

Giordano, M., & Shah, T. (2014). From IWRM back to integrated water resources management. *International Journal of Water Resources Development,30*, 364–376. doi:10.1080/07900627.2013.851521 [Taylor & Francis Online], [Web of Science ®],

Gyampo, M. A. (2012). Wastewater production, treatment, and use in Ghana. Paper presented at the Third Regional Workshop of the Project 'Safe Use of Wastewater in Agriculture. [Google Scholar]).

Harris, L.M, and Morinvi, L, C. (2013). Improving participatory water governance in Accra, Ghana. CIGI Africa Initiative; Policy brief, June 2013.

Harvey, P.A, Reed, R.A and Skinner, B.H. (2002). Guidelines for Sustainable Hand Pump Projects in Africa," Interim

Holcombe, R. G., (1997). A Theory of the Theory of Public Goods. A Review of Austrian Economics 10, No. 1.

Karikari and Ansa-Asare (2006Karikari, A., & Ansa-Asare, O. (2006). Physico-chemical and microbial water quality assessment of Densu River of Ghana. *West African Journal of Applied Ecology,10*(1). [Google Scholar]),

Karr, J. R. (1991). Biological integrity: A long-neglected aspect of water resource management. *Ecological Applications,1*, 66–84.10.2307/1941848[Crossref], [PubMed], [Web of Science ®], [Google Scholar]).

Kativhu, T., Mazvimavi, D. Tevera, D. and Nhapi, I. (2018). Implementation of Community Based Management (CBM) in Zimbabwe: The dichotomy of theory and practice and its influence on sustainability of rural water supply systems. Physics and Chemistry of the Earth

Kelly, E, Shields, K.F., Cronk, R. Lee, K., Behnke, N., Klug, T., and Bartram, J. (2018). Seasonality, water use and community management of water systems in rural settings: Qualitative evidence from Ghana, Kenya, and Zambia. *Science of the Total Environment*, 628 629, 715–721

Kessey, K. D., &Arko, B. (2013). Small scale gold mining and environmental degradation, in Ghana: Issues of mining policy implementation and challenges. *Journal of Studies in Social Sciences,5*. [Google Scholar]).

OECD (2011). "Public Governance and Water Policies: An Innovative Multilevel Approach. Water Governance in OECD Countries: A Multi-level Approach." 23-36.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Owusu, P. A, Asumadu-Sarkodie, S and Ameyo, P. (2016). A review of Ghana's water resource management and the future prospect. *Cogent Engineering* (2016), 3: 1164275

Parry-Jones, S., Reed, R. and Skinner, B.H (2001). Sustainable Hand Pump Projects in Africa: A Literature Review," WEDC, Loughborough University, Leicestershire, 2001.

Pretty, J. N. (1995). Participatory Learning for Sustainable Agriculture," *World Development*, 23(8), 1247-1263. doi:10.1016/0305-750X(95)00046-F [12]

Report, WEDC, Leicestershire, 2002

Rogers, P. and Hall, A. (2003). Effective Water Governance. Global Water Partnership, Technical Advisory Committee Background Paper No 7. Global Water Partnership, Stockholm.

Sara, J and Katz, T. (1997). Making Rural Water Supply Sustainable: Report on the Impact of Project Rules," UNDP World Bank Water and Sanitation Program, 1997. http://www.wsp.org/sites/wsp.org/files/publications/global_ruralreport.pdf

Saunders, M., Lewis, P., and Thornhil, A. (2009). *Research methods for business students*, 5th ed. London, Prentice Hall

UNDP (2013): "User's Guide on Assessing Water Governance." 100.

USAID. (2011). Biodiversity and tropical forests environmental threats and opportunities assessment. Retrieved fromhttp://www.encapafrica.org/documents/biofor/ETOA_Ghana_FINAL.pdf

Whittington, D., Davis, J., Prokopy, L., Komives, K., Thorsten, R., Lukacs, H., Bakalian, A., Wakeman, W., (2009). How well is the demand-driven, community management model for rural water supply systems doing? Evidence from Bolivia, Peru and Ghana. Water Policy 11:696–718. https://doi.org/10.2166/wp.2009.310.

WHO (2008). Guidelines for Drinking Water Quality. 3rdEdn,, Volume 1.

WHO. (2015). World Health Statistics 2015: Part II Global health indicators. Geneva, Switzerland.

WRC Ghana. (2011). *Groundwater management strategy*. Retrieved from http://www.wrc-gh.org/documents/reports/ [Google Scholar]);

WRC Ghana. (2012). *Groundwater management strategy*. Retrieved from http://www.wrc-gh.org/documents/reports/

Appendix 1: Questionnaires

PRESBYTERIAN UNIVERSITY COLLEGE, GHANA

QUESTIONNAIRE FOR COMMUNITY MEMBERS

Introduction

I wish to introduce myself as a Master's student of the Presbyterian University College, Ghana. As part of my study, I am required to conduct a research on water management within your community. It will be much appreciated if you could support the research by responding to the questions in this instrument. All answers provided will be treated with utmost confidentiality

A. SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

1. Age of respondent …….

2. Sex: Male [ ] Female [ ]

3. Educational Level: No formal education [ ]; Basic education [ ] Secondary education [ ]
   Tertiary education [ ]

4. Size of family / household: No. of Adults [ ] No. of Children [ ]

B. LIVELIHOOD / ECONOMIC ACTIVITIES

5. Indicate your primary occupation.

Agriculture [ ]Petty trading [ ]Services [ ] Artisan [ ]

6. What has been your average monthly income for the past one year?

GH¢……

C. SOURCE OF WATER TO HOUSEHOLDS / COMMUNITY

7. Please indicate your main sources of water in order of use in your household.

Public stand pipe [ ] Hand dug well [ ] Stream [ ] Borehole [ ] Tanker service [ ]

8. What is the major source of water to your household during the dry season?

Public stand pipe [ ] Well [ ] tanker services [ ] stream [ ] others (specify)…….

9. What is the general water situation in your community?

……

……

10. In your opinion, is the water in your community safe for human consumption?

……

……

……..

11. Which of the following do you consider as a major problem with regards to the water used in your community?

    Distance to water source [ ] colour of water [ ] taste of water [ ] others (specify)…....

12. How would you describe the state of the water source in your community?

    Clean [ ] Salty [ ] Smelly[ ] Coloured [ ]

D. COMMUNITY PARTICIPATION

13. Who provided the water used by the community?

The Community [ ] District Assembly [ ] NGO [ ] Others[ ]

(specify)……

14. Was the community consulted on where to site the facility before it was installed?

Yes [ ]; No. [ ] Can't Tell [ ]

15. Did the community / households contribute any money towards the provision of the water facility used by the community? Yes [ ] No [ ]

E. WATER CHALLENGES AND SOLUTION

16. What challenges do you face with regards to water supply within the community?

- .....
- .....

- .....
- ……...……
- .....

17. What is your suggested solution to improve and sustain the operation of the existing water supply?

- .....
- .....
- .....
- ……...……
- .....

Appendix 2: Interview Guide

PRESBYTERIAN UNIVERSITY COLLEGE, GHANA

QUESTIONNAIRE FOR WATER COMMITTEE MEMBERS

Introduction

I wish to introduce myself as a Master's student of the Presbyterian University College. As part of my study, I am required to conduct a research on water management within your community. It will be much appreciated if you could support the research by responding to the questions in this instrument. All answers provided will be treated with utmost confidentiality

A. SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

1. Age of respondent …….

2. Sex: Male [ ] Female [ ]

3. Educational Level: No formal education [ ]; Basic education [ ] Secondary education [ ]
   Tertiary education [ ]

4. Size of family / household: No. of Adults [ ] No. of Children [ ]

B. WATER COMMITTEE PARTICIPATION

5. What role does the water committee play in the management of these water resources?

……

……

……

……

6. How do you rate community participation in planning and implementation of the water supply project?

……

……

……

……

How will you describe the community participation on choice of technology used for the water supply scheme

……

……

……

7. As water committee members do you receive technical and capacity building training on water management?

……

……

C. CHALLENGES AND SOLUTION OF WATER MANAGEMENT

8. What are the major problems of your water supply scheme

……

……

……

……

9. Are these challenges affecting the smooth supply of water management? If yes, please explain how.

……

……

……

10. What is your suggested solution to improve and sustain the operation of the existing water supply scheme

……

……

……

……

……